

Asian Society for Innovation and Policy



# PROCEEDINGS OF THE



## 9<sup>th</sup> INTERNATIONAL CONFERENCE: Technology & Innovation for SMEs

University of the Philippines  
Diliman, Quezon City, Philippines

3-5 October 2019



## **Proceedings of the ASIP 9<sup>th</sup> International Conference: Technology and Innovation for SMEs**

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University of the Philippines Institute for Small-Scale Industries (UP ISSI)  
Korea Institute for Science and Technology Evaluation and Planning (KISTEP)  
Korea Institute of Science Technology Information (KISTI)  
Korea Research Institute of Chemical Technology (KRICT)

### **Operation**

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ASIP 2019 International Conference

**Proceedings of the ASIP 9<sup>th</sup> International Conference: Technology and Innovation for SMEs**

Prepared by the University of the Philippines Institute for Small-Scale Industries

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## *List of Abbreviations*

<b>AcSIR</b>	Academy of Scientific and Innovative Research
<b>ADMATEL</b>	Advanced Device and Materials Testing Laboratory
<b>AIM</b>	Atal Innovation Mission
<b>AMCen</b>	Additive Manufacturing Center
<b>AMERIAL</b>	Advanced Mechatronics, Robotics and Industrial Automation Laboratory
<b>ASEAN</b>	Association of Southeast Asian Nations
<b>ASIP</b>	Asian Society for Innovation and Policy
<b>ASTHRDP</b>	Accelerated Science and Technology Human Resource Development Program
<b>ASTI</b>	Association of Science and Technology Information
<b>BioPERC</b>	Bioprocess Engineering and Research Center
<b>BIRAC</b>	Biotechnology Industry Research Assistance Council
<b>BIST</b>	Business Innovation through Science and Technology
<b>CASTED</b>	Chinese Academy of Science and Technology for Development
<b>CHED</b>	Commission on Higher Education
<b>COMPAS</b>	COMpetitive Analysis Service
<b>COPE</b>	Communities of Practice for Entrepreneurship
<b>CPR</b>	Center for Policy Research
<b>CPT</b>	Core-strategic Purpose Technology
<b>CRADLE</b>	Collaborative R&D to Leverage the Philippine Economy
<b>CSIR</b>	Council of Scientific & Industrial Research
<b>DA</b>	Department of Agriculture
<b>DBT</b>	Department of BioTechnology
<b>DepEd</b>	Department of Education
<b>DITC</b>	Department of Information and Communications Technology
<b>DMSC</b>	Die and Mold Solutions Center
<b>DOLS</b>	Dynamic Ordinary Least Square
<b>DOST</b>	Department of Science and Technology
<b>DST</b>	Department of Science and Technology
<b>DTI</b>	Department of Trade and Industry
<b>EPDC</b>	Electronics Product Development Center
<b>ERDT</b>	Engineering Research and Development Technology
<b>FDI</b>	Foreign Direct Investment
<b>FIC</b>	Food Innovation Centers
<b>GEMS</b>	Green Enviro Management Systems
<b>GERD</b>	Gross Expenditure on Research and Development
<b>GGSIU</b>	Guru Gobind Singh Inraprastha University
<b>GMS</b>	Greater Mekong Subregion
<b>GPN</b>	Global Production Network
<b>GRI</b>	Government-funded Research Institute
<b>HRD</b>	Human Resource Development
<b>HSE</b>	Higher School of Economics
<b>i3S</b>	Inclusive Innovation Industrial Strategy
<b>ISSEK</b>	Institute for Statistical Studies and Economics of Knowledge
<b>ISSI</b>	Institute for Small-Scale Industries
<b>IoT</b>	Internet of Things
<b>JAIF</b>	Japan-ASEAN Integrated Fund

<b>J-NIS</b>	Japanese National Innovation Survey
<b>KIPRIS</b>	Korea Intellectual Property Rights Information Service
<b>KISTEP</b>	Korea Institute of Science and Technology Evaluation and Planning
<b>KISTI</b>	Korea Institute of Science Technology Information
<b>KOTIS</b>	Korea Toxicogenomics Integrated System
<b>KRICT</b>	Korea Research Institute of Chemical Technology
<b>KSTAR</b>	Korean Superconducting Tokamak Advanced Research
<b>LGUs</b>	Local Government Units
<b>MEXT</b>	Ministry of Education, Culture, Sports, Science and Technology
<b>MI</b>	Mekong Institute
<b>MIRDC</b>	Metals Industry Research and Development Center
<b>MKCF</b>	Mekong-Republic of Korea Cooperation Fund
<b>MPGG</b>	Mt. Paektu Geoscientific Group
<b>MRSP</b>	Mechatronics and Robotics Society of the Philippines
<b>MSMEs</b>	Micro, Small, and Medium Enterprises
<b>MUDRA</b>	Micro Units Development and Refinancing Agency
<b>NCT</b>	National Core Technology
<b>NEDA</b>	National Economic and Development Authority
<b>NICER</b>	Niche Centers in the Regions for R&D
<b>NISTADS</b>	National Institute of Science, Technology, and Development Studies
<b>NISTEP</b>	National Institute of Science and Technology Policy
<b>NPD</b>	National Product Development
<b>NST</b>	National Research Council of Science and Technology
<b>NTIS</b>	National Science & Technology Information Service
<b>NZAP</b>	New Zealand Aid Programme
<b>ODI</b>	Outward Direct Investment
<b>PCAARRD</b>	Philippine Council for Agriculture, Aquatic, and Natural Resources Research Development
<b>PCHRD</b>	Philippine Council for Health Research and Development
<b>PCIEERD</b>	Philippine Council for Industry, Energy and Emerging Technology Research and Development
<b>PEDRO</b>	Philippine Earth Data Resource Observation Center
<b>POEs</b>	Private-Owned Enterprises
<b>POT</b>	Package of Technologies
<b>PPP</b>	Public-Private Partnership
<b>PRC</b>	Policy Research Center
<b>R&amp;D</b>	Research and Development
<b>RDLead</b>	R&D Leadership Program
<b>RIICs</b>	Regional Inclusive Innovation Centers
<b>RIS</b>	Regional Innovation System
<b>ROK</b>	Republic of Korea
<b>RSM</b>	Rotterdam School of Management
<b>RSTL</b>	Regional Standards and Testing Laboratories
<b>S&amp;T</b>	Science and Technology



<b>S4CP</b>	Science for Change Program
<b>SciCAT</b>	Science for the Convergence of Agriculture and Tourism
<b>SDC</b>	Swiss Agency for Development and Cooperation
<b>SETUP</b>	Small Enterprise Technology Upgrading Program
<b>SEP</b>	Science and Engineering Person
<b>SME</b>	Small and Medium-sized Enterprises
<b>SOEs</b>	State-Owned Enterprises
<b>STEPI</b>	Science and Technology Policy Institute
<b>STI</b>	Science, Technology and Innovation
<b>SETU</b>	Self-Employment and Talent Utilization
<b>SRISHTI</b>	Science and Research and Innovation System for High Technology-led path for India
<b>STPI</b>	Science & Technology Policy Research and Information Center
<b>TFPG</b>	Total Factor Productivity Growth
<b>TICA</b>	Thailand International Cooperation Agency
<b>UAV</b>	Unmanned Aerial Vehicle
<b>UP</b>	University of the Philippines
<b>USAID- STRIDE</b>	United States Agency for International Development-Science, Technology, Research and Innovation for Development
<b>VCNS</b>	Value Chain Network Analysis System
<b>VUCA</b>	Volatility, Uncertainty, Complexity and Ambiguity



## *Executive Summary*

The emergence of technology breakthroughs in the era of the Fourth Industrial Revolution (FIRe) has disrupted almost every industry in every country. The breadth and depth of this FIRe era has transformed the entire systems of production, management, and governance and has the potential to raise global income levels and improve the quality of life (World Economic Forum, 2019).

As we embrace this era where access to information is unlimited, this conference on Technology and Innovation for SMEs served as a venue to systematize the pool of knowledge on technological breakthroughs towards formulation of policy actions. Hence, this conference was anchored on the following perspectives:

- *Innovation drives growth and helps address social and economic challenges.* Recognizing innovation as a key source of future growth for emerging economies, it is vital that government should make necessary investments in intangible assets such as research and development (R&D), and physical capital such as equipment and infrastructure; and undertake policy interventions to address social challenges such as climate change, health and food security (Organisation for Economic, Co-operation and Development, & OECD, 2010).
- *Policies need to reflect innovation.* A supportive policy environment that incentivizes investment and innovation can boost economic development. Policies on science and technology and R&D are indeed essential ingredients such that inventions can be transformed into innovations. Considering the multifaceted landscape of innovation, the existing national policy frameworks need to reflect specific technologies that can influence innovation performance. This policy in order to be effective should make life better for individuals and society at large (Organisation for Economic, Co-operation and Development, & OECD, 2010).
- *People should be empowered to innovate.* Education and skills development are required in empowering people to innovate. Entrepreneurs are particularly important actors in innovation, as they help to turn ideas into commercial applications (Okpara, 2007). Thus, educational policy should help foster entrepreneurial culture by instilling the skill and attitudes required for creative enterprises. Entrepreneurial spirits and flexibility should be likewise integrated in the curriculum to equip students with the required competencies for them to be creative and innovative.
- *Created knowledge should be disseminated and applied.* Science continues to be the heart of innovation. With the increasing global economy, it is essential to reform by implementing well-designed S&T policies and R&D initiatives in order to excel and improve collaboration among academic institutions, R&D agencies, and business sector. Knowledge creation, dissemination, and application is indeed critical since it requires technology platform to facilitate the processing of created knowledge and technology transfer such that tangible research outputs can be promoted and commercialized.

Taking into account the theoretical and empirical perspectives in innovation, it is hoped that the outcomes of the conference may contribute to the growth and welfare of SMEs in Asia.

## Conference Structure

The 9<sup>th</sup> ASIP Conference on Technology and Innovation for SMEs was designed and organized in response to issues concerning technological capability and innovative efforts of SMEs in Asia. Its structure took inspiration from the role of education in entrepreneurship. Each topic was selected not based on a journalistic view, but rather by its theoretical or practical implications (Seol & Suh, 2015).

Recognizing the different ways Asian enterprises are innovating, the conference was structured in such a way that it would fit the intended goals and audience of each session. The general structure and format for each session type is outlined below:

- Plenary Session
  - ◇ A moderator was assigned to formally introduce the keynote speakers and facilitate the open discussion.
  - ◇ Keynote speakers were given 30 minutes to present their papers.
  - ◇ Audience size generally ranged from 80-100 participants.
  - ◇ Sessions were designed to offer topics on technology and policies for SMEs in Asia, specifically on innovation, industries, startups, and knowledge dissemination.
- Breakout Sessions
  - ◇ The regular session consisted of :
    - ◆ Technology Innovation
    - ◆ Management of Technology
    - ◆ Economics of Technology
    - ◆ Technology Policy
  - ◇ The special session consisted of :
    - ◆ Evaluation of Korean Policy for the 4<sup>th</sup> Industrial Revolution
    - ◆ Entrepreneurship Education in the Philippines
    - ◆ Entrepreneurship
    - ◆ SME Policy
    - ◆ S&T Networks for South and North Korea with ASEAN
  - ◇ The government session consisted of :
    - ◆ Future of SME and Startup Ecosystem and National R&D Investment
    - ◆ National R&D Investment: Its Adequacy and Implementation
  - ◇ A moderator was assigned in each session to formally introduce the presenters and facilitate the open discussion.
  - ◇ Presenters were given at least 20-25 minutes to present their papers and 10 minutes for open discussion.
  - ◇ Audience size in each session type generally ranged from 15-20 participants.
- Student Contest
  - ◇ A moderator was assigned to facilitate the contest.
  - ◇ Contestants were given 15-20 minutes to present their papers.
  - ◇ Judges from industry and academia served as research panel.

- Tutorial Class
  - ◊ 4-5 hours in length
  - ◊ Class size: 16 participants
  - ◊ Lecture on key concepts of scientometrics, specifically on software for paper and patent analysis and visualization using VOS viewer to construct and visualize bibliometric networks; and knowledge matrix plus to construct and visualize papers and patents.

## **Key Findings**

The question at the heart of the conference was: “How can we promote R&D and innovation to SMEs?” Considering the limited access to external resources coupled with the constraints in internal resources, SMEs have disadvantages in R&D and innovation as compared to larger firms. To bridge these gaps, various public policies have been implemented including financial, networking and IPR support programs (Okamuro, Nishimura, Colombo, & Stam, 2019). The effectiveness of such policies and programs based on empirical evidence as well as proposals for a better policy framework for SME’s R&D were presented in the conference. From this viewpoint, this section highlights the salient findings and implications from the conference.

- *Technology for SMEs.* Research outputs on science and technology can serve as benchmark statements in formulating policies that would systematize the cooperation among government agencies, business support organizations and enterprises in addressing strategic investments that would contribute to the future growth and success of small enterprises. Recognizing innovation and technology as fundamental drivers of economic growth, it is vital to implement a well-designed policy intervention to support technology absorption, transform lagging industries and develop new sources of innovation-led growth; promote eco-innovation as a source of new business generation for SMEs in Asia-Pacific Area; and provide package support including matching investment, R&D subsidy, and marketing support to help startups.
- *SME Policies.* Considering the impact of the 4<sup>th</sup> industrial revolution, the SME policies and programs focused on building a data-driven organization, promoting productivity and competitiveness through human resource development and technology transfer and strengthening linkages and collaboration among stakeholders. To measure the effectiveness of such policies and programs, the SME Policy Index served as baseline of the government to identify key policy priorities and build consensus around policy reform.
- *International Mission.* Research findings need to be translated into policy briefs which could serve as a communication tool to disseminate research outputs to a wide range of possible partners. To integrate the principles of good governance, it is imperative to facilitate policy dialogue for the creation of an effective enabling environment in terms of legislation, followed by the development of implementation mechanisms, policies and procedures for enactment. To achieve tangible research outcomes, findings of the previous studies should be used to measure research impacts.
- *Technology Innovation.* The impact of technology influences the performance of SMEs. Researches on technological trends and social networking analyses as well as core strategic technologies monitoring could help the organizational acuity toward usage of technological innovation. Moreover, winning the race in the age of Internet of Things (IoT) would involve adoption of practical technologies and innovative models that affect

the value chain of products and industries; use of analytical techniques that included value chain analysis; and encourage multiple research competency in order to create modes for co-innovation and co-development among countries. Results of the studies presented on technology innovation could be used as guideline for technology planning, R&D policy making, and technology strategy.

- *Management of Technology.* The increasing societal trends implies production of new technologies and commercialization of products and services. Thus, investing in R&D is vital to enhance technological progress and economic growth. Such investments include the implementation of R&D patent policy to secure the national competitiveness through the government's patent performance, based on technology characteristics; ability to transfer created knowledge effectively between institutions by adopting innovation process; studies conducted on pattern of technology value hype cycle.
- *Economics of Technology.* With the growing importance of technology economics, the government plays a crucial role, as it necessitates to implement policies that will support POEs in the attainment of its goal of economic expansion and global market integration and enhancement of SMEs' performance and competitiveness through the 3Is - interlinkages, innovation, and internationalization.
- *Technology Policy.* Providing evidence-based advice to government agencies can enhance public researches particularly in innovation and economic performance, and science and technology-based programs. Critical review as well as analysis on the frameworks of innovation system and government policies particularly in procurement are also required to upgrade the national cutting-edge technology areas; enhance government subsidy and address social demand driven policy such as housing and energy.
- *Evaluation of Korean Policy for the 4<sup>th</sup> Industrial Revolution.* The Korean government-wide policy focuses on AI, R&D, and Korea 4.0. Strengthening technology innovation for industry and society and paradigm shift in innovation policy concepts are the important goals of the Korean policy. To realize these goals, the HR policy covers provisions on improving educational system of science and engineering, promoting key R&D persons, reinforcing international experience of talented person, raising science and engineering person (SEP) suitable for field demand and expanding R&D infrastructure to promote SEP.
- *Entrepreneurship Education.* Formal education and trainings in entrepreneurship development in the Philippines aim to motivate youth as well as adults to put their learned skills not only to employment but also to starting up businesses of their own. Curricula and activities in entrepreneurship education are real-life vehicles for developing holistic entrepreneurial skills. The proposed frameworks of entrepreneurial education are anchored on transformational leadership principles, programs of community practices for entrepreneurship (COPE) programs, entrepreneurial marketing practices, and Kant's philosophical perspective.
- *Entrepreneurship.* Mentorship is considered as one of the components which helped successful startups in their business venture. In achieving sustainable business growth, it is vital to conduct studies on evaluation of business climate index in order to obtain timely and informative economic indicators on how businesses feel on the economy and prospects for growth.

- *SME Policy.* To accelerate policy changes that promote SME's growth, the government should play an important leadership role to strengthen R&D through collaboration of SMEs and large companies with universities. Public policies can enhance commercialization of universities' R&D and create an enabling environment for SMEs.
- *S&T Networks for South and North Korea with ASEAN.* Engaging in S&T networks can foster innovation for public sectors. Among the best practices of S&T networks in Korea included project fund commitment, promotion of FDI, and well-established effort in science engagement. One of the critical key elements of the networks' success is mutual trust built among members. To further enhance the existing S&T networks, it is vital to include the policies and provisions on economic cooperation between South Korea and North Korea in order to establish technical partnership in supply chain management.
- *Future of Startup Ecosystem.* In fostering an enabling ecosystem for start-ups, policy issues that need to be considered are education and skills such as offering online education, access to capital such as provision of financial support in the early stage of start-ups, facilities and equipment such as creating innovation hubs and opportunities for tech startups and health care services.
- *National R&D Investment: Its Adequacy and Implementation.* Building an innovation-driven economy requires strong R&D investments to achieve sustainable economic growth and productivity. Countries that have strong R&D investments such as South Korea, India, and Russia are characterized by having a strong national innovation system. To increase the level of R&D investments, the government should therefore implement interventions that can foster innovation and diffuse new technologies such as R&D strategic planning and effective fund allocation; collaborative R&D projects between public and private sectors, particularly in manufacturing industry; STI development; linkage between universities and R&D institutions; and policy reforms in R&D system.



## Conference Key Speakers

*Dr. Tan is currently the Chancellor of the University of the Philippines Diliman. He is a medical anthropologist. His first degree was a DVM (Doctor of Veterinary Medicine, 1977) from the University of the Philippines. He began to teach at the University of the Philippines in 1984 and is currently Professor 12 in UP Diliman, with the department of anthropology as his home department. In addition, he is a clinical professor with the College of Medicine in the University of the Philippines Manila where he directs a graduate degree program in medical anthropology and lectures in graduate programs in genetic counselling, and in bioethics. He is also an affiliate faculty with the College of Science and with the Tri-College Philippine Studies program, both in UP Diliman.*



*Prof. Seol is the President of the Asian Society for Innovation and Policy (ASIP) and the editor-in-chief of the Asian Journal of Innovation and Policy (AJIP). He is a professor of economics at Hannam University in Korea. In addition, he is also the honorary chairman of the Korea Technology Innovation Society and the founding honorary chairman of the Korea Valuation Association.*



*Prof. Park is a professor at Sunchon National University. She was the former presidential adviser for science and technology for Korea. She also served as director of Science and Technology Innovation Division and chair of the Science and Technology Policy Research at the Korea Future Development Institute. Prof. Park has a doctorate degree in botany physiology from Yonsei University in Seoul, Korea.*



**PROF. KY-YOUNG PARK**



**PROF. YOUNGIL PARK**

*Prof. Park is a professor at Ewha Women University in Korea. He obtained his doctorate degree in industrial management from the graduate school of Science and Technology, Korea Advanced Institute of Science and Technology and his master's degree in public administration from Seoul National University. He served as the former vice minister of the Ministry of Science and Technology and at one time was the president of Technical Management Economic Society and senior director of Korea Research Foundation.*

*Prof. Han is a professor at the School of Business of Hanyang University in Seoul, Korea. He has a doctorate degree in strategic management and minor in entrepreneurship in small business at the University of Georgia where he obtained his MBA. He has a bachelor's degree in business administration from Seoul National University. He also served as administrator of the small and medium business administration in Korea.*



**PROF. JUNG-WHA HAN**



**DIR. JERRY T. CLAVESILLAS**

*Dir. Clavesillas is presently the Director III of the Bureau of Small and Medium Enterprise Development (BSMED) of the Department of Trade and Industry (DTI). He is the Philippine representative to the Asia Pacific Economic Cooperation (APEC) Small and Medium Enterprise (SME) Working Group as well as the Association of South East Asian Nations (ASEAN) SME Working Group. He oversees DTI's programs for SMEs such as: Shared Services Facilities Project, SME Roving Academy, National Industry Cluster Capacity Enhancement Project (NICCEP), and Promotion of Green Economic Development (ProGED).*

*Dr. Choi has been appointed as the 7<sup>th</sup> President of the Korean Institute of Science and Technology Information by the National Council of Science and Technology. She earned her Ph.D. in Infomatics from the Yonsei University and developed her career as a director for the Information Service Center and Knowledge Service Center in KISTI for the last 30 years.*



**DR. HEE-YOON CHOI**



**USEC. BRENDA L.  
NAZARETH-MANZANO**

*Usec Manzano is currently serving as the DOST's Undersecretary for Regional Operations. She graduated with the degree of Bachelor of Science in Chemistry at the Western Mindanao State University with magna cum laude honors. She earned her master's degree in environmental engineering at the Asian Institute of Technology in Bangkok, Thailand. She also earned academic units in Master of Science in Management Engineering from Adamson University and Master of Science in Chemistry at the University of Santo Tomas.*

*Dir. Lelelawath is currently serving his second term as executive director of Mekong Institute (MI). Prior to joining MI, he was the deputy executive director of the International Institute for Trade and Development (IITD) in-charge of planning, supervising and conducting research projects, training programs and various capacity building activities. He was also assistant professor of Economics at the University of Minnesota, Morris, USA where he taught International Economics and Mathematics for Economists. (Mekong Institute, 2019a).*





## *Introduction*

SMEs play a vital role in the Asian economy and comprise about 70% of the workforce and GDP in the region (ADB, 2019). To enhance productivity and ensure sustainable growth in Asia, it is vital to offer the recent developments in market and technologies for SMEs to innovate and grow. Supporting innovation in established SMEs can foster inclusive growth by reducing productivity and wage gaps between SMEs and large companies (OECD, 2018).

To realize the mission of Asian Society for Innovation and Policy (ASIP) — *supporting policies, building networks and promoting research*, this year’s conference “**Technology and Innovation for SMEs**” was organized to provide valuable platform for individuals to present their research outputs and exchange ideas on conceptual and empirical advances on technological innovations for SMEs' growth.

This year’s conference aimed to facilitate an open and constructive dialogue between researchers, academicians, policymakers, and practitioners based on research works and practical experiences which foster a better understanding of the best practices in applying technologies and innovation to resolve the issues affecting SMEs. Bringing together the academicians and practitioners to share their experiences and perspectives would not just strengthen research in many different aspects of technological innovation for SMEs but could yield stronger outcomes such as transforming social capital in a way that affects society positively and economic prosperity of our grassroots entrepreneurs.

Inspired by ASIP’s principles on innovation and learning, the conference offered keynote speeches on technology and policies for SMEs that featured the role of science and technology in innovation policy and industrial development; strategic review of the vitalization of innovative startup ecosystem; and impact of knowledge management on the SMEs growth. A total of eleven (11) sessions run throughout the conference with researchers presenting and discussing issues on technology and innovations for SMEs, specifically on management, economics, policy, entrepreneurship, S&T networking and R&D investment. In conjunction with the conference, student contest and tutorial session on scientometric analysis were organized which aimed to promote and develop a demand-driven and practice-oriented research among students.

Recognizing the challenges and opportunities on technology and innovation for SMEs, the conference served as a venue to strengthen collaboration between different networks, disciplines, and sectors to strengthen knowledge exchange and networking through R&D initiatives.

## *Welcome Address*

**Dr. Michael L. Tan**

Chancellor, University of the Philippines Diliman  
PHILIPPINES



### Summary

UP Diliman Chancellor Dr. Michael L. Tan set the tone for the day by extending his warm greetings to the organizers of the ASIP 2019 International Conference, headed by its President, Prof. Sung-Soo Seol together with the Board Members and Steering Committee; Korean Ministries of Science and Technology and SMEs as represented by Prof. Youngil Park and Prof. Jung-wha Han, respectively; local organizing committee and the participants of the conference.

Dr. Tan shared his viewpoint that one of the keys of success of most East Asian countries, as well as Thailand and Malaysia, has been the support given by the government to the small and medium enterprises. With this perspective, he described the economic prosperity of small enterprises as a result of the government venture development programs to aggressively stimulate the growth of SMEs. In particular, these small enterprises include the tiny stores that offer food, clothing, crafts, and household needs.

Among the various support measures for SMEs in the Philippines, Chancellor Tan mentioned the passage of two new laws by President Rodrigo R. Duterte that could help to revitalize the four million Filipinos depending on SMEs. Anent to this, he also shared his viewpoints on some measures on how UP and other academic institutions could help SMEs to keep their business running considering the social function, environmental advocacy, and finances, to wit:

1. Provide training focusing on the social angle of running a business;
2. Help to publicize, revive, and modernize Philippine industries to support farmers and manufacturers;
3. Encourage small business owners to use technology to reduce business costs such as cashless transaction;
4. Re-examine the financial scheme through revisiting its design and support system;
5. Conduct studies on strategies for value-added marketing and integration of enterprise in the value chain; and
6. Publicize SMEs' good practices both local and international, such as the use of online selling platforms.

Taking into account this analytical framework, the Chancellor consequently concluded in his remarks that the capacity to implement policy and government agenda depends crucially on trust. As the government searches for a path to economic growth of SMEs, there is a need to restore public trust in government through consultation and involvement of citizenry in public policy-making process. Through the renewed public trust, it can enhance the role of the citizens to comply with the public policies set by the government.



## *Welcome Address*



**Prof. Sung-Soo Seol**

President, Asian Society for Innovation and Policy  
NORTH KOREA

### Summary

Prof. Sung-Soo Seol, the ASIP President, started his remarks by welcoming the participants of the ASIP 9<sup>th</sup> Conference.

Reminiscing ASIP's humble beginnings, Prof. Seol shared that the society has evolved from a conference on innovation between the Korea Technology Innovation Society and the Chinese Society for Techno-economics in 2005 and 2006. Regular meetings were held until 2011, when a small international conference was organized by the Society in Daejeon, the Science City of Korea, with scholars from China and India. With the international conferences organized from Korea to China, the Society yielded support from its several members in Asian countries to continue its mission to build networks through holding yearly international conference.

With heartfelt gratitude, the ASIP President informed the participants that the Philippines is the 6<sup>th</sup> country where ASIP conference was held and subsequently announced that the next ASIP conference will be held in Cambodia which will be hosted by the Royal University of Phnom Penh.

In recognition of the role of innovation for the sustainable development in Asia, the Society as mentioned by Prof. Seol offered the following activities in conjunction with the 9<sup>th</sup> ASIP conference:

1. Asian Innovation Forum hosted by the Korean Institute of Science and Technology Evaluation and Planning (KISTEP);
2. Student research opportunities that included contest on technology and innovation for SMEs and tutorial session on tools for scientometric analysis.

The ASIP President ended his remarks by expressing his gratitude to the hosting institute, the UP Institute for Small-Scale Industries, for supporting the Society's advocacy to include innovation for the betterment of people, society, region, and countries in Asia.



KEYNOTE ADDRESS:

## SCIENCE TECHNOLOGY INNOVATION POLICY FOR SMEs

**PROF. KY-YOUNG PARK**

KEYNOTE SPEAKER

Former Presidential Advisor for Science and  
Technology Korea  
Sunchon National University  
SOUTH KOREA



### SUMMARY

The paper presented by Prof. Ky-young Park centered on innovation policies for SMEs in South Korea. She described the evolution of S&T policy in Korea in four phases, namely: imitating, internalizing, catching-up, and innovating. In her keynote speech, she also shared the significant contribution of science and technology to the rapid economic development of Korea for the last 50 years. As to the country's level of economic development, Korea ranked 12<sup>th</sup> in the world's largest economy with GDP of 1.619 billion US dollars, 30<sup>th</sup> in the per capita gross national income, and 6<sup>th</sup> in the largest goods trade partner in 2018. This rapid economic growth in Korea was due to the massive investment made to promote heavy chemical industry, such as shipbuilding, steel, and petrochemicals. According to her, these heavy chemical industries have played a major role in the development of Korean economy from 1980 to present. In this period of technological change, she summed up the issues as well as challenges brought about by this rapid change in major industries in Korea, to wit:

1. Small businesses powerfully effected by developments within the big business sector. However, differences in innovation capacity between SMEs and large firms lead to economic imbalances.
2. Vertical or horizontal cooperation between SMEs and large firms in the relevant industries is vital in order to alleviate economic imbalances.
3. Although, it is also important to promote new high-tech sectors in industry changes, there is still a need to continually modernize existing industries.
4. To mitigate economic imbalances, strategic view is necessary for emerging countries.
5. Lack of cooperation in Korea was evident in the recent tech trade war between Korea and Japan.

To cope with these challenges and opportunities posed by the rapid and disruptive technological change, Prof. Park stressed on the importance of cooperation between SMEs and large companies to gain



the benefits of creating and improving products and create new technologies. Anent to this, she cited the theoretical framework of Relational Management of Andrew Downard as a model to explain the positive effects of collaboration and networking between companies in this era of modern technologies. These included: (1) globalization and scarce resources require more control over the supply chain; (2) high level of competition requires better cost efficiency; and (3) risks from internal situation (financial and labor situation, know-how, etc.) of companies can be mitigated.

In response to this era of uncertainty, Prof. Park gave a striking glimpse of the mega trend of technology innovation in the future in which she emphasized that the main trends represent the combination of cyber-physical systems, the Internet of Things, and the Internet of Systems. With this significant acceleration of globalization processes, the qualitative changes that affect today's global economy require measures to adjust to specific nature of international relations. Consequently, she concluded that humans have no choice but to control the pace of development and growth for a sustainable society.

In simple terms, Prof. Park advised that it is not wise to follow the industrial development process of developed countries since most of them grew during the second industrial revolution. Thus, she concluded that: a) systemic co-operation between the government, business support organizations, and enterprises would represent a strategic investment into the future growth and success of small enterprises; b) innovation and technology absorption are widely recognized as a fundamental driver of economic growth in both advanced and emerging economies; c) well designed policy interventions may be used to support technology absorption, transform lagging industries, and develop new sources of innovation-led growth; d) pressure with a lower environmental impact will continue to increase over the coming years; e) eco-innovation could be a source of new business generation for SMEs in Asia-Pacific Area; and e) internationalization of activities is a crucial step for SMEs.

In closing, Prof. Park ended her remarks with this quote *“Forget blue-sky thinking. To really change the world, embrace your boundaries and focus on innovating relentlessly within them”* (Canadian Business, 2017.01.16).

KEYNOTE ADDRESS:

## **S&T POLICY FOR INDUSTRIAL TECHNOLOGY DEVELOPMENT IN SMEs: LESSONS LEARNED AND IMPLICATIONS FROM THE KOREAN CASE**

**PROF. YOUNGIL PARK**

KEYNOTE SPEAKER

Former Vice Minister of Science and Technology  
Ewha Womans University  
SOUTH KOREA

### **SUMMARY**

One of the critical issues that need to be addressed with regard to the promotion of sustainable and inclusive development is the full consideration of science, technology, and innovation (STI). Policies on access to new and appropriate technologies should be formulated and implemented in order to achieve steady improvements in living conditions which can be lifesaving for vulnerable populations and increase productivity which ensures rising incomes (United Nation System Task Team, 2011).

From this viewpoint, the speech of Prof. Youngil Park focused on how to foster technology development and ensuring technological competences among SMEs in Korea which comprise 99.9% or 3.5 million enterprises; accounting for 82.2% or 14 million of the workforce and contributing to value added of around 20,441,565 (100 MKW). In response to this, he presented three perspectives to solve these critical issues within the context of S&T Policy for Industrial Technology Development in SMEs, to wit: (1) STI Policy, Industrial Technology Development, and SMEs; (2) Policy for SMEs: Korean Case; and (3) Lessons Learned and Implications for Next Steps.

- **STI Policy, Industrial Technology Development, and SMEs**

In order to measure the impacts of innovation and technology, S&T policies need to become an integral part of the broader policy agenda. Prof. Park cited the STI Policy Framework to explain the actors and linkages in the innovation system. According to him, the framework illustrates the boundaries of technology policy to include all measures targeting innovation and technology diffusion. In this respect, policy-makers should: (1) ensure complementarity between technology policy and reforms in product, financial and labour markets, as well as in education and training; (2) co-ordinate technology policy and macroeconomic policy; and (3) build on the globalisation process through openness to international flows of goods, people and ideas, and policies increasing the absorptive capacity of domestic economies (Organisation for Economic Co-operation and Development, 1998b).

From STI policies, the Korean government aligned its S&T policies with the nation's agenda on sustainable development through *acquiring core competences in strategic technology areas and developing an innovation system that will enable the nation to make a successful transition toward a knowledge-based economy* (Organisation for Economic Co-operation and Development, 1998a). To achieve this, particularly in the context of industrial technology development, Prof. Park mentioned



that the Korean government is aiming to improve its performance or quality of products through adoption of *new* product development (*NPD*) processes of *high-tech* product companies and development of production technology and improvement of process innovation. The indicators to measure the success factors for SME improvement are: (1) owner's willingness to innovate and (2) development of expertise and human resource. The failure factors are: a) lack of funding, b) lack of manpower resources, and c) technology and market forecast failure.

- **Policy for SMEs: Korean Case**

The evolution of SME Policy in Korea is marked by constraints and expansion of strategies to improve its performance in the global economy. The historical development of SME Policy in Korea as mentioned by Prof. Park has evolved into four stages: (1) Conglomerate-SMEs Contract-based Cooperation (early 80s), (2) Technology-Intensive SMEs (mid 80s to early 90s); (3) Growing SMEs / New Start-Up Incubation (mid 90s to early 2000); and Creative Innovation and Economic Vitality (mid 2000 to present).

- **Lessons Learned and Implications for Next Step**

Capturing lessons learned throughout the S&T Policy in Korea, Prof. Park shared that the Korean government discovered opportunities for improvement and these are as follows: (1) consider nation's development stages; (2) implement strategic approach in implementing selectivity and concentration policy; (3) integrate diffusion, industrialization, and entrepreneurship in the innovation policy; (4) enhance competencies of technocrats, S&T policy-makers, and professionals; (5) recognize the importance of institution building; and (6) strengthen cooperation and support from ministries. Although the Korean government learned lessons from the past, there are still emerging issues that the government needs to consider in its policy formulation, which include: (1) linkage throughout the entire innovation process; (2) dynamic approach in complex environment; (3) expand supply capability and demand generation; (3) optimum policy mix; (4) stronger than any other sector policies; and (5) prioritize policies for high-tech SMEs.

Bringing together the lessons and current issues on technology development for SMEs in Korea, Prof. Park shared his viewpoint on broader implications of S&T Policy in Korea, which include: (1) recognizing the importance of SMEs' willingness to innovate, and promotion of entrepreneurial culture; (2) enhancing national intelligence capabilities and infrastructures; (3) regulating policy, legal framework, and institution building; (4) cultivating the human resources and basic research; (5) supporting international cooperation; and (6) establishing mechanisms for coordination and cooperation.

In conclusion, Prof. Park presented a framework which shows the approaches, contextual activities, and outcomes of S&T-oriented policy/legislation/culture in Korea. From this framework, he emphasized the major role SMEs will play in cross relationship with other countries.

KEYNOTE ADDRESS:

## **INNOVATIVE ECONOMY AND VITALIZATION OF NEW TECHNOLOGY-BASE STARTUPS**

**PROF. JUNG WHA HAN**

*KEYNOTE SPEAKER*

Former Minister, Minister of SMEs  
Hanyang University  
SOUTH KOREA

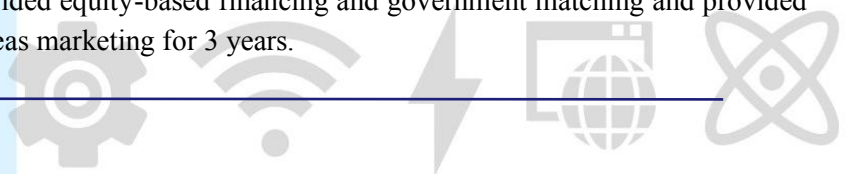


### **SUMMARY**

Aiming to promote entrepreneurship and innovation, the Korean government is making strong efforts to boost the startup sector. The government has been collaborating with the startup sector to implement the strategic directions that will promote innovative technology-based startups (Organisation for Economic Co-operation and Development, 1998).

The presentation of Prof. Jung-wha Han focused on government initiatives of Korea in promoting high and new technology-based startups for the past 30 years. According to him, although the government achieved success in terms of numbers since the country has more than 37,000 ventures in 2019, the scale-up of ventures has not been so successful, particularly in becoming competitive in the global market. Aside from this, the country also experienced the dysfunction of government sponsorship, such as problems of moral hazard and adverse selection. To solve this problem, the government has tried to establish innovative startup ecosystem which requires: (1) expanding market, (2) increasing investment, (3) supporting technology commercialization, (4) promoting fair trade system, (5) reducing cost of failure, and (6) enhancing entrepreneurial capabilities.

Prof. Han shared the case of the Tech-Incubator Program for Startups (TIPS) in Korea as an outcome of the policy implementation on innovative startup ecosystem by the Korean government. During the implementation phase of the program, he discussed the problems encountered by the government as far as promoting technology-based startups is concerned and these are as follows: a) excessive preference to secure job opportunity; b) avoidance to startup by the high-potential scientists and engineers; c) difficulty to cross over the death valley due to undercapitalization for technology-based startups; d) low success rate of commercialization of innovative technology; and e) high personal cost of business failure. In response to these predicaments, the government catalyzed private investment in such technology-based startups, screened startups by the accelerators established by successful entrepreneurs and leading venture capitalists, provided equity-based financing and government matching and provided R&D subsidy and support for overseas marketing for 3 years.





At present, TIPS has already 41 operating companies and 670 startups since it started in 2013. With respect to the process of operating the program, Prof. Han urged that the TIPS operating companies have the right to recommend startups for government support. Selected startups receive incubating and mentoring services with R&D subsidy of US \$420,000 and startup fund of US \$80,000, overseas marketing support of US \$80,000 and additional US \$160,000 as matching investment by the government. He also commended figures on the performance of the programs in 2018 which show a total of US \$1B cumulative on private investment, 2 IPO (Market cap US \$433M) and 7 M&A (US \$50.6M), 104 companies on overseas operation and increase of 5.3 employees per company, is a manifestation that TIPS is achieving its objectives.

Prof. Han concluded his remarks by citing the following key success factors of TIPS: (1) selection of startups by private investors, such as angels, accelerators, and venture capitalists; (2) mentoring and coaching by experienced and successful entrepreneurs; (3) packaged support including matching investment, R&D subsidy, and marketing support to help startups cross the death valley; (4) additional investment by other private and foreign investors; and (5) monitoring of healthy operation by the government.



KEYNOTE ADDRESS:

## TECHNOLOGY AND INNOVATION FOR SMEs IN THE PHILIPPINES

**DIR. JERRY T. CLAVESILLAS**

*KEYNOTE SPEAKER\**

Director, Department of Trade and Industry  
PHILIPPINES

### SUMMARY

In 2017, the MSMEs, as cited in the remarks of Dir. Jerry T. Clavesillas, accounted for 99.56% of the total establishments in the Philippines and employed 62.9% of its workforce who are expected to be the key drivers of innovation and sustainable economic growth. To complement their contribution to the country's national development, he assured that DTI continuously provides substantive initiatives for them to be more empowered and competitive in the domestic and global markets.

Recognizing this and given the challenges of our current innovation ecosystem, the Director in his remarks, reported that DTI has developed and launched the Inclusive Filipinnovation and Entrepreneurship Roadmap last October 2018. The roadmap, as explained in the message of the Director, is a result of a collaborative effort among government, academe, and industry which defines the strategic directions to achieve sustainable growth and critical mass of creative talent pool. Having set a clear direction, he also discussed the recommendations and strategies that will help to achieve the overall vision of creating an inclusive innovation and entrepreneurship ecosystem within the contextual frameworks as listed below:

1. Strong Government-Academe-Industry Linkages
2. Human Capital Development Towards Innovation and Entrepreneurship
3. Enabling Policy Environment to Accelerate Innovation and Entrepreneurship
4. Entrepreneurship Culture and Support Programs for MSMEs Funding and Financing for Innovation and Entrepreneurship, and
5. Growth and Development of Industry Clusters

To support the recommendations of the roadmap, Dir. Clavesillas stated that DTI had established Memorandum of Understanding (MOU) with DOST, DA, CHED, DepEd, DICT, and NEDA in which the seven agencies have signified their commitment to align their policies towards the realization of the roadmap goals.





One of the major recommendations of the roadmap is the creation of Regional Inclusive Innovation Centers (RIICs), according to him, *these centers would serve as cornerstone of the Inclusive Innovation Industrial Strategy (or i<sup>3</sup>S) and would lie at the heart of our economic transformation which would bridge the gap between government, industry, and academe; and create the regional ecosystem covering both virtual & physical connectivity of the various stakeholders and players such as universities, R&D labs, S&T parks, incubators, fab labs, co-working spaces, investors, LGUs, start-ups, SMEs, and large enterprises.*

To reinvigorate the RIICs, the DTI likewise integrates the activities stipulated in 7Ms, a program to help entrepreneurs to rollout their business:

- **Mindset Change** – promote innovation by linking DTI’s Negosyo Center and SME Roving Academy, DOST’s Technology Business Incubators, private incubators and accelerators, and similar entities. This initiative is complemented by the integration of entrepreneurial education and market-oriented research in the curriculum of DepEd and CHED.
- **Mastery** – provide research assistance on ways of operating business, producing with greater value, and competing in the market.
- **Mentoring** – mentor promising entrepreneurs to receive essential professional mentoring from experts to develop their ideas into growing businesses through Kapatid Mentor ME program. To develop businesses through Kapatid Mentor ME program.
- **Money** – offer financial assistance to startups and MSMEs who are conducting research through DOST, DA, and CHED.
- **Machines** – equip entrepreneurs with must-have knowledge on equipment and right tools to test their products or develop prototypes through DTI’s shared service facilities and FabLabs, DOST’s food innovation centers, and DICT’s Tech4Ed centers.
- **Market Access** – assist in promoting local products through DTI’s Go Lokal! concept store, Manila FAME, and various trade fairs, coupled with DOST’s oneStore.ph.
- **Models of Negosyo** – create innovative business models for commercialization of research and development output. One excellent example cited was the Green Enviro Management Systems (GEMS) which is a spin-off company established in 2012 through the commercialization of research conducted by the Bioprocess Engineering and Research Center (BioPERC) of the Department of Chemical Engineering of the University of San Carlos in Cebu.

Dir. Clavesillas ended his remarks by restating the ultimate goal of the Inclusive Filipinnovation and Entrepreneurship Roadmap: *“to activate innovation and entrepreneurship as the main levers to reduce, if not completely eliminate poverty in the country”*. With this, he is optimistic that the outcomes of this roadmap could be achieved through strong linkages and collaboration among stakeholders.

*\*Note: Speech was delivered by Dr. Aleli B. Bawagan, Director of UP ISSI, in behalf of Dir. Clavesillas*

KEYNOTE ADDRESS:

## DATA-BASED SME INNOVATION SUPPORTING PROGRAM

**DR. HEE-YOON CHOI**

KEYNOTE SPEAKER

President, Korean Institute of Science & Technology  
SOUTH KOREA



### SUMMARY

Guided by KISTI's Mandate – *to support national research projects and policy; and drive development of knowledge industry through supporting, nurturing, and systematically managing Government-funded Research Institute (GRI) under the NST*, Prof. Hee-Yoon Choi, the president of the Korean Institute of Science and Technology, started her keynote address by presenting a framework which illustrates how KISTI, as a research institute, can support government programs on technology and innovation for SMEs. She presented the pathway framework featuring the strategies undertaken by the Institute to address the challenges faced by the Korean government in its journey towards Industry 4.0, to wit: (1) Data Driven Paradigm Shift and KISTI, (2) National Policy for SMEs in Korea (3) Innovation Support Programs for SMEs in KISTI, (4) SME Support Outcomes, and (5) Smart Services for SMEs.

- **Data Driven Paradigm Shift and KISTI**

The 4<sup>th</sup> Industrial Revolution and the data paradigm shift focus on the main agenda, *change in progress based on data and AI*. With the emergence of the data economy, KISTI could help its government to formulate policies that will solve problems dealing with technological innovations for SMEs. Understanding the factors that characterized the value creation system of data economy: (1) data management, (2) data distribution, (3) data utilization, and (4) data services, is essential to supply new product and services, improve productivity and efficiency, and improve product and service quality.

The digital transformation in the sense of the 4<sup>th</sup> Industrial Revolution means a wide range of changes in life including economy, industry, and society. This is not due to the fact that technological breakthroughs in smart manufacturing and AI services make unseen and far-reaching automation possible.

For organizations to be more agile, however, a fundamental paradigm shift is needed. This is where the organization integrates in its' operation subtle digital transformation that redefine the essence of the industry.

With this drastic change to humanity, KISTI considers the fourth Industrial Revolution as an





opportunity for Korea to make a leap on its performance in terms of innovations. It can construct and operate information infrastructure that could contribute to the growth of Korea's innovation. Specifically, the following R&D strategies are being implemented to ensure that the root of S&T would improve the quality of lives of their citizenry:

- a. KISTI is the only government-funded organization whose role is defined by the law
  - Promoting management, sharing, and utilization of knowledge and information about S&T
  - Constructing the national-level system of knowledge and information about S&T and performing the role of collecting, managing, and sharing national R&D information
  - Performing the role of the national supercomputing center
- b. Concentration on construction and operation of R&D infrastructure and operating services
  - Service-oriented organization conducting R&D Services as the key role
  - Use major resources in S&T information services and construction & operation of R&D infrastructure
- c. Creation and diffusion of differentiated achievements fitted for service-oriented organization
  - KISTI's achievements arises from drawing and providing superior service
  - Superiority of the service is spreaded from the actual value created by the service's beneficiary

The increasing demand to generate tangible outstanding research outcome in the 4<sup>th</sup> Industrial Revolution area urges KISTI to set its role and future plan based on government S&T Policy that includes: (a) national S&T data platform and application, (b) HPC Infra for 4<sup>th</sup> Industrial Revolution, and (c) solution for national and social issues.

Cascaded with I-Korea 4.0, a S&T strategy or policy direction to meet the 4<sup>th</sup> Industrial Revolution, KISTI developed I-KISTI 4.0 which focuses on mandated R&D and services, developing research and development ecosystem. KISTI's strategy for I-KISTI 4.0 is anchored along the following perspectives:

- a. *National R&D (Efficiency)* – create data ecosystem through foundation for open science which includes collection/open/join application of national R&D data
- b. *ICT/Data Technology (Accumulation)* - strengthen innovation through S&T infrastructure which includes advanced supercomputing ecosystem and intelligent information service system.
- c. *National Agenda (Enforcement)* – streamline data-driven solution in response to social agenda through the use of data-driven analysis and conduct of research on safety/environment
- d. *SMEs (Support)* – use intelligent analysis to improve the micro-environment for SME competitiveness through the creation of industry-university-institution-government cooperation ecosystem

- **National Policy for SMEs in Korea**

The Korean government recognizes the contribution of SMEs to the country's economic growth through employment generation and export activities. Business statistics reported that SMEs in Korea make up 99% of the number of enterprises, 88% of total employment, 38% percent of export, and 51% of added value (Ministry of SMEs and Startups, 2019).

Given the nature and challenges faced by this sector, the implementation of the National Policy for SMEs in Korea as stipulated below, serves as a support mechanism to update and strengthen them to realize their full potentials in today's global economy:

- a. Innovate manufacturing to enhance competitiveness of SMEs and startups*

- Expand support for smart factory
    - Private-led R&D
    - Expand markets for innovative products
    - Improve living condition for employees
    - Policy financing that values potential

- b. Accelerate startup boom to become innovation and startup-driven country*

- Prepare for the 2<sup>nd</sup> startup boom
    - Promote technology startup
    - Allow second chance
    - Improve regulation for new industry

- c. Support innovation by micro enterprises and self-employed as separate policy targets*

- Increase sales and reduce costs of micro enterprises
    - Lay foundation for innovation in micro enterprises and self-employment
    - Support well—prepared startup and revival of failed startups
    - Revitalized local commercial districts and traditional markets

- d. Lay foundation for fair economy and drive open innovation beyond win-win cooperation*

- Create a condition for fair trade
    - Eliminate technology theft from SMEs
    - Create and maintain an open innovation eco system

- **Innovation Support Programs for SMEs in KISTI**

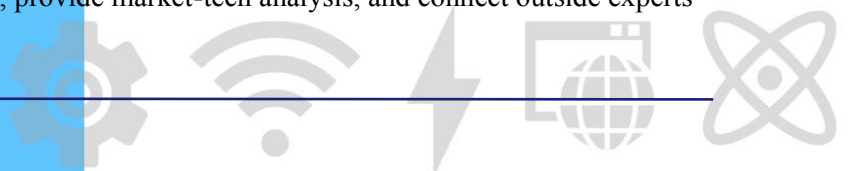
The Association of Science and Technology Information (ASTI) is basically customer, supporter, and co-worker of KISTI's SMEs support programs. KISTI's SME support programs are as follows:

- a. Family Company Program*

- Select SMEs named as KIST-Family Company to support intensively
    - Provide on-demand support by utilizing the resources of KISTI as well as outside experts

- b. Knowledge Community Program*

- Promote information exchange and collaboration between industries, institutes, and universities to nationwide or local communities
    - Find out new business opportunities by communication among different industries
    - Organize communities, provide market-tech analysis, and connect outside experts





*c. Technology Commercialization Program*

- Establish Technology Commercialization Platform for Sustainable Growth in Innovative SMEs

*d. Virtual Design Support Program*

- Support SMEs by KISTI's Supercomputing power

- **SME Support Outcome**

From 2014-2018, the report on economic and social outcomes through SMEs support with demand-based services set out a highly positive message on the contribution of KISTI to improve the economic growth of Korea. SMEs average sales increase ratio of 8.0%. From this figure, KISTI Family Companies sales increase ratio of 24.0%.

- **Smart Services for SMEs**

As part of the KISTI's SME support program, smart services are also provided which include: (a) ScienceON, (b) Value Chain Network Analysis System, (c) Competitive Analysis Service, (d) Super Computing Modeling and Simulation, and (e) NTIS services to SMEs.

*a. ScienceON*

- Provide variety of Intelligent S&T Knowledge Infrastructure. Among its functions include: knowledge infrastructure guide, R&D information search, research data sharing, R&D support based on HPC, R&D support for computational field, collaborative research support, information analysis, modeling & simulation, and education & training.

*b. Value Chain Network Analysis System (VCNS)*

- Provide information on sales network, vendor, and competitors' trading network based on actual transaction data

*c. COMPetitive Analysis Service (COMPAS)*

- Provide online analysis service to help users make informed decisions on their R&D-related tasks

*d. Super Computing Modeling and Simulation*

- Support manufacturing SMEs by developing M&S SW based on open source libraries, providing HEMOS and commercial M&S through the cloud service, and building digital twin platform using engineering big data.

*e. NTIS services to SMEs*

- Support small and medium enterprise to get customized R&D information based on their business needs

To summarize, Prof. Choi ended her keynote address emphasizing the impact of data on SMEs in the era of 4<sup>th</sup> Industrial Revolution taking into account the technological evolution, the global competitive market and changing needs of society. In building a data-driven organization, she reiterated the KISTI's strategies on leveraging data in innovation prospects, to wit: (1) improve data reliability and extend data utilization, (2) active use of supercomputing, (3) provide intelligent analysis services, and (4) strengthening international cooperation.



KEYNOTE ADDRESS:

## **FIRE-PROOFING THE PHILIPPINE SMEs THROUGH SCIENCE, TECH- NOLOGY AND INNOVATION**

**USEC. BRENDA L. NAZARETH-  
MANZANO**

KEYNOTE SPEAKER

Undersecretary, Department of Science and  
Technology

### **SUMMARY**

One of the most significant events in history was the beginning of the industrialization in the 18<sup>th</sup> century. The Department of Science and Technology (DOST) Undersecretary Brenda L. Nazareth-Manzano started her remarks with an overview on the evolution of industrial revolution from Industry 1.0, which revolved around the use of steam to power engines and machines to the industrial era, to Industry 4.0 or FIRE, which collectively transform production systems and processes through the integration of the physical, digital, and biological spheres.

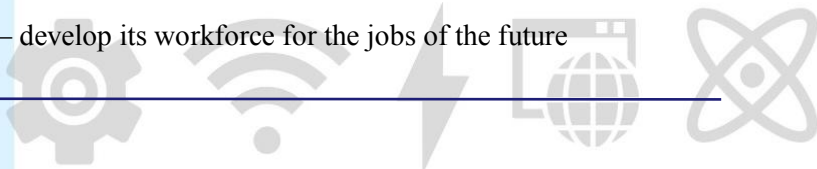
In adopting the transformation agenda of the digital-driven Industrial Revolution 4.0, Undersecretary Manzano raised this question to the audience of the conference: *How ready are the Filipinos, particularly the manufacturing sector – SMEs, to embrace the challenges brought about by Industry 4.0 and keep up with the developments and demands of the future?*

In this context, she presented key findings of studies conducted with respect to the country's capacity to adapt to the global disruption that are expected to come along with the FIRE:

1. Weak performance of SMEs in technology and innovation, human capital development, and regulatory quality improvement
2. Forty three percent (43%) of the SMEs surveyed in the country were innovation-active. In general, only two in every five SMEs were innovation-active.
3. Innovation-related activities reported were mostly attendance to training programs while about 51% of the SMEs surveyed did innovation through acquisition of machinery, equipment and software. Cost is the most cited barrier to innovation and SMEs lack funds for it.
4. In terms of the labor force, nearly half of wage workers in the Philippines are at high risk of getting affected by the Artificial Intelligence in the next few years.

To cope up with the changing demands of time, Usec. Manzano cited the following policy recommendations to address the major challenges to increase innovation-related activities in the Philippines from the reports of World Bank and USAID-STRIDE in 2010 and 2015, respectively:

1. Education and human capital – develop its workforce for the jobs of the future





2. Research and knowledge creation increase investments in science, technology, and innovation
3. Enabling environment - eliminate regulatory barriers and bottlenecks to innovation.

Among the government agencies, she explained that *DOST is one at the forefront of driving innovations and implementing measures to lead the country towards Industry 4.0*. The DOST has implemented programs which could cultivate the culture of innovation in the country.

### **1. Strengthening the country's human capital**

- Scholarship grants have been offered for both undergraduate and graduate programs. The graduate scholarship program called the Engineering Research and Development Technology (ERDT) covers 26 engineering disciplines while the Accelerated Science and Technology Human Resource Development Program (ASTHRDP) covers 105 science programs.
- In 2018, the DOST and the Department of National Defense signed an agreement to work together on various R&D for human security. Aside from the ongoing initiatives on Robotics and Mechatronics R&D, the DOST's Philippine Council for Industry, Energy and Emerging Technology Research and Development (DOST-PCIEERD) is implementing the program "Artificial Intelligence Training and Proposal Writeshop" which aims to train college professors and researchers on the fundamental education on the current state of AI tools – touching on machine learning, most of the time on Convolutional Neural Networks, and Natural Language Processing.

### **2. Providing enabling environment for innovations through the establishment of facilities**

- For computing and data storage, DOST has Remote Sensing and Data Science (DATOS), Computing and Archiving Research Environment (COARE) and Philippine Earth Data Resource Observation Center (PEDRO) working together from data capture to analysis and archiving.
- To accelerate drug discovery research in the country, the DOST's Philippine Council for Health Research and Development (DOST-PCHRD) is implementing the TUKLAS LUNAS (Drug Discovery and Development) Program. To date, there are already 10 Tuklas Lunas Centers established in the country which serve as hubs of natural products research for drug development.
- Bioactivity and Toxicity Facility were also established in UP Diliman to screen for inflammation, diabetes, hypertension, pain, gout, cancer, cholesterol-lowering, immunomodulation, and in vitro hepatotoxicity and nephrotoxicity.
- The Advanced Device and Materials Testing Laboratory (ADMATEL) was established to reinforce and upgrade the failure analysis and materials testing facilities of the local industry and to entice potential investors seeking for a more conducive business environment.
- The Electronics Product Development Center (EPDC) is the country's first electronics design facility that provides design, prototyping, and testing facilities for printed circuit boards – the primary electronics component that mechanically supports and electronically connects the components. The EPDC provides manufacturing support for university research programs and offers design and manufacturing expertise to SMEs.



- The DOST's Metals Industry Research and Development Center's (DOST-MIRDC) Die and Mold Solutions Center (DMSC) aims to provide free bridging and advanced training programs in the area of die and mold making and design.
- The Food Innovation Centers (FIC) were established and operationalized in strategic areas nationwide to serve as a hub for innovations, research and development, and technical support services for value-adding of fresh produce and development of processed foods in the regions.
- For the laboratory testing and calibration needs of the SMEs, DOST operates 16 Regional Standards and Testing Laboratories (RSTL) that offer physical, chemical, and microbiological testing for the food, feeds, water, and waste water samples. To provide convenient and easy access to laboratory services, OneLab program was implemented connecting these laboratories in a network.
- The DOST has launched two 3D printing research facilities in the country – Additive Manufacturing Research Laboratory (AMREL) and Additive Manufacturing Center (AMCen). Being one of the major drivers of Industry 4.0, 3D printing, from small parts to big structures, will be used in aerospace, defense, biomedical, healthcare, printed electronics, agricultural machinery, and automotive industries.
- A total of forty four (44) Technology Business Incubators were established nationwide to nurture more than 200 startups.
- To improve access to experts and technologies particularly by individuals or SMEs living outside the major urban centers, DOST is implementing the OneExpert, an interactive web-based nationwide pool of S&T experts intended to provide technical advice and consultancy services. In addition, the oneStore was established to provide customers with an effortless shopping experience and retailers with simple and direct access to one of the largest customer base systems in the Philippines.
- Innovation fund to SMEs has been provided to SMEs since 2002 through the Small Enterprise Technology Upgrading Program (SETUP), a nationwide strategy which aims to offer a package of assistance to SMEs to include consultancy on manufacturing and agricultural productivity, energy audit, cleaner production, product labeling and packaging, and food safety.
- In cooperation with the Mechatronics and Robotics Society of the Philippines (MRSP), the DOST through the MIRDC will be establishing the Advanced Mechatronics, Robotics and Industrial Automation Laboratory (AMERIAL). This aims to conduct R&D activities related to mechatronics, robotics, and automation for SETUP beneficiaries.

### 3. Coming up with policy framework

- In terms of science investments, the R&D budget remained at 0.6% of the Philippine Government's Budget. In 2019, about 17.3 billion pesos has been allocated for R&D with about 7.5 billion pesos being managed by the DOST.
- In 2016, the DOST started formulating the Harmonized National R&D Agenda to align the R&D initiatives and unify the goals towards the attainment of the national long-term development goal, *AmBisyon Natin 2040*.
- The Science for Change Program (S4CP), one of the banner programs of the DOST, was created to accelerate Science, Technology and Innovation in the country to keep up with the developments in our time wherein technology and innovation are game changers. The goal of

the S4CP is to build the capacity of institutions in the regions to do R&D to promote industrial competitiveness, stimulate regional growth and development, and ultimately, reduce regional inequalities. Briefly, the S4CP is composed of four component programs, namely: (a) Niche Centers in the Regions for R&D (NICER), (b) R&D Leadership Program (RDLead), (c) Collaborative R&D to Leverage the Philippine Economy (CRADLE), and (d) Business Innovation through Science and Technology (BIST).

To drive inclusive innovation in the country, Usec. Manzano affirmed that through the collaborative efforts among different government agencies in crafting the **Inclusive Filipinnovation and Entrepreneurship Roadmap**, the strategies and plans related to innovation were refocused to ensure that collective efforts are geared towards the achievement of a healthier innovation and entrepreneurship ecosystem.

Recognizing the collective efforts of DOST and other various government agencies like the Department of Trade and Industry (DTI) and the National Economic and Development Authority (NEDA) in advancing innovation among SMEs, Usec. Manzano humbly informed the participants that the Philippines makes a big leap from 73<sup>rd</sup> place last year to 54<sup>th</sup> place this year out of 129 economies in the Global Innovation Index (GII) which signifies that the country shows improvements on its performance in terms of innovations. Furthermore, she cited that the country had a total score of 36.18 over 100, above the median score of 33.86, which is said to be “above expectations for level of development” among lower middle income economies. The GII report shows that the Philippines is among the innovation achievers this year after posting an above average score in all innovative dimensions, except on market sophistication.

With all these programs that support R&D, S&T human resource development, technology transfer, as well as promote productivity and competitiveness of SMEs and with the signing of RA 10055 – *Philippine Technology Transfer Act*, RA 11293 – *The Philippine Innovation Act*, RA 11337 – *The Innovative Startup Act*, RA 11312 – *amendment to the Magna Carta for Scientists Act*, and RA 11035 – *Act Institutionalizing the Balik Scientist Program*, Usec. Manzano shared her viewpoint that DOST is optimistic that it would be able to further strengthen the country’s climate for innovation; hence, bringing the SMEs and the country towards the Industry 4.0.



KEYNOTE ADDRESS:

## **MEKONG INSTITUTE: KNOWLEDGE DISSEMINATION PLATFORM FOR THE GREAT ME- KONG SUB-REGION**

**DIR. WATCHARAS LEELAWATH**

KEYNOTE SPEAKER

Director, Mekong Institute  
THAILAND

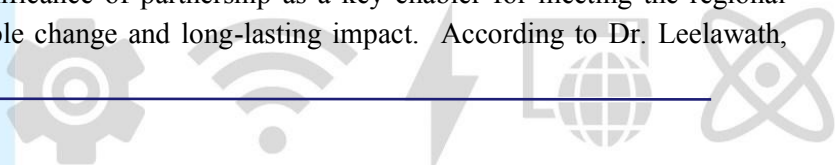
### **SUMMARY**

The vision of the Mekong Institute (MI) is: *capable and committed human resources working together for a more integrated, prosperous, and harmonious Greater Mekong Sub-region (GMS)*. Dr. Watcharas Leelawath, currently serving his second term as the director of the Institute, shared to the participants the mechanisms for disseminating knowledge within the context of research and technology, training and innovation, as one of the strategies to clearly achieve the Institute's vision.

In the brief overview of MI, Dr. Leelawath presented the key features of the Institute. MI is an intergovernmental organization founded by six member countries of the Greater Mekong Sub-region (GMS), namely Cambodia, P.R. China, Lao PDR, Myanmar, Thailand, and Vietnam. Its core functions are to provide, implement, and facilitate integrated human resource development (HRD), capacity building programs, and development projects related to regional cooperation and integration. To effectively perform its functions, the programs and activities of the Institute focus on three main thematic areas, namely (1) Agricultural Development and Commercialization which aims to improve agricultural productivity, sustainability, and commercialization in the GMS; (2) Trade and Investment Facilitation which aims to promote sustainable and inclusive economic growth for regional cooperation and integration; and (3) Innovation and Technological Connectivity which aims to foster innovation and technological connectivity in the GMS.

To support the GMS National Development Plan, MI ensures that issues on gender equality, environmental sustainability, and labor mobility are appropriately addressed in all its activities. Thus, strategies that include enhancement of private sector participation and competitiveness, promotion of good governance, development of strategic alliances, and implementation of development projects are implemented to achieve success in all its program themes.

In addition, MI recognizes the significance of partnership as a key enabler for meeting the regional challenges and generating sustainable change and long-lasting impact. According to Dr. Leelawath,







through the collaborative efforts with its partners, the Institute can leverage resources, expertise, and competencies to promote GMS ideals and values towards achieving common development goals and strengthening visibility and impact of its action. Among the key partners of MI are Thailand International Cooperation Agency (TICA); People's Republic of China (PRC); Mekong-Korea Cooperation Fund (MKCF); Japan-ASEAN Integrated Fund (JAIF); Swiss Agency for Development and Cooperation (SDC); and New Zealand Aid Programme (NZAP).

For the purpose of establishing strong strategic relationship with its partners, MI develops and implements the Knowledge Dissemination Platform for GMS which aims to (1) strengthen the network members' capacity to generate knowledge and provide policy advice; (2) enhance systematic knowledge-sharing among academic and research institutions and think tanks, especially on development experiences and policy lessons; (3) serve as a mechanism to push forward utilization of research findings and policy recommendations; and (4) raise the region's voice in the international arena on issues related to economic growth and inclusive development.

In a brief discussion, Dr. Leelawath explained the design adopted by the Institute in developing projects that are relevant to address the needs of GMS. According to him, the Institute conducts **research** on the key issues that need to be addressed by MI that include, but not limited to: creation of enabling environment; support for trade and transport facilitation; SME development; generation of business opportunities; and access to global markets. Research findings are translated into **policy briefs** which serve as a communication tool to disseminate research outputs to the range of possible partners that include academic institutes, private sector groups, SME cooperatives or associations, civil society organizations, cooperative initiatives, development partners, and international organizations. To integrate the principles of good governance, MI facilitates **policy dialogue** for the creation of an effective enabling environment in terms of legislation, followed by the development of implementation mechanisms, policies, and procedures for enactment. Through policy dialogue, it helps MI to create an enabling environment for project implementation and for achieving project **impact**. In adopting this design, he cited the following projects as a product of the Institute's tangible research outcomes:

- **Regional and Local Economic Development on East West Economic Corridor Project**
  - This project aims to improve the livelihood of smallholder farmers and the economic status of small and medium-size enterprises (SMEs) in six provinces along the East West Economic Corridor of the Greater Mekong Subregion by making their product more competitive. They are the maize sector in Kayin State in Myanmar, coffee sector in Quang Tri Province in Vietnam, and rice sector in Khammouane Province in Lao PDR.
  - Notable progress has been made in since the launch of the project in March 2013 (Mekong Institute, 2019b):

- ◆ *Farmers/Production* – Twenty-four (24) farmer groups were formed among which eight are operating well and providing various services to their members.
- ◆ *SME Development* - Twenty-nine (29) private enterprises were involved in the project, which offered farmers 18 improved value chain services and inputs.
- ◆ *Enabling Environment* - About 300 government officials from more than 20 different departments of the project sites participated in various activities aimed at improving the enabling environment.
- ◆ *Organizational Development* - MI has 20 competent and skilled staff who can serve as resource persons in training programs, accounting for 30% of all staff.
- **Innovations and Technologies for Agriculture Commercialization in CLMV Countries**
  - This project aims to develop the capacity on agricultural commercialization to foster economic development and competitiveness of Mekong countries. To achieve this, MI undertakes the following implementing strategies:
    - ◆ Promoting innovations and technologies in agriculture practices, production and trading system
    - ◆ Linking domestic, regional, and global markets
    - ◆ Supporting agricultural trade and investment
    - ◆ Promoting agri-based SMEs involving private sector
    - ◆ Ensuring sustainability and institutional mechanisms to enhance regional cooperation
  - Project interventions:
    - ◆ Selection of agricultural product, producer community for development of efficient value chain
      - ◇ *Activity*: Improve production and processing, post-harvest technology, good agriculture practices, quality control and certification practices, and access to new markets
      - ◇ *Stakeholder/beneficiary*: Farmers, producer groups, farmers associations and processors, business associations, and the public sector.
    - ◆ Develop supportive framework for proper linkages and enabling environment
      - ◇ *Activity*: Develop institutional capacities considering technical and non-technical aspects of trade facilitation
      - ◇ *Stakeholder/beneficiary*: Government agencies, financial institutions, and private sector entities and organizations



- Key components:
  - ◆ Enhancing productivity and quality of agri-produce
  - ◆ Promoting innovations and technologies for agri-produce
  - ◆ Agriculture commercialization and trading
  - ◆ Encouraging agri-business enterprises (SMEs)
  - ◆ Trade facilitation for agri-produce
  - ◆ Agri-entrepreneurship development

Taking everything into account, Dr. Leelawath concluded his speech by recognizing the extensive impact of technology and innovation in agricultural sector to enhance productivity and improve the quality of life among farmers in GMS. Agricultural technologies should be widely accessible to farmers to improve their crop production. To make things happen, he strongly advised to maximally use research findings to improve research impact.

REGULAR SESSION 1:

TECHNOLOGY INNOVATION

Moderator:       **Prof. Sujit Bhattacharya**  
                          Chief Scientist CSIR-NISTADS & Prof Ac-  
SIR, India

List of Papers Presented	
Title	Author/s
Who is Winning the Global Race in Iot?: A Social Network Analysis Based on Research Publications	Sujit Bhattacharya Ravinder Kumar
Analyzing the Technological Trend of UAV	Jeonghwan Jeon Ganchimgee Hussain
Monitoring and Detecting Core-strategic Purpose Technology (CPT) with New Methodological Approach	Yongrae Cho Hyunjun Park Jaemin Park Kyutae Kim Yoonhwan Oh
How can SMEs Innovate in the Internet of Things (IoT) Age?	Nestor Michael C. Tiglao



REGULAR SESSION 1:  
TECHNOLOGY INNOVATION

**Who is Winning the Global Race in IoT?: A Social Network Analysis Based on Research Publications**



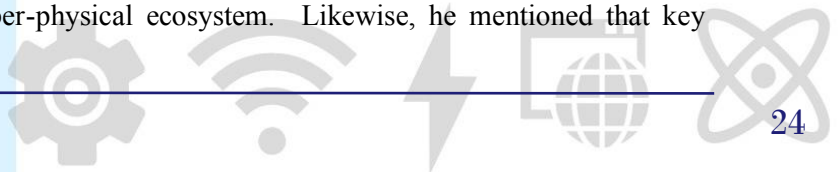
**Major Points of the Presentation**

Recognizing Internet of Things (IoT) as a key transformative technology, the presenter, Prof. Sujit Bhattacharya commended that this network formed by billions of interconnected objects, is becoming the foundational technology of the 4<sup>th</sup> Industrial Revolution. According to him, the new IoT enabled paradigm of ‘Cyber-Physical’ system calls for development and deployment of a more robust, reliable, and secure network that creates seamless connectivity among humans and devices. These new technologies are intensively science-based and their technology readiness level is contingent upon how research is shaping up and reaching maturity stage. It is thus important to know how research is shaping in this field.

The study presented by Prof. Bhattacharya captured the structure and dynamics of IoT research and revealed insights into which of the countries and institutions are emerging as key players and loci of research in this transformative technology. Research papers were taken as ‘proxy’ indicator to capture the research happening in this field. In the conceptual framework of the study, the tools and techniques of social network was applied to understand the linkages among the different concepts within IoT; and how the key concepts are embedded within the intellectual domain of the field.

Findings in this study as revealed by Prof. Bhattacharya show some very interesting aspects of research in the field and draw some key research gaps. IoT enabled systems can be successfully deployed through human centric systems which calls for research in social sciences which is not prominently visible.

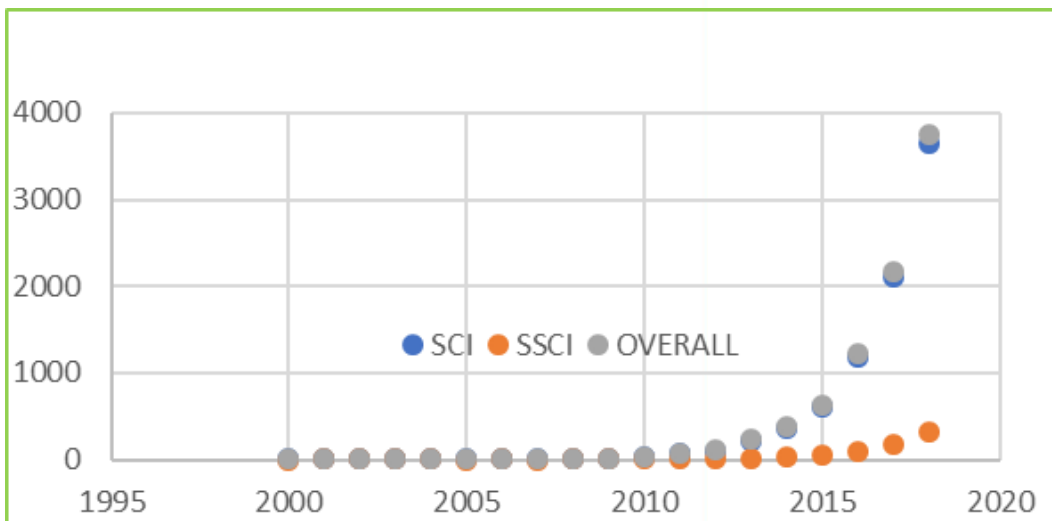
Consequently, Prof. Bhattacharya concluded that it is a challenging exercise to capture the different facets of research around IoT as it covers a broad spectrum of research fields. The linkages of IoT and research across the key subdomains show how IoT as a foundational technology for developing a cyber-physical ecosystem. Likewise, he mentioned that key





countries are competing as well as collaborating. According to him, winning the race would involve multiple research competencies and its successful translation. Thus, it is more important to create mode for co-innovation and co-development among countries.

**Keywords:** Internet of Things (IoT), Social Network Analysis, Transformative Technology



*Figure 1. Publication Trend in IoT*

REGULAR SESSION 1:  
TECHNOLOGY INNOVATION

## Analyzing the Technological Trend of UAV

**Jeonghwan Jeon, Ganchimgee, Hussain (Gyeongsang National University)**



### Major Points of the Presentation

In the global aerospace industry, Prof. Jeonghwan Jeon mentioned that Unmanned Aerial Vehicle (UAV) is becoming an essential means of securing growth and competitiveness. Thus, it is essential to conduct studies on technological trends to present policy research directions and findings which will serve as baseline of policy makers in the aerospace industry in developing policies and management strategies.

For this purpose, the study presented by Prof. Jeon aimed to analyze the technological trend of UAV through quantitative method using topic modeling and patent data. In the research framework of the study, he explained that the data were taken from the Korea Intellectual Property Rights Information Service (KIPRIS), an internet-based patent document search service designed to promote the use of patent information for R&D activities. The study covered 1,837 UAV documents of KIPRIS from 2000-2018.

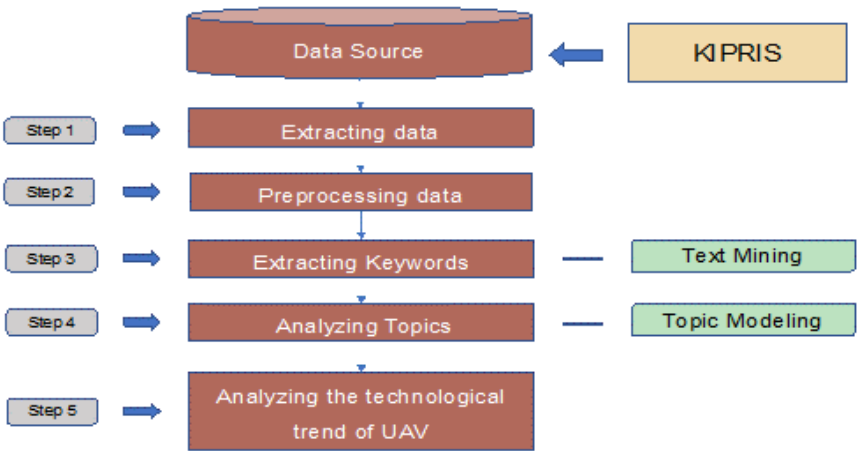
From this data source, Prof. Jeon discussed the seven steps employed using the case study approach, namely: (1) extracting data; (2) preprocessing data; (3) extracting keywords; and (4) analyzing topics. Using topic model and adopting Gibbs sampling algorithm, the topics (keywords) were defined based on words that are likely to appear and significant for each topic. Result of the analysis showed that topics on object detection (44.1%), signal processing (20.3%), and operational system (12.8%) were the commonly used keywords on technological trend of UAV. From this result, the UAV technological portfolio was structured based on *detection* which covers topics on image processing, object detection, and data processing; *flying* which covers topics on speed control, logistic, and parameter optimization; and *operation* which covers topics on operation system, power device, and communication services.



Findings in this study as revealed by Prof. Jeon show that the trends in technology development derived according to the analysis system are closely related to UAV. Thus, such results can be used as guideline of technology planning, R&D policy making, and technology strategy of UAV.

To enhance the analysis of the differences among keywords on UAV, Prof. Jeon consequently suggested that future research may be conducted focusing on the analysis of technological hot/cold trend, portfolio and capabilities of UAV.

**Keywords:**      **Technological Trend of Unmanned Aerial Vehicle (UAV), Topic Modeling, Gibbs Sampling Algorithm**



*Figure 2. Research Process of the Study*



## **Monitoring and Detecting Core-strategic Purpose Technology (CPT) with New Methodological Approach**

**Yongrae Cho (Future Strategy Team, STEPI), Hyunjun Park (Division of Innovation System Research, STEPI), Jaemin Park (Center for R&D, Yonsei University), Kyutae Kim (CEO Office, Dawin Strategy Consulting), Yoonhwan Oh**

### **Major Points of the Presentation**

One of the Korean statutes that govern the outflow/export of technology is the Act on Prevention of Leakage and Protection of Industrial Technology (ITA). This Act regulates the National Core Technology (NCT), that is industrial technology which, if leaked, may have a detrimental effect on the national security and development of the national economy due to their substantial economic value (Choe & Lee, 2017).

From this perspective, Prof. Cho shared that one of the key issues that needs to address by the Korean government with respect to ITA is the implementing policy and procedure to detect and monitor the core strategic technologies that directly relate to national security and survival. To overcome the limitations in the current NCT selection procedure, the study intended to suggest new methodological processes to detect NCT field and the related industry-focused technologies.

To develop and propose new methods, Prof. Cho advised to change the fundamental to practical technologies that affect the value chain of products and industries. With this, the Core-strategic Purpose Technology (CPT), a newly coined terminology, was proposed in which he explained that this terminology is more directly related to the national and corporate survival and has high elasticity in responding to industrial fluctuations. The proposed methodological approach complements with the current NCT selection procedures and system by introducing quantitative indicators. The key indicators are categorized according to the following perspectives: technological, economic, and security. From these indicators, the study used analytical techniques that included value chain analysis, technology-standard relation analysis, and technology-standard relation analysis to detect NCT field and the related industry-focused technologies. Subsequently, the study verified the new indicators with the historical trend to ensure that such indicators are related to national security and survival.

Aggregately, Prof. Cho, commended that through these CPT-oriented new methods, it would complement the existing qualitative and bottom-up approach by introducing qualitative and top-down approach. According to him, this additional and richer scientific information would aid policy practitioners’ strategic decision making in the process of setting basis of and designating national core technologies.

**Keywords:** National Core Technology, Prevention of Leakage and Protection of Industrial Technology, Core-strategic Purpose Technology (CPT)

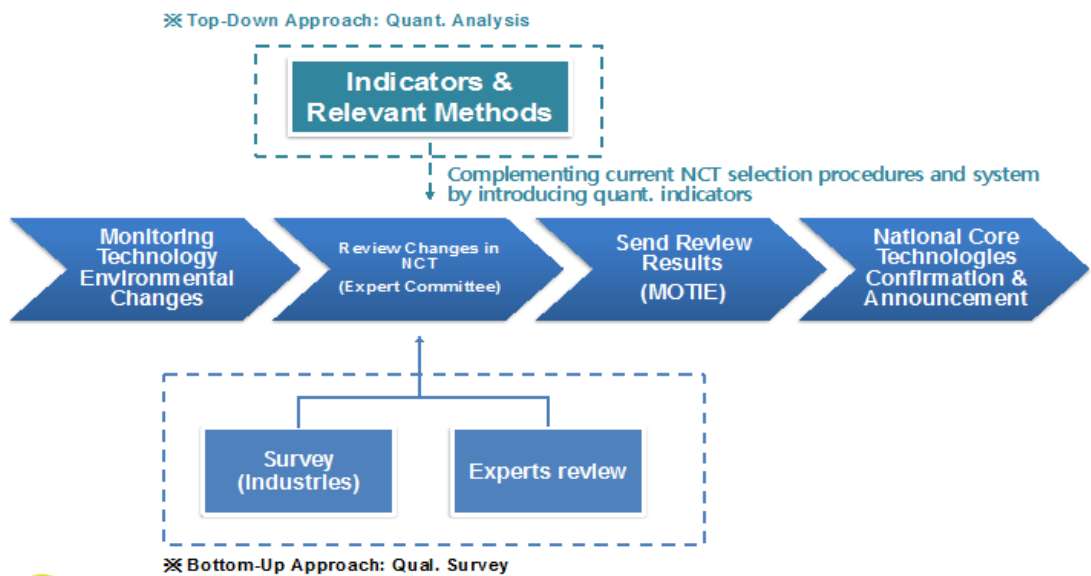


Figure 3. New Methodological Process to Detect National Core Technology Field and the Related Industry-Focused Technologies

REGULAR SESSION 1:  
**TECHNOLOGY INNOVATION**

## **How can SMEs Innovate in the Internet of Things (IoT) Age?**

**Nestor Michael C. Tiglao**  
**(University of the Philippines)**



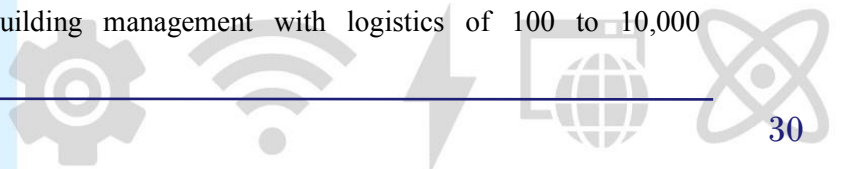
### **Major Points of the Presentation**

To initiate and sustain a productive discussion, the presenter, Dr. Nestor Michael C. Tiglao started by posing a question, “Why Do We Need to Innovate? In response to this, Dr. Tiglao stressed that innovation is imperative simply because customers demand it, analysts expect it, and investors reward it.

By all account, it is indeed essential to find ways on how SMEs can innovate in the age of Internet of Things (IoT). According to Dr. Tiglao, the Philippine government has two laws mandating the promotion of innovation in the country and these are the Philippine Innovation Act (RA 11293), an Act adopting innovation as vital component of the country’s development policies to drive inclusive development, promote the growth and national competitiveness of micro, small, and medium enterprises; and Innovative Startup Act (RA 11337), an Act providing benefits and programs to strengthen, promote and develop the Philippine startup ecosystem.

Before reinforcing the law, Dr. Tiglao emphasized the necessity to prepare the workers in the age of unprecedented and even accelerating change through continuous education, learning, and training. With this, he presented innovation models for SMEs that they can adopt as they face the age of IoT which is considered as the heart of the 4<sup>th</sup> Industrial Revolution, to wit: 3<sup>rd</sup> Party Full Service Provider, Corporate Ventures, Company/Builder/Agency, Strategic Partnerships, Incubators/Accelerators, Innovation Labs/Spin-off programs, Direct Startup Engagement, Ecosystem Innovation and Open Innovation.

In determining the effectiveness of such models to SMEs, a survey was conducted among 50 SMEs of the member state of the European Union, particularly in sectors of health care, manufacturing, retail, energy, building management with logistics of 100 to 10,000





employees. Results of the survey showed that the top three innovation models used by the member state of European Union were the 3<sup>rd</sup> Party Full-Service Provider (44%), Corporate Ventures (36%), Company Builders/Agency (36%), and Incubators/Accelerators (30%). Among the features of the top 3 innovation models included the following: (1) purchases, services, and products from a full-service provider with ready-to-use solution; (2) creates an own venture arm that strategically invests in numerous startups in relevant area; (3) co-creates/co-develops with experts that facilitate the end-to-end innovation process; and (4) creates an own arm that strategically supports numerous startups in relevant areas.

Given the results, Prof. Tiglaio also shared the experience of Adapsense on how innovation gave the company an edge in a highly competitive market. According to him, the company makes use of online service, 3D printing technology and cloud services in order to deliver efficient solutions to businesses which could eventually result to an improved productivity and enhanced customer experience.

**Keywords:** Internet of Things (IoT), Innovation Models for SMEs

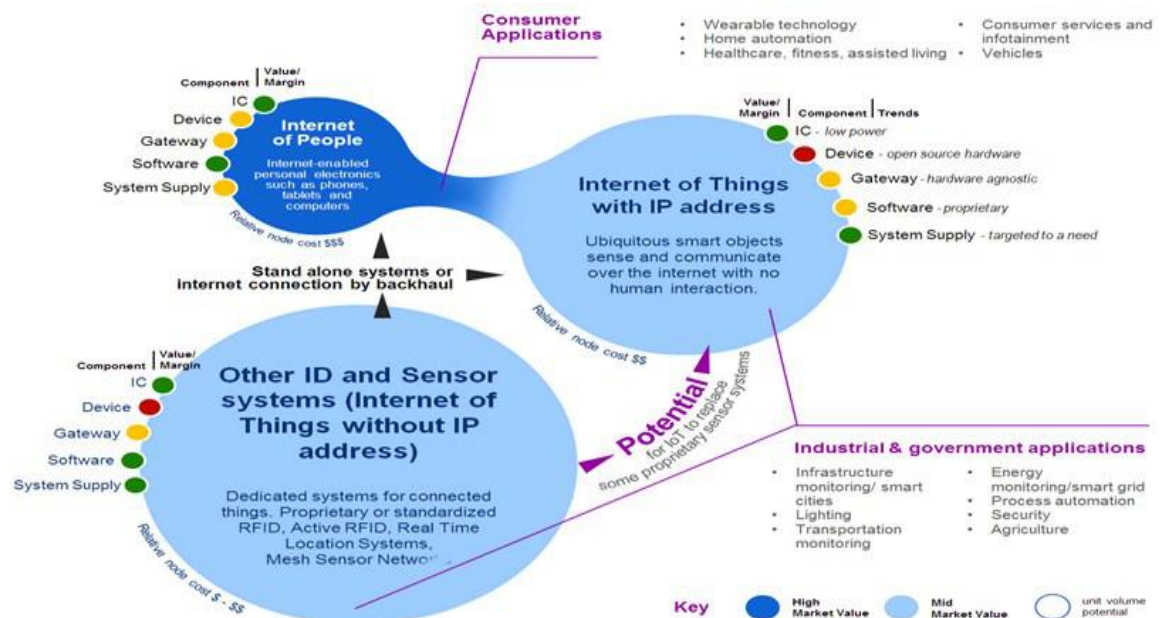


Figure 4. The Industrial Internet of Things

REGULAR SESSION 2:

MANAGEMENT TECHNOLOGY

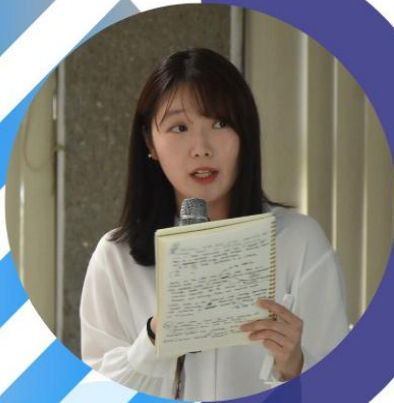
Moderator:     **Prof. Linda Ting-Lin Lee**  
University of Kaohsiung Taiwan

List of Papers Presented

Title	Author/s
Causal Relationship Analysis Between National R&D Patents and Technology Trade: A Focus on Patent Performances Based on NTIS Data	Soo-Hyun Park Sung-Uk Park Jae-Soo Kim
Interaction in R and D Networks: Evidence from National R and D in Korea	Young Jun Kim
Technology Value Hype Curve	Sung-Soo Seol



REGULAR SESSION 2:  
MANAGEMENT TECHNOLOGY



## **Causal Relationship Analysis Between National R&D Patents and Technology Trade: A Focus on Patent**

**Soo-Hyun Park (University of Science and Technology), Sung- Uk Park (Korea Institute of Science and Technology Information), Jae-Soo Kim (KISTI)**

### **Major Points of the Presentation**

The presenter, Dr. Soo-Hyun Park mentioned that R&D achievements are the key drivers of economic growth. The purpose of the study was to verify the statistical figure of the causal relation between national R&D patent and technology trade, to find out which technical field has a significant impact on technology trade and to check technical dependency of each technical field in the specific country. Hypothesis 1 states that national R&D performance has significant positive impact on technology exports, while hypothesis 2 states that national R&D performance has a significant negative impact on technology imports. Results using the patent and paper data from National Science and Technology Information System (NTIS) and data from Korea Statistical Information Service indicate that patent has a strong linear relationship than paper with technology export and import. Paper has no significant co-relationship with patent. Research meets hypothesis 1. It was mentioned that technical dependency is crucial. It was also shared that future national R&D patent policy should be implemented strategically to secure national competitiveness through the government's patent performance, based on the technology characteristics.

**Keywords:** R&D Output, Technology Trade, Export of Technology, Import of Technology, Intellectual Property, Patent



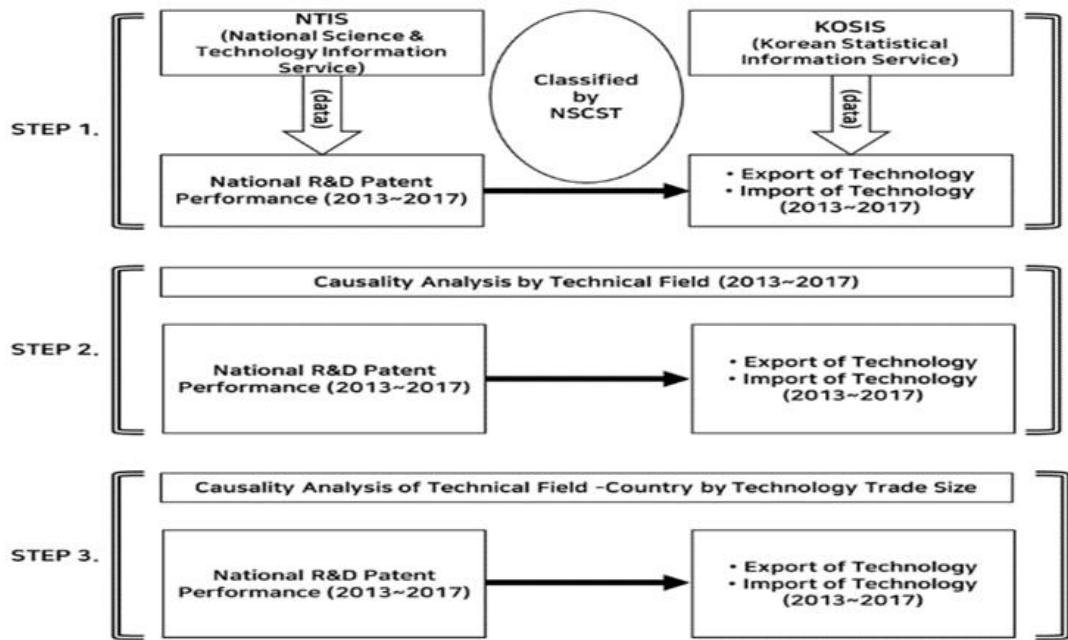


Figure 5. Hypothesis and Research Model on National R&D Performance

REGULAR SESSION 2:  
MANAGEMENT TECHNOLOGY

**Interaction in R&D Networks:  
Evidence from National R&D  
Programs in Korea**

**Young Jun Kim (Korea University, Korea)**



**Major Points of the Presentation**

The presenter stated that investment in R&D is one of the most important factors in enhancing technological progress and economic growth. He talked about interaction, which is the innovation process that includes knowledge creation and knowledge transfer, and how innovative capacities of actors and national competitiveness are mainly affected by the interactions among institutional R&D actors. He added that innovation can be created by dynamic interaction among university-industry-government as these interactions expand. Literature, he said, hints that government should encourage, instead of control, the interactions among Triple Helix institutional actors. One of his concluding remarks was that the policy makers should consider carefully the unintended effects of the policies before executing them.

**Keywords:**     **Research and Development Networking, Knowledge Creation, Knowledge Transfer, Innovative Capacities**







REGULAR SESSION 2:  
**MANAGEMENT TECHNOLOGY**



## **Technology Value Hype Curve**

**Sung-Soo Seol (Hannam University,  
Korea )**



### **Major Points of the Presentation**

The presenter shared that Gartner's hype cycle is the graphical depiction of a common pattern that arises with each new technology or other innovation. He explained that the Gartner's Hype Cycle methodology gives a view of how a technology or application will evolve over time, providing a sound source of insight to manage its deployment within the context of the specific business goals (Gartner, 2019).

Some criticisms of the cycle include the non-reflection of change over time and outcomes not depending on the technology itself. Some lessons from venture capitalists, on the other hand, include uncertainty of prediction, many technologies dying completely without any trend and accurate technical insights that have no application.

**Keywords:**     **Technological Innovation, Gartner's Hype Cycle, Explosive Value**



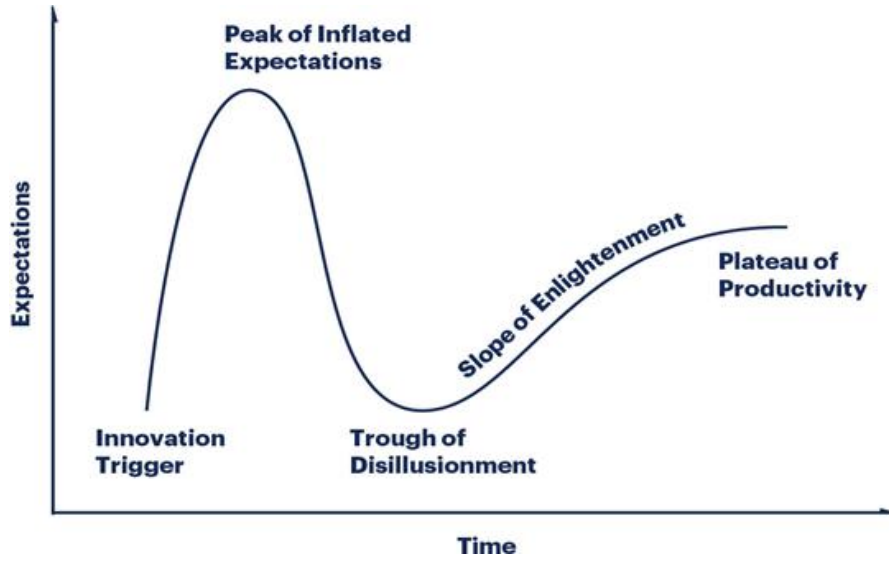


Figure 6. Technology Hype Cycle (Gartner, 2019)

REGULAR SESSION 3:

ECONOMICS OF TECHNOLOGY

Moderator: Prof. MH Bala Subramanya  
Indian Institute of Science India

List of Papers Presented	
Title	Author/s

Chinese SMEs Outward Foreign Direct Investment	Renying Chi Daoxue Liu
The Role of Regional Innovation Systems in SME Innovation and Competitiveness	M H Bala Subrahmanya
Firm-Level Effects of Participating in Global Production Networks: Evidence from the Philippines	Annette Balaoing-Pelkmans Karl Robert Jandoc Rob van Tulder





### REGULAR SESSION 3: ECONOMICS OF TECHNOLOGY

## Chinese SMEs Outward Foreign Direct Investment Performances Based on NTIS Data

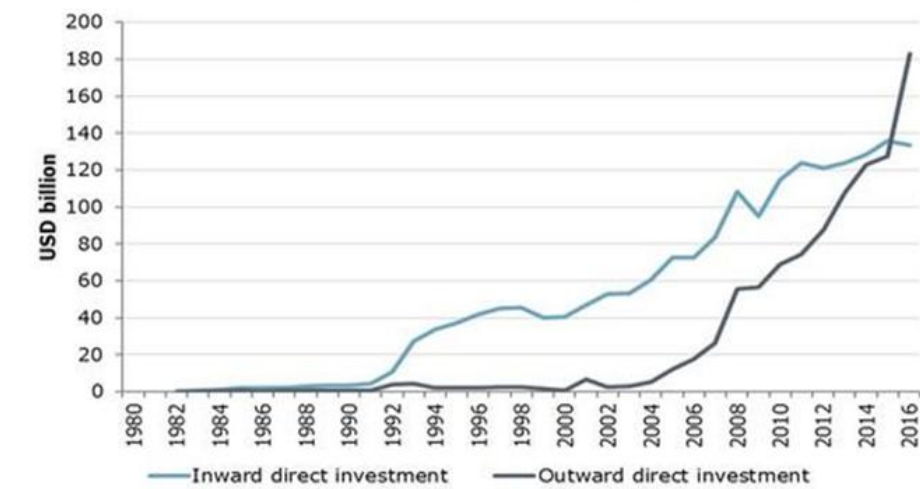
### Major Points of the Presentation

The study presented by Prof. Renyong Chi focused on the factors that affect the Outward Direct Investment (ODI) of Chinese MSMEs. The study sought to find out how state-owned enterprises (SOEs) and private-owned enterprises (POEs) influence the motives and behaviors of Chinese ODI namely market, efficiency, resource-asset, and strategic-asset seeking motives. The method used in the study was correlational research in determining the relationship between the characteristics of SOEs/POEs and the motives/behaviors of Chinese ODI. It also used comparative analysis in identifying the characteristics of different Chinese ODI's motives through Dunning's Eclectic Paradigm (OLI Model). The study concluded that the difference in the ODI motives of SOEs and POEs are influenced by the difference on their institutional environment, resources, and competencies. The model presented in the study can be used as a basis for other firms' ODI by identifying its advantages and disadvantages. Moreover, the study can encourage the Chinese government to implement policies that will further support POEs in the attainment of its goal of economic expansion and global market integration.

**Key words:** China, Private Firms, Outward Foreign Direct Investment (OFDI), SMEs, Internationalisation







Source: UNCTAD (2017)

Figure 7. Development Stage of Chinese ODI

REGULAR SESSION 3:  
**ECONOMICS OF TECHNOLOGY**



**The Role of Regional Innovation Systems in SME Innovation and Competitiveness**

**MH Bala Subrahmanya**  
**(Indian Institute of Science, India)**

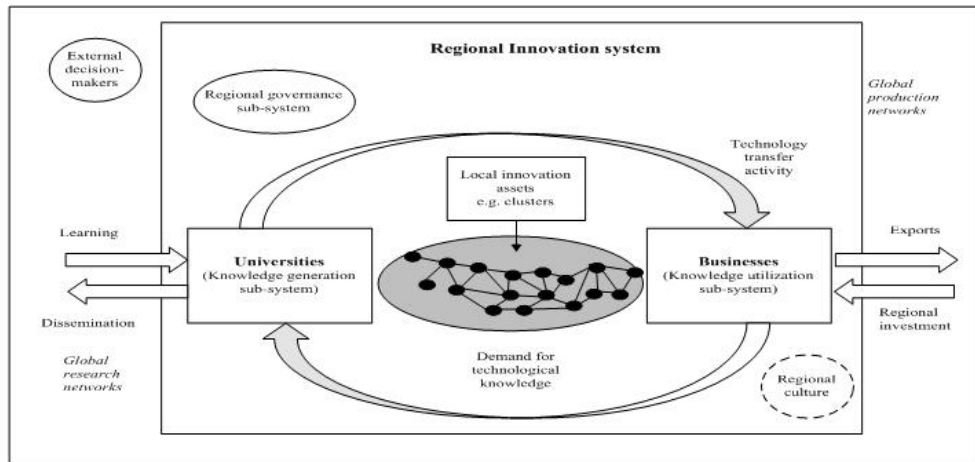


**Major Points of the Presentation**

The presenter shared the important role that the Regional Innovation System (RIS) plays on enhancing SMEs' productivity and competitiveness. Despite significant economic contributions of SMEs, the sector faces difficulty in competing in regional, national, and international markets as business environment intensifies brought about by globalization. In conclusion, Prof. Subrahmanya mentioned that RIS induced interlinkages are likely to be beneficial to SMEs in undertaking innovation, achieving internationalization, and enhancing their economic performance. He consequently suggested that the findings of the study be used as a basis for policy makers and researchers to adopt RIS as a strategy to enhance SMEs' performance and competitiveness through the 3Is - Interlinkages, Innovation, and Internationalization.

**Keywords:**     **Regional Innovation System (RIS), SME Innovation and Competitiveness, Interlinkages**





Source: Cooke, P and A Piccaluga (2004): *Regional Economies as Knowledge Laboratories*, Edward Elgar, Cheltenham

Figure 8. Regional Innovation System

REGULAR SESSION 3:  
ECONOMICS OF TECHNOLOGY



## **Firm-level Effects of Participating in Global Production Networks: Evidence from the Philippines**

**Annette Balaoing-Pelkmans, Karl Robert Jandoc, Rob van Tulder  
(University of the Philippines and  
RSM Erasmus University Rotterdam/**

### **Major Points of the Presentation**

The study presented by Karl Robert Jandoc tackled the participation of different firm levels in the Global Production Network (GPN) in the Philippines. In this study, the different levels in which firms are situated determine the capacities of each firm's export capacity, import capacity, and success rate in the global market. The methods used were statistical analysis of different firm-levels in the Philippines and document review of import and export transactions in the country. The study concluded that a firm's export capacity determines its success rate and competitiveness in the global market. GPN1 firms that are mostly foreign-owned are the ones that have greater opportunities for quality upgrading than GPN2 Firms (Filipino-owned firms as such). Findings in the study as shared by the presenter can be used as a reference for further research on identifying the constraints and opportunities that apply to different types of firms and encourage the conduct of a systematic documentation and monitoring process by the government and concerned stakeholders.

**Keywords:**    **Global Production Networks (GPN), Filipino-owned Firms, Firm Export Capacity**



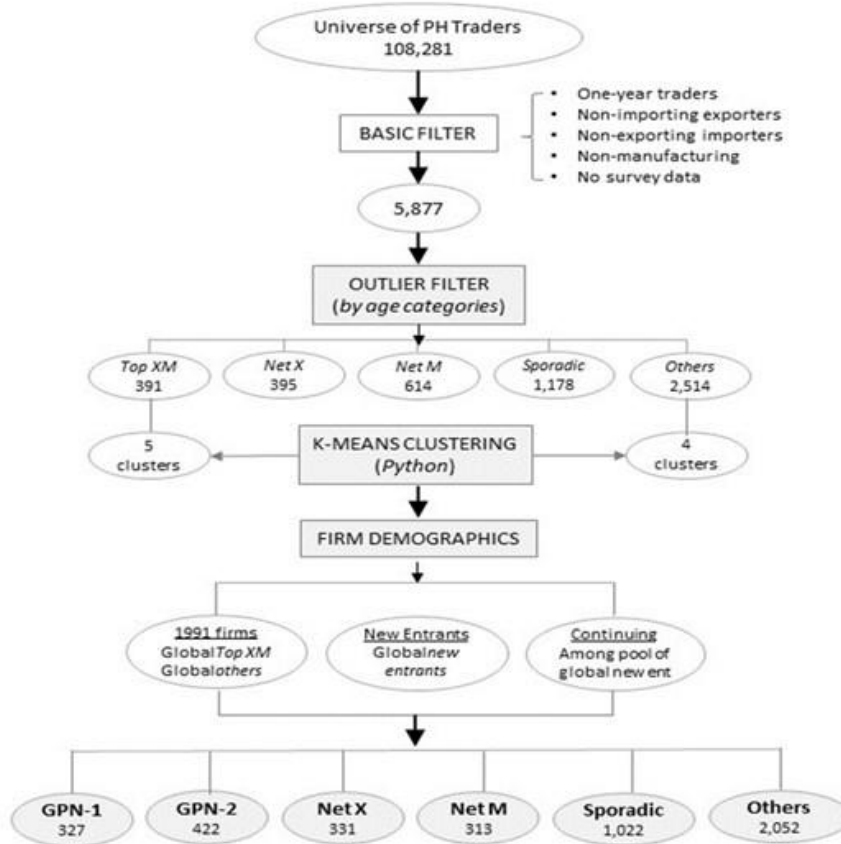


Figure 9. Characterization of Firm Types

REGULAR SESSION 4:

TECHNOLOGY POLICY

Moderator:     **Prof. Hong-Tak Lim**  
Pukyong National University Korea

List of Papers Presented

Title	Author/s
Innovation Through Public Procurement: A Case of Fusion Energy Technology in Korea	Ki-Seok Kwon
The Impact of Government Subsidy on People's Decision on Purchasing an Electric Scooter-a Viewpoint of Mental Accounting	Yu-Yun Chang Ting-Lin Lee
Users/Citizens and Transformative Innovation Policy: Critical Review on the Frameworks of Innovation System	Hong-Tak Lim
Promoting Agricultural Technologies through Farm Tourism Sites	Reynold Ferdinand G. Manegdeg





REGULAR SESSION 4:  
TECHNOLOGY POLICY

**Innovation Through Public  
Procurement: A Case of Fusion  
Energy Technology in Korea**

**Ki-Seok Kwon**

**(Hanbat National University, Korea)**



**Major Points of the Presentation**

Public research is an essential policy measure for economic advancement to meet the demand on firms' innovation. Anent to this, public procurement, as cited by the presenter, Prof. Ki-Seok Kwon, has been considered as a source of learning and stimulus for technical innovations according to studies.

The study presented by Prof. Kwon focused on the factors involved in technical innovation particularly in public procurement and the benefits derived from the contracts. Case study and survey were used to investigate the research problem. Fifty-three (53) out of 162 firms participated in the study in which detailed information on innovation outcomes and company characteristics were collected.

According to the presenter, the preliminary results from the survey and interviews suggested that some characteristics of firms are more related to the selection in the construction of KSTAR and ITER. In this vein, there were four groups of firms involved in the construction of KSTAR and preparations for ITER; the low-tech and passive, the NF-specialized, tech-intensive, and the scale-based. Furthermore, it was found that there was some inconsistency between the interviews and survey results. An example of this inconsistency was that the effect of the involvement in the project is not so remarkable for NF-specialized firms in survey. Scale-based firms seem to create more benefits from the involvement than others. This is due to the fact that Korean innovation system depends on big firms, hence they have a stronger survivability in the market environment.



**Keyword:** Public Procurement, Technical Innovation Factors, Contract Benefits



Figure 10. Interactive Model of Science and Technology in Catch-up Countries



## **The Impact of Government Subsidy on People's Decision on Purchasing an Electric Scooter-a Viewpoint of Mental Accounting**

### **Major Points of the Presentation**

Due to the increasing environmental sensitivity, governments worldwide have introduced relevant technology incentive policies to promote the adoption of electric vehicles as a measure to achieve the goal of diminishing traffic emissions. Although subsidy in traditional economic theory is a powerful policy tool in stimulating the market, the penetration of electric vehicles remains low.

In this research, as presented by Yu-Yun Chang, Gogoro scooter, a domestic brand of Taiwan was taken as the object, and the concept of the “mental book value” from the Mental Accounting perspective was adopted. The study intended to investigate the purchasing decision of people through the use of questionnaire of decision-tree-like which attempts to explain the effectiveness of a government purchasing subsidy policy. Subjects were divided into three groups according to the situation from the Mental Accounting perspective (group 1 - no scooter, group 2-owning a petroleum-fueled scooter and has not earned its cost, and group 3- owning a petroleum-fueled scooter and has already earned its cost).

According to her, the research indicates that there were significant differences between groups; and each group had a different set of features that may indeed cause differences in purchase decisions after analyzing the 485 valid data. It seems reasonable to conclude that people's “decision-making behavior” is influenced by Mental Accounting. The study claimed that mental book value could be a very good variable in market segmentation. Although, it has a negative influence on the purchasing possibility, willingness-to-pay, and the impact of the purchasing subsidy on people. In other words, a high residual value in mental accounting would reduce the purchasing possibility, and also decrease the effect of government subsidies.



In the past, as explained by the presenter, most of the relevant researches mainly explore on how to improve the performance of electric scooters from a technical point of view or to study market acceptance from a marketing perspective. However, only few commented on subsidies from a policy perspective and rarely discussed the purchasing possibility, willingness-to-pay based on the Mental Accounting viewpoint. Consequently, she mentioned that the contribution of this research is the use of Mental Accounting to measure the residual value, which emphasizes the bottom-up approach, and instead of emphasizing how much the subsidy provided, which was focused on the top-down approach.

**Key words:** E-scooter, Mental Book Value, Decision Tree, Willing-to-Pay

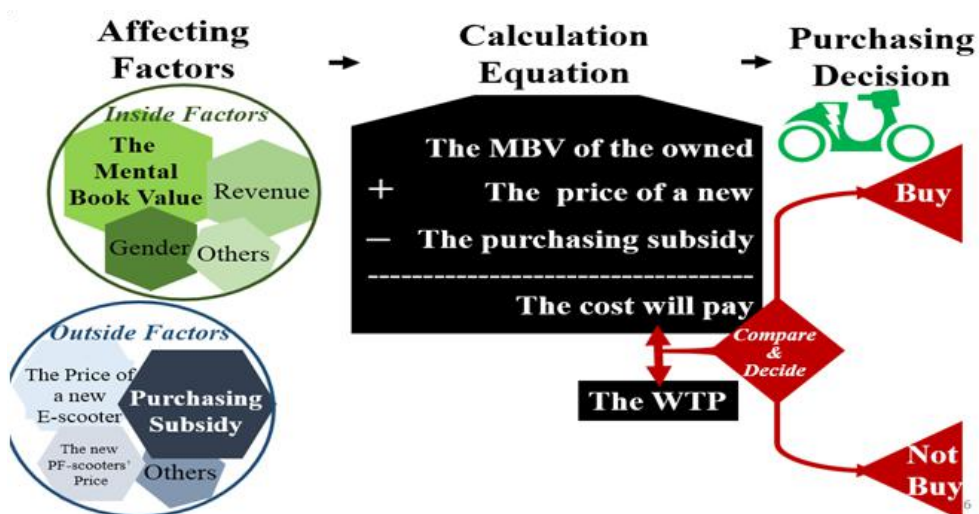


Figure 11. Research Framework and Design of the Study on the Impact of Government Subsidy on People's Decision on Purchasing an Electric Scooter

REGULAR SESSION 4:  
TECHNOLOGY POLICY



## **Users/Citizens and Transformative Innovation Policy: Critical Review on the Frameworks of Innovation System**

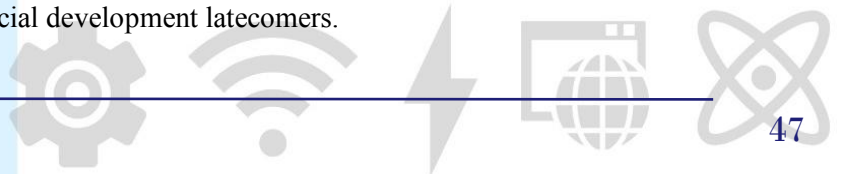
**Hong-Tak Lim**  
(Pukyong National University, Korea)

### **Major Points of the Presentation**

The study presented by Prof. Hong-Tak Lim focused on the three frameworks for innovation policy: (1) R&D Policy, (2) National Innovation System Policy, and (3) Transformative Innovation Policy. The first framework is identified as beginning with a Post-World War II institutionalisation of government support for science and R&D with the presumption that this would contribute to economic growth and address market failure in private provision of new knowledge. The second framework emerged in the 1980s globalising world and its emphasis on competitiveness which is shaped by the national system of innovation for knowledge creation and commercialisation. The third framework linked to contemporary social and environmental challenges such as the Sustainable Development Goals and transformative change. (Schot & Steinmueller, 2018).

In this context, the study aimed to review the frameworks of innovation system along these perspectives: contributions of transformative innovation policy frame, and role of users in transformative innovation in the context of digital transformation. The presenter used documentary analysis methodology to comprehensively review literature on digital transformation and system approach to innovation, specifically relevant literature on the national innovation system (Lundvall), business system (Whitley), and socio-technical system (Geels).

One of the principal findings of the study is that the transformative innovation policy frame is still new to address the social demand driven policy such as fulfillment of social function that includes education, mobility, housing, energy rather than economic competitiveness and application/use capability of citizens/users. Likewise, it was found that this policy frame has different paths of economic and social development latecomers.





In the context of digital transformation, the study claimed that users/citizens could generate potential business value that includes prosumer, co-creation of value in service, and generation of new type of firm such as knowledge-intensive social enterprises, cooperatives.

**Keywords:** Transformative Innovation Policy, Digital Transformation, National Innovation System, Business System, Socio-Technical System

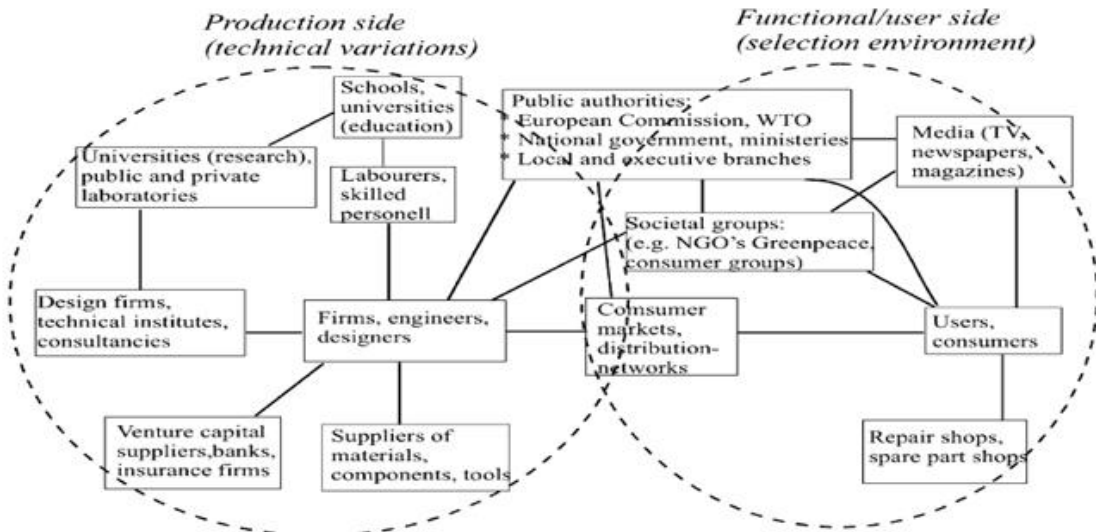


Figure 12. Social Groups which Carry and Reproduce ST System

REGULAR SESSION 4:  
**TECHNOLOGY POLICY**

**Promoting Agricultural Technologies through Farm Tourism Sites**

**Reynold Ferdinand G. Manegdeg**  
**(University of the Philippines)**

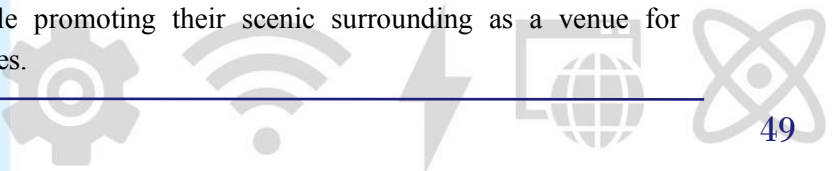


**Major Points of the Presentation**

Agriculture remains of crucial importance in the economy of the Philippines, albeit its relative contribution to gross domestic product (GDP) has been declining over the years. From 1998 to 2009, the sector accounted for 13 to 14% of the total GDP. This steadily declined to 10% by 2017 (Brown, Eborá & Decena, 2018).

Considering the state of Philippine agriculture, the presenter, Mr. Reynold Ferdinand G. Manegdeg, eventually presented some of the factors that could contribute for the greater growth and development of the agricultural sector in the Philippines, to wit: (1) robustness of research and extension, (2) single-crop focus, and (3) infrastructure investments. According to him, investment in agricultural R&D as percentage of agricultural GDP typically hovered to just around 0.3 % annually—far below the 1% recommended by World Bank. There have been significant increases in R&D investment during the past few years, although the total investment would still be very low to even approximate the recommended rate (Brown, Eborá & Decena, 2018).

To support the country's R&D investment in agriculture, the DOST Philippine Council for Agriculture, Aquatic, and Natural Resources Research Development (PCAARRD) and UP Institute for Small-Scale Industries (ISSI) worked collaboratively to provide interventions and accelerate the capability of farmers and entrepreneurs to transform ordinary farms into science-based tourism farms. Thus, the Establishment of Science for the Convergence of Agriculture and Tourism (SciCAT) Program was conceptualized to showcase PCAARRD's matured technologies which can also be promoted on a larger scale. This technological convergence likewise aimed to improve productivity and capacity of farm tourism sites on sustainable farming practices while promoting their scenic surrounding as a venue for educational and recreational activities.



This collaborative research and extension project as mentioned by the presenter aimed to transform Magsasaka-Siyentista Farms into SciCAT Farm Enterprises that will serve as the community's main tourist farm attraction leading to the creation of employment and entrepreneurship opportunities in the community. Specifically, the project provided interventions to address its specific objectives, to wit: (1) develop SciCAT as a new technology transfer modality; (2) expand linkages and networks of SciCAT sites in terms of production, postharvest, and marketing activities; (3) capacitate farmers and interested individuals in the community with technical and managerial know-how; (4) create additional employment opportunities in the community; (5) utilize identified farms to share knowledge and disseminate information on Package of Technologies (POTs) applied through tourism activities; and (6) improve selected farms' productivity and enhance their capability to practice sustainable farming through POTs.

Case and feasibility studies were prepared to determine the current scenario including issues and challenges on farm tourism operations and to assess the viability and vitality of farm sites through SWOT analysis. Data were gathered through interviews, environmental/marketing scanning, and secondary data. Results from these studies served as baseline in developing the Farm Tourism Enterprise Plan to strategize the launching of the farm enterprise and Mentorship Program for Magsasaka-Siyentista to guide them in the organization and operation of farm enterprise and assist them in their application for accreditation to the Department of Tourism.

In conclusion, Mr. Manegdeg shared that buy-in of beneficiaries is critical as the project can fund only for renovation of facilities. Meanwhile, crop diversification was also found as a key principle in the project's concept as it expands the farms' commodities with available mature technologies. Among the common implementation challenges include transforming mindset/mental model of farmers and developing entrepreneurial competencies of MSMEs to sustain the farm tourism sites. As to government intervention, studies claimed that higher level of uncertainty makes public intervention more effective and necessary in terms of final outcomes. Hence, the stronger the uncertainty related to the real effectiveness of the SciCAT project is on the long term, the more necessary and effective the public involvement in this risky project will be.

**Keywords:** Farm Tourism Enterprises, Agricultural Technologies, Capacity Building and Mentoring



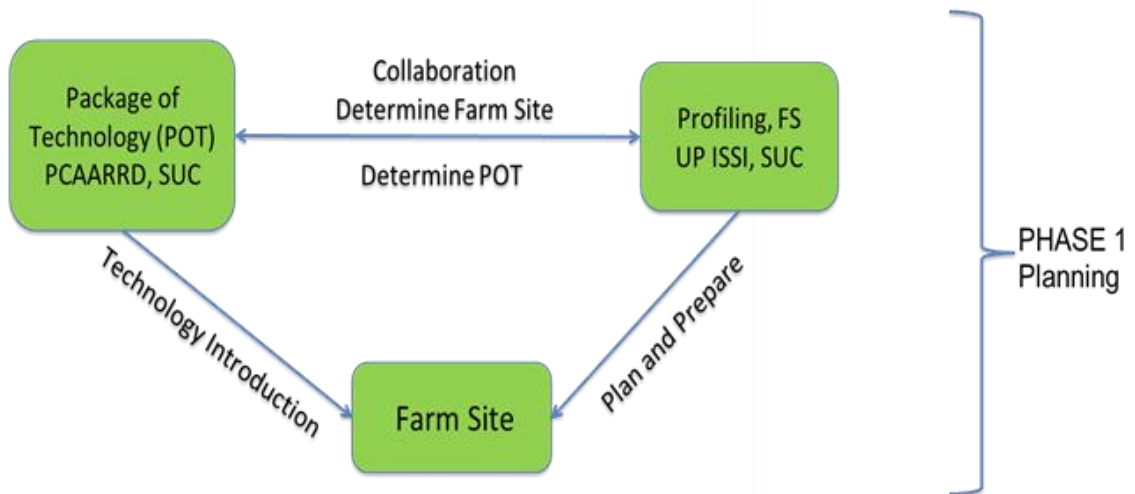


Figure 13. SciCAT Program Framework: Phase 1

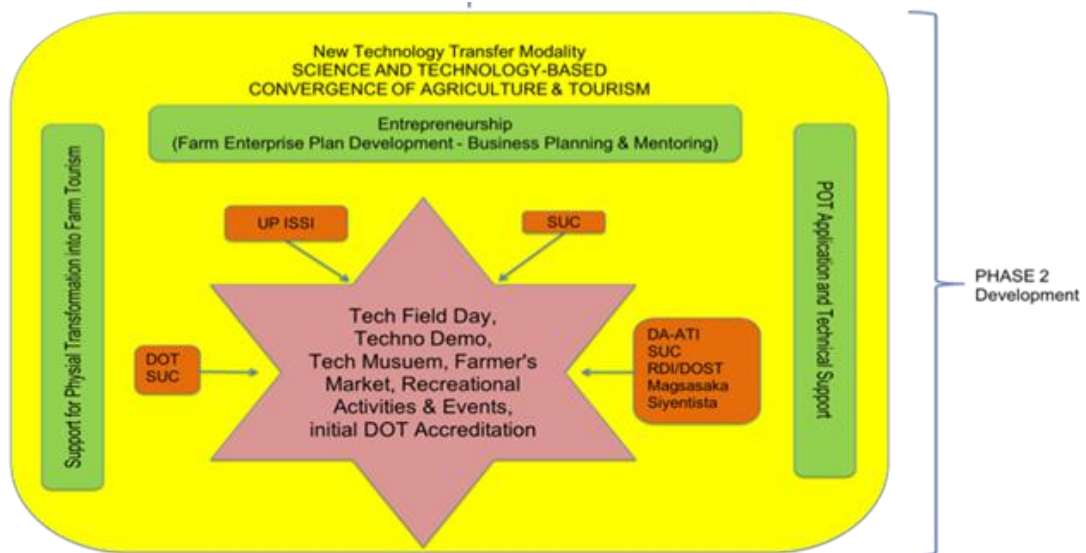


Figure 14. SciCAT Program Framework: Phase 2



SPECIAL SESSION 1:

EVALUATION OF KOREAN POLICY FOR  
THE 4<sup>TH</sup> INDUSTRIAL REVOLUTION

Moderator: **Chan-Goo Yi**  
Chungnam National University Korea

List of Papers Presented

Title	Author
The 4 <sup>th</sup> Industrial Revolution Policy in Korea: Evaluation and Policy Innovation	Chan-Goo Yi
Evaluation on Technology Policy Related to 4 <sup>th</sup> Industrial Revolution	Young-Joo Ko
A Study on the HR Policy in the Ministry of Science and IT (MSIT)	Janghoon Kim
Policy for the Protection and Utilization of Personal Information	Byung-Sang Hwang







SPECIAL SESSION 1:  
**EVALUATION OF KOREAN POLICY FOR  
THE 4<sup>TH</sup> INDUSTRIAL REVOLUTION**

**The 4<sup>th</sup> Industrial Revolution  
Policy in Korea: Evaluation  
and Policy Innovation**

**Chan-Goo Yi**  
(Chungnam National University, Korea)

**Major Points of the Presentation**

Prof. Yi focused on Korean Policy on the Fourth Industrial Revolution. His research aimed at: a) policy evaluation and policy innovation from the perspective of the 4<sup>th</sup> Industrial Revolution, and b) providing empirical data and theoretical rational for integrating individual policies from the Ministry of Strategy and Finance, Ministry of Science, ICT and Information, Ministry of Commerce, Industry and Energy, Ministry of Education, Ministry of Employment and Welfare, among others. He stressed that research by KOTIS showed policy gaps on: a) accelerating broad-range societal change, b) manufacturing change in the health and medical sector, c) changing financial ecosystem, d) opportunity imbalance vs employment instability, and e) supporting and leading individual innovations. In his paper, he identified two processes of analytical object, namely: a) selection of process of 2 – 3 core policies according to the following innovation areas: technology innovation, economic innovation, social innovation, and policy innovation; and b) rearranging related policies from policy change. Prof. Yi used a mix of policy evaluation and policy change theories such as policy effect model and comprehensive evaluation model. He used the Policy Change Model of Hogwood and Peters of policy innovation, policy maintenance, policy succession, and policy termination. He ended his presentation by saying that the individual authors in this session individually conducted qualitative and quantitative analysis according to the characteristics of innovation areas policy, policy domain, and research stages. The research output will provide the Korean government with better design of policy process in assessing and evaluating the Fourth Industrial Revolution.

**Keywords:** Policy Evaluation, Innovation, Innovation, Policy Change Model



	Policy Innovation	Policy Maintenance	Policy Succession	Policy Termination
Principle	Intended	Adapted	Intended	Intended
Legal System	absence of existing law	no change of law	a few legal replacements	dispose of all relevant laws
Organization	absence of existing organization	nothing intentional organizational changes	at least change of beyond organization level	abolition of existing organization
Budget	absence of existing budget	budget item continuation	few items of existing budgets remained	abolition of existing budget

*Figure 15. Types of Policy Change by Hogwood and Peters (1983)*

## SPECIAL SESSION 1:

## EVALUATION OF KOREAN POLICY FOR THE 4<sup>TH</sup> INDUSTRIAL REVOLUTION

### Evaluation on Technology Policy Related to 4<sup>th</sup> Industrial Revolution



### Major Points of the Presentation

Prof. Ko explained in his paper the different technology policies related to 4<sup>th</sup> IR such as: a) Investment Strategy and Innovation Plan for Materials, Parts and Equipment, b) Program for Development of Next Generation Intellectual Semiconductor Technology, c) Development of Fundamental nano-Materials, d) Plan for Innovation Growth Engine, and e) 4<sup>th</sup> Science and Technology Growth Engine (artificial intelligence, innovative new drugs, 5G, autonomous vehicle, big data, new energy, etc). He outlined in his presentation the plan of the Committee for the 4<sup>th</sup> IR such as: hyper-connect networks, drone, smart airport, strategy for smart city, nurturing the data industry, cloud computing development and strategy for health care, and robot marketing. The evaluation framework for these policies will use the technology innovation for industry and society and the paradigm shift in innovation policy concepts. These concepts will be completed by the following questions: a) Plan by plan – Is there consistency and what are the evidences? b) Is implementation according to plan? c) What are the qualitative outcomes and expected impacts? d) What is the effectiveness on ecosystem? e) Is the technology policy people-centered? f) What are the packaged investments needed? He discussed that the literature review will make use of existing publications including patents, evaluation studies on technology policy, longitudinal survey on performance and time series analysis between plans. Prof. Ko stressed that the research paper will influence policy innovation in Korea as far as 4<sup>th</sup> IR taking into account people, society, industry, and regions.

**Keywords:** Technology Policies, Investment Strategy, Innovation Plan, Performance, and Time Series Analysis



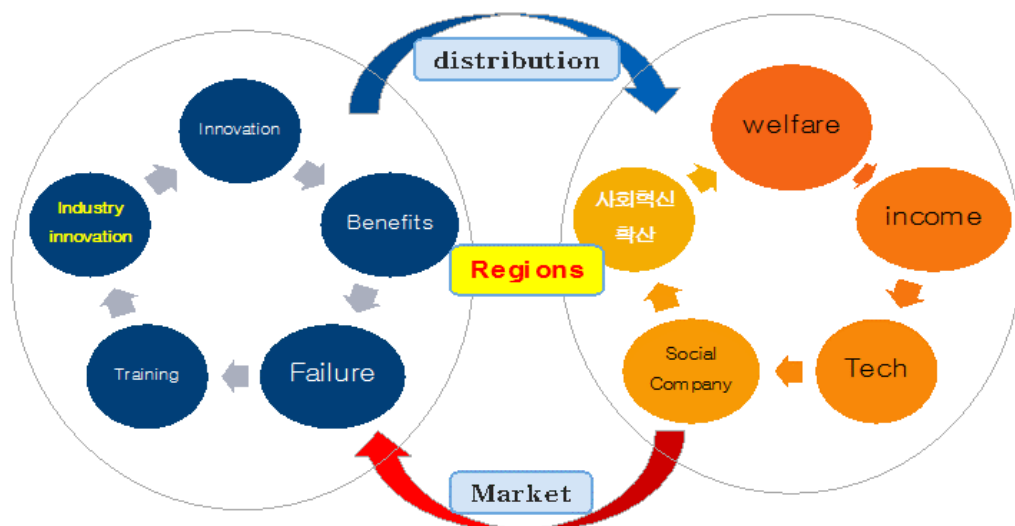


Figure 16. Technology Innovation for Industry and Society



SPECIAL SESSION 1:  
**EVALUATION OF KOREAN POLICY FOR  
THE 4<sup>TH</sup> INDUSTRIAL REVOLUTION**

**A Study on the HR Policy in the  
Ministry of Science and IT  
(MSIT)**

**Major Points of the Presentation**

Prof. Kim's research paper talks about policy on human resource in the Ministry of Science and Information Technology. His paper addressed two research questions: a) What should be the suitable role model of human talent in relation to the 4<sup>th</sup> IR, and b) What are the implications of HR development policy as a governance mechanism? He then discussed the theoretical underpinnings in developing HR policy to wit: a) manufacturing renaissance, b) promoting innovative growth, and c) upgrading R&D investment system, d) defining 4<sup>th</sup> IR, e) human resource capability as a source of competitive advantage, f) governance mechanism, and g) defining digital talent to include duality on employment.

The Korean government-wide policy on R&D talent as Prof. Kim explained includes AI, R&D and Korea 4.0. At the micro level, he then discussed the R&D Talent Policy of MSIT and the three Master Plans for HRST Program with focus on improving educational system of science and engineering promoting key R&D persons, reinforcing international experience of talented person, raising science and engineering person (SEP) suitable for field demand and expanding R&D infrastructure to promote SEP. He concluded his presentation by reiterating one of the gaps that future study could address will be on comparative analysis of HR policies of different ministries like that of education, trade and industry, and energy.

**Keywords:** Human Resource Policy, Personnel Management, Human Talent in Industrial Revolution





	1 <sup>st</sup> HRST (2006)	2 <sup>nd</sup> HRST (2011)	3 <sup>rd</sup> HRST (2016)
<b>Vision</b>	<b>Talented SEP</b> for national competitiveness	<b>Creative SEP</b> for strong HR country	<b>Entrepreneurial SEP</b> for globalization
<b>Goal</b>	<ul style="list-style-type: none"> <li>- Globalization</li> <li>- Job creation</li> <li>- UIR linkages</li> </ul>	<ul style="list-style-type: none"> <li>- Infra for creativity</li> <li>- Job creation, stability</li> </ul>	<b>Increasing 400,000 HR in S&amp;T</b> <b>*15(180M) → *20(220M)</b>
<b>Task</b>	<ul style="list-style-type: none"> <li>- Educational system</li> <li>- Key R&amp;D person</li> <li>- Int'l experience</li> <li>- SEP for market demand</li> </ul>	<ul style="list-style-type: none"> <li>- <b>STEAM education</b></li> <li>- <b>Specialization of Graduate school</b></li> <li>- Utilization of Research institutes</li> <li>- Using firms to meet demands</li> <li>- <b>Foreign, female &amp; senior scientists</b></li> </ul>	<ul style="list-style-type: none"> <li>- <b>Employment and start-up capability</b></li> <li>- Education, research competitiveness</li> <li>- <b>CDP of existing scientists</b></li> <li>- Build up creative talent</li> <li>- Utilization of potential HR</li> <li>- Supporting infra for SEP</li> </ul>
<b>Action Plans</b>	<ul style="list-style-type: none"> <li>- World class university</li> <li>- Graduate school</li> <li>- The gifted</li> <li>- <b>School-work links</b></li> <li>- <b>Life-long education</b></li> <li>- Job creation</li> </ul>	<ul style="list-style-type: none"> <li>- <b>WCU Programs</b></li> <li>- Education system for social needs</li> <li>- Developing localized SEP</li> <li>- Experienced advanced SEP</li> <li>- <b>R&amp;D HR for high-tech industries</b></li> <li>- <b>R&amp;D HR suitable for demands</b></li> <li>- Promoting R&amp;D-intensive firms</li> </ul>	<ul style="list-style-type: none"> <li>- Enhancing skill for industry needs</li> <li>- <b>Educational ecosystem for start-up</b></li> <li>- S&amp;E education for industry needs</li> <li>- R&amp;D capability of S&amp;E</li> <li>- <b>Convergent capability of scientists</b></li> <li>- Broadening boundary of scientists</li> <li>- Recruiting foreign talented SEPs</li> <li>- <b>Utilizing female, senior scientists</b></li> <li>- Diffusing culture along with public</li> </ul>

Figure 17. Summary of HR Policy in the MSIT

SPECIAL SESSION 1:  
**EVALUATION OF KOREAN POLICY FOR  
THE 4<sup>TH</sup> INDUSTRIAL REVOLUTION**

**Policy for the Protection and  
Utilization of Personal Infor-  
mation**



**Major Points of the Presentation**

The paper of Prof. Byung-Sang Hwang on policy for data protection and utilization, especially of personal data, explained the two laws in Korea, case study on data protection in the US, Japan, and Europe and recommendation for policy innovation. In his introduction, he discussed about developing a hyper-connected society with 4<sup>th</sup> IR such as superintelligence, superconnectedness, and convergence and Korea's rank of being 31<sup>st</sup> in the world in 2018 in the International Institute for Management Development (IMD). Despite progress in the level of big data utilization in Korea, there are two laws that impede the greater use of big data. These are the Personal Data Protection Act of 2011 and Act Amendment Promotion of 2016.

In November 2018 motions were made to amend the Personal Data Protection Act, Information and Communication Network Act, and Credit Information Act. The following were the concerns regarding the acts: a) personal data breaches when selling and sharing customer information between enterprises, b) possible identification of unrecognized personal data when combined with other information, c) independence and versatility in the formation and operation of the Personal Data Protection Committee, and d) authority to investigate and dispose of personal data breaches by the National Human Rights Commission in Korea. He presented the cases of the US, Japan, and Europe with respect to implementation of laws that address data protection, big data exchange, use of customer data and selling them to third parties without their consent, data portability, and range of application for personal data processing, monitoring activities performed by information subjects, among others.





Against this backdrop, the paper suggested the following to improve personal data protection and utilization in South Korea by: a) pass the three acts – Personal Data Protection Act, Information and Communication Network Act, and Credit Information Act by the National Assembly; b) harmonize the protection and personal data and activation of the big data industry; c) secure transparency in handling personal data, and d) structure and display risk information.

**Keywords:**     **Data Protection and Utilization, Data Breaches, Information and Communication Network**

SPECIAL SESSION 2:

**ENTREPRENEURSHIP EDUCATION  
FOR SMES**

Moderator:     **Prof. Rolando Ramon Diaz**  
UP ISSI, Philippines

**List of Papers Presented**

Title	Author/s
Updates on Entrepreneurship Education in the Philippines	Paz H. Diaz
Exploring Educational Institutions for Transformational Leadership Training for Entrepreneurs	Aliza D. Racelis
Entrepreneurial Marketing Practices of Microentrepreneurs in Muntinlupa City	Mary Rose Palmares
Towards a Kantian Business and Entrepreneurship Curriculum of Ends	Rose Nonette Capadosa
Entrepreneurship Education for Adult Learners in the Community: Insights from the Learners and Educators of the Communities of Practice for Entrepreneurship (COPE) Program in Sapang Munti, Bulacan	Glennis S. Uyanguren Marvin M. Manlapas



## SPECIAL SESSION 2:

### ENTREPRENEURSHIP EDUCATION FOR SMEs



## Updates on Entrepreneurship Education in the Philippines

**Paz H. Diaz**  
(Small Enterprises R&D Foundation, Philippines)



### Major Points of the Presentation

The presenter mentioned that David McClelland hypothesized that entrepreneurship can be developed, instead of being inborn, and made an experiment about this. Training using the achievement motivation theory was done, resulting in the youth participants showing characteristics of entrepreneurs. They strove to seek and receive feedback, sought models of achievement to emulate, etc. In 2017, CHED established the outcomes-based curriculum for the Bachelor of Science in Entrepreneurship. This curriculum was designed to produce entrepreneurs motivated and knowledgeable in recognizing opportunities and mobilizing resources. The students shared that they learned how to take risks and acknowledged weaknesses that can become strengths. Some suggestions shared were that they need more freedom over what they study and that there should be more open and accessible information from school programs. Overall, students showed positive attitudes towards entrepreneurship and taking up entrepreneurship courses in college and in senior high school. Most of the responses showed very strong positive attitudes like enthusiasm and openness.

**Keywords:** Achievement Motivation, Entrepreneurship Education, Commission on Higher Education (CHED)





## SPECIAL SESSION 2:

### ENTREPRENEURSHIP EDUCATION FOR SMEs



## Exploring Educational Institutions for Transformational Leadership Training for Entrepreneurs

### Major Points of the Presentation

The presenter shared that organizations face the challenges of volatility, uncertainty, complexity, and ambiguity (VUCA) and the answer to VUCA is being direct, understandable, reliable, and trustworthy. The aim of the study is to explore the leadership curricula of entrepreneurship schools across the globe, and transport the learnings there into the ASEAN region (Singapore, Philippines, Indonesia, Thailand, Malaysia) in order to make concrete proposals for our SME training programs in the Philippines. To be successful, a leader who manages teams effectively is critical, together with the needed technical skills, capabilities, and resources. Authentically transformational leadership is one where the leader is a creativity cultivator, an expert talker, an effective networker, a persuasive salesperson, etc. The National University of Singapore's goal is to nurture correct leaders for success. The MIT Sloan course on Entrepreneurial Management and Innovation focuses on leading profound innovation for pioneering a more sustainable economy and society. Research findings show that there is an important correlation between transformational leadership and enterprise growth. These transformational leaders constantly inspire followers, build meaning, and challenge thoughts and creativity. The presenter ended with the suggestions that the trainee be a transmission "belt" from individual to organizational learning and be an agent of change and innovation. The following learning processes are also ideal and are proposed for Philippine institutions: a) personal reflection practices, b) relational practices, and c) societal practices.

**Keywords:** Educational Institutions, Transformational Leadership, Training, Entrepreneurship





SPECIAL SESSION 2:  
**ENTREPRENEURSHIP EDUCATION FOR  
SMEs**

**Entrepreneurial Marketing  
Practices of Microentrepre-  
neurs in Muntinlupa City**

**Mary Rose Palmares  
(Polytechnic University of the Philip-  
pines)**

**Major Points of the Presentation**

The presenter explained that entrepreneurial marketing is a behavior wherein market conventions are challenged during the creation of new solutions and that entrepreneurs wear many hats as a manager of HR, finance, marketing, etc. In her study, focusing on Muntinlupa City, she sought to find the effectiveness of entrepreneurial marketing practices in terms of the 4Ps of price, promotion, product and place, using the quantitative approach. For product, the entrepreneurs used product differentiation. For price, there was standard markup pricing. For place, distribution strategy was practiced (easy access and convenience). The entrepreneurs also focused on customer relationship, for promotion. Place had the highest rank among all of these. Some of the results mentioned include the following: in terms of age, it brought a significant difference in the decision-making process of the respondents. For education, those who had higher attainment were able to practice the 4Ps strategy more. In terms of business structure, for those with sole proprietorship, they become the face of the business and that distinguishes them from the others. A number of recommendations are as follows: for the academe, industry and government to partner and evaluate curriculum to identify gaps in policy-making and program development; to have awareness in programs available to the entrepreneur; and to develop a program that will enhance the quality of Filipino entrepreneurs (database management and mobilization of cooperatives small business networking).

**Keywords:** Entrepreneurial Marketing, Marketing Mix, Micro-enterprise  
Food Industry





SPECIAL SESSION 2:  
**ENTREPRENEURSHIP EDUCATION FOR  
SMEs**

## **Towards a Kantian Business & Entrepreneurship Curriculum of Ends**

**Rose Nonette Capadosa  
(University of the Philippines)**

### **Major Points of the Presentation**

The presenter shared that the paper's main argument is that the business school uses a utilitarian policy framework on curricula, philosophy of education, and pedagogy. She explored the Philippine business schools offering Bachelor of Science in Business Education and Entrepreneurship, with the research focusing on how business school learners should be taught. For the part on empirical observation, official documents were used and for the part on analysis, Kant's philosophical perspective was utilized. Existing curricula use the utilitarian approach and are highly competency focused. Business entrepreneurship courses are designed to hone learners, but business ethics is relegated to an elective course. It was mentioned that utilitarianism, which states that an action is right if it is useful, dehumanizes learners. Education's philosophical imperative though, quoting Muega, is "bringing up a productive citizen who is a happy individual and does not step on the rights of others." Being happy means being morally happy. Kant mentions that humanity must be treated as an end and not just a means. The framework recommendation is to focus on individual learners' authentic needs and contexts. Learners must be seen as ends in themselves and all stakeholders (teachers, parents, students, reformers) must be involved.

**Keywords:**     **Rational Justification, Employability Approach, Deontological,  
Kantian Ethics, Human Capital**





## SPECIAL SESSION 2: ENTREPRENEURSHIP EDUCATION FOR SMEs

### **Entrepreneurship Education for Adult Learners in the Community: Insights from the Learners and Educators of the Communities of Practice for Entrepreneurship (COPE) Program in Sapang Munti, Bulacan**

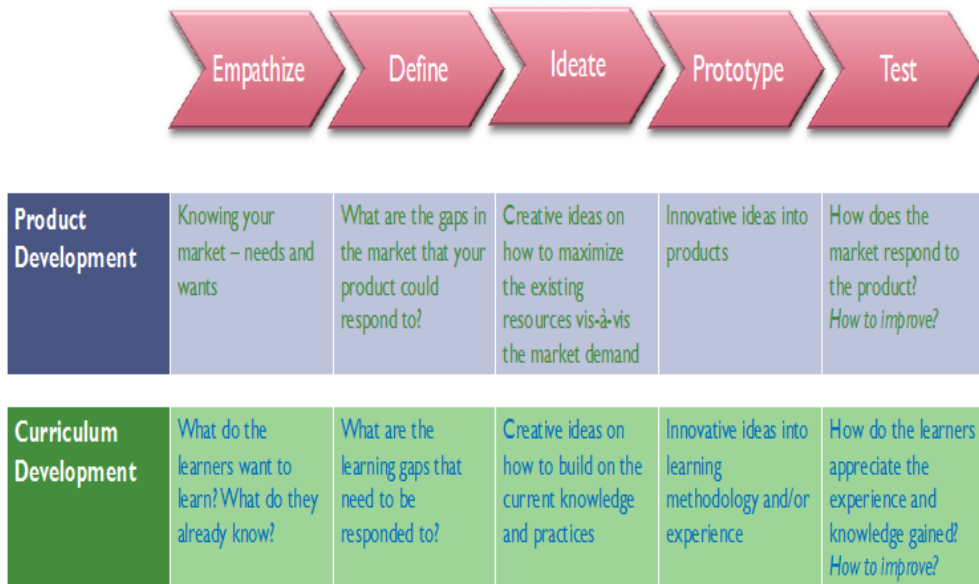
**Glennis S. Uyanguren, Marvin M. Manlapas  
(University of the Philippines)**

#### Major Points of the Presentation

The presenters talked about the Communities of Practice for Entrepreneurship (COPE) program, which aims to bring entrepreneurship education to communities that are unable to access these types of services in a formal school. The objectives are to be able to express the learning points of both learners and educators in COPE and to get insights on developing the community's culture of entrepreneurship. The methodology used was soft approaches from community organizing (integration and learning methodologies). The project is still a work in progress, so the presentation made was on initial data. Majority of the learners wanted to learn how to start their business. There were also those who wanted to know how to be able to increase production during the rainy season. The educators noticed that the learners are appreciative, cooperative, and enthusiastic to learn and that they needed guidance in management. The setup produced a hybrid of learner-educators and educator-learners. Through the COPE Program, they wanted to inspire the learners to create ideas with the use of the thinking design approach (empathize, define, ideate, prototype, and test). They also want to turn innovative ideas into products and to see the market's response. The plan is to replicate the COPE project to other community-based enterprises.



**Keywords:** Entrepreneurship Education, Adult Learners, Communities of Practice for Entrepreneurship (COPE)



*Figure 18. Inspiring Innovative Ideas through Thinking Design Approach*



SPECIAL SESSION 3:

ENTREPRENEURSHIP

Moderator:     **Prof. Renyong Chi**  
                    Zhejiang University of Technology, China

List of Papers Presented

Title	Authors
Pre-Screening of Small Items for Technology Startups	Chang-Ryong Ko Jong-In An
Business Climate Index Reports of Small & Medium Enterprises 2019: Findings & Discussions	Daoxue Liu Renyong Chi







### SPECIAL SESSION 3: ENTREPRENEURSHIP

## Pre-Screening of Small Items for Technology Startups

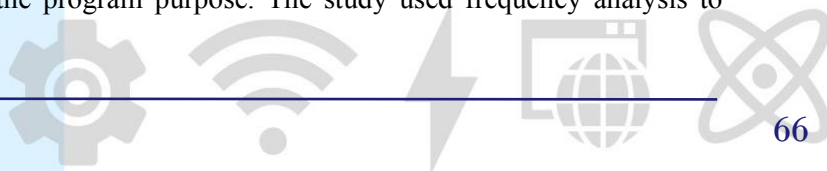
**Chang-Ryong Ko, Jong-In An (Hannam University, Korea)**

### Major Points of the Presentation

In 2012, Dr. Chang-Ryong Ko mentioned that Korea implemented a creative economy policy to secure future growth engines and create jobs. Howkins (2010) as cited by Dr. Ko defined creative economy as an activity that uses knowledge and information. Due to the implementation of this policy, the necessity of pre-screening of technology startup items has emerged to determine the probability that a startup item will be a success in the market.

To ensure effective policy implementation, the Korean government developed an Innopolis Campus, a project which comprises of universities designated to create new technology through R&D and promote startups, including the capability of technology startup. The H University, based in Daejeon, Korea is currently one of the five universities in Daedeok Innopolis and has been supporting the screening of startup items and cultivation of startups and growth based on the university's resources since 2014.

To spread and promote R&D performance, Dr. Ko shared that this study on pre-screening of small items for technology startups was conceptualized to analyze data on the pre-screening process of startup item using the data from the founders who participated in H University startup item screening program in Korea from 2014-2016 and presented pre-screening results of the frequency analysis based on the program purpose. The study used frequency analysis to





analyze the data of 286 out of 355 participants of H University's screening program of startup items in 2014-2016.

Result of the study shows that of the 286 proposed ideas, 5 (1.7%) items were market-linked screened and the success of the idea type startup items in the market-linked screening is due to the mentoring effect. Consequently, the study of Dr. Ko suggested to conduct future research project on the analysis of the factors that failed in market-linked screening among promising type startup items and comparison of characteristics of promising and idea type startup item which are market-linked screened.

**Keywords:**      **Technology Startups, Pre-Screening of Small Items, Market-Linked Screened**



### SPECIAL SESSION 3: ENTREPRENEURSHIP

## **Business Climate Index Reports of Small & Medium Enterprises 2019: Findings & Discussions**

**Daoxue Liu, Renyong Chi (Zhejiang University of Technology)**

### Major Points of the Presentation

Since the opening of the market in 1978, the growth of SMEs in China continuously grew. As they play the critical role in China's economy, the government has provided various ways to support them such as the SME Promotion Law of China in 2003 (Hoffmann, 2017). With this Law, the new definition of SME varies by industry category in terms of the number of employees, business revenues, and total assets of enterprises.

According to Dr. Daoxue Liu, the presenter, the Chinese mainland has more than 100 million SMEs (including microenterprises and family business) as of 2018, in which it accounts 99.7% of the total registered companies in China. Based from 2019 China Small and Medium Enterprises Development Report, the Chinese SMEs contribute more than 60% of the nation's GDP, 50% of tax revenues, 70% of import and export trade, and 80% of urban employment. With respect to innovation, SMEs have contributed 66% of patents nationwide, 74% of technological innovations, and 82% of new products.

Although SMEs serve as the major impetus for China's social and economic development, the presenter emphasized that it is essential to evaluate the business climate index to obtain timely and informative economic indicators and prospects for growth. For the purpose of this study, it used composite index method to evaluate business climate for Chinese SMEs based on integrated dataset by using official statistic data, listed enterprise data and survey; analyzed the development of Chinese SMEs trend; and explored the differences in development of SMEs among the various regions of China to look forward to the future trend of Chinese SMEs.



In evaluating the Business Climate Index of Chinese SMEs (CSMECI), Dr. Liu mentioned that the 3-sub indexes namely: ISMECI, LSMECI, MISMECI were synthesized to obtain the official statistics of industrial SME, list of SMEs and SME monitoring and investigation, respectively. Through this evaluation, the composite business climate index of 31 provinces and 7 regions of Chinese mainland were obtained. The latest evaluation results (2019) show that the climate index top 3 in terms of regions are East China, South China, and North China region with East China as the most developed region for SMEs.

As a result, the salient findings in this study as revealed by the presenter in terms of the development of Chinese SMEs trends included: (1) the average business climate index of Chinese SMEs has remained stable overall, and supporting the real economy in Chinese mainland in the last two years; (2) the high-quality development of SMEs is becoming the new engine for the high-quality development of China's economy; and (3) digital economy (such as e-commerce, cloud computing and payment services etc.) boosts transformation and development of SMEs. On the other hand, some of the main problems and challenges faced by SMEs in China were also presented. These include: (1) increased risk of export uncertainty; (2) core technology bottlenecks are constrained and high-level innovation and technology supply is insufficient; and (3) difficulty to solve financing problems since the funds of SMEs are tight in which the presenter consequently suggested the need to strengthen teamwork among academe, institute, and government through project support and cooperation partner to mitigate the challenges they faced.

**Keywords:** Business Climate Index, Evaluation Index System, Composite Index Method

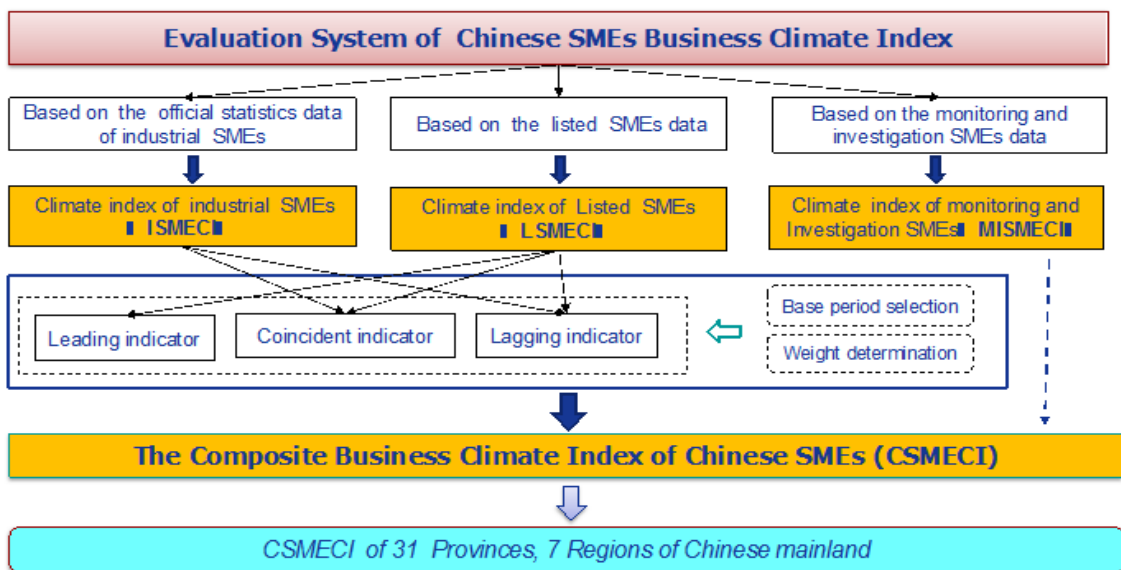


Figure 19. Framework of the Evaluation Index System

SPECIAL SESSION 4:

SME POLICY

Moderator:     **Prof. Angelina Yee**  
                          Nottingham University, Malaysia

List of Papers Presented

Title	Author/s
Critical Success Factors of Companies Commercialising Universities’ R&D Outputs: Perspective of SMEs and Large Companies’ Management in Malaysia	Kok Chian Tam Aik Lee Chong Angelina Seow Voon Yee Joel Kah Marn Tham
Technological Needs and Technology Adoptions of Large Companies and SMEs in ASEAN: An Explorative Field Study	Angelina Seow Voon Yee Avvari Mohan Abas Zakaria
Challenges of Building and Running a Local Start-up in the Philippines	Janmar Dimaano





## SPECIAL SESSION 4: SME POLICY



### **Critical Success Factors of Companies Commercialising Universities' R&D Outputs: Perspective of SMEs and Large Companies' Management in Malaysia**

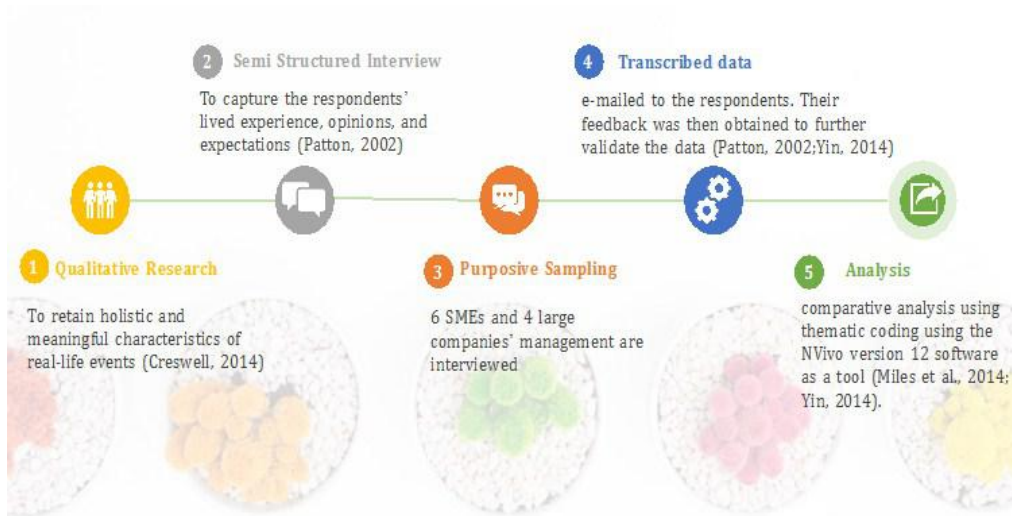
**Kok Chian Tam (International University of Malaya-Wales & Heriot-Watt University Malaysia), Aik Lee Chong (UCSI College), Angelina Seow Voon Yee (University of Nottingham Malaysia), Joel Kah Marn Tham (International University of Malaya-Wales)**

#### **Major Points of the Presentation**

The study tackles the critical success factors (CSFs) of companies that commercialize universities' R&D outputs in Malaysia. Despite various efforts on commercializing R&D outputs of universities, it remains a major problem in Malaysia. Moreover, literature regarding commercialization of R&D are very limited. The study provides a comprehensive description of companies venturing on commercialization of universities' R&D outputs in the perspective of SMEs and large companies. The study is a qualitative research that makes use of comparative analysis of the perspectives of large companies and SMEs. The study concludes that commercializing universities' R&D has significant impact on the growth of both SMEs and large companies and it needs to be complemented by government support as well as an increase in SMEs' willingness to take risk.

**Keywords:** R&D Commercialization, Research Output





*Figure 20. Research Methodology of the Study on Critical Success Factors of Companies Commercializing Universities' R&D Outputs*



#### SPECIAL SESSION 4: SME POLICY

### **Technological Needs and Technology Adoptions of Large Companies and SMEs in ASEAN: An Explorative Field Study**

**Angelina Yee, Voon Seow, Avvari V. Mohan, Zakaria Abas (Nottingham University, Malaysia)**

#### **Major Points of the Presentation**

The study presented by Dr. Avvari V. Mohan and Dr. Angelina Yee analyzed the different technological needs and technology adoptions of large companies and SMEs in ASEAN countries. Technology adoption is important in gaining regional and corporate competitiveness of companies/enterprises. However, it imposes various challenges such as high risk and high expectations of return on investments (ROIs). The study used comparative analysis in identifying the technological needs of different companies/industries within ASEAN countries. The conclusion of the study revealed that there are differences on the technological needs and technology adoption rate among ASEAN countries and that despite these differences, there is a striking commonality of the need to strengthen R&D through the collaboration of SMEs and large companies with universities as they provide access to new technologies for industries. The study can set off ASEAN countries to adopt their own policies that are applicable to their economic capabilities and situation. These policies should aim to create a supportive environment on enterprises and strengthen R&D, technological innovation and adoption to boost SMEs' performance and competitiveness.

**Keywords:** Technological Needs of SMEs, Technology Adoptions, Technologies for Industries



## SPECIAL SESSION 4: SME POLICY

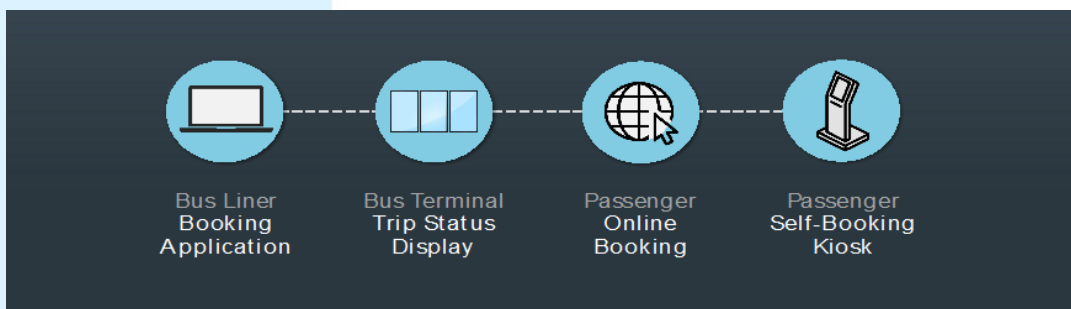
### Challenges of Building and Running a Local Start-up in the Philippines

**Janmar Dimaano (University of the Philippines Institute for Small-Scale Industries)**

#### Major Points of the Presentation

The study presented focused on the different challenges faced by a startup company in the Philippines, particularly by Easybus. The lack of information on funding/funding opportunities, local investors, and startup programs are some of the major hurdles to the growth and sustainability of startup companies such as Easybus. This qualitative research used simulation, documentary analysis, and self-assessment to gather the required data. Results of the study revealed that digitization and transaction-based model can help improve efficiency and foster business continuity. The model used by Easybus can also be adopted by other companies that cater to similar services such as that of Easybus.

**Keywords:** Digitization and Transaction Based Model, Startup Programs



*Figure 21. Digitization of the Existing Manual Booking System*

SPECIAL SESSION 5:

**S&T NETWORKS FOR SOUTH AND  
NORTH KOREA WITH ASEAN**

Moderator: **Dr. Young Joo Koo**  
Korea

List of Papers Presented

Title	Author
Financial Progress: Mekong-Republic of Korea Cooperation Fund (MKCF)	Watcharas Leelawath
Some Thoughts on the Future Korea Peninsular via Economic Cooperation Between South Korea and North Korea	JiYoung Park
The Mt. Paektu Geoscientific Group: A Model for Science Cooperation with North Korea	Richard Stone
North Korea (Introduction, Economics, Politics, Society, and Prospect)	Pravit Khaemasunun
Industrialization and FDI in Cambodia	Vanny Sok





## SPECIAL SESSION 5:

### S&T NETWORKS FOR SOUTH & NORTH KOREA WITH ASEAN



## Financial Progress: Mekong-Republic of Korea Cooperation Fund (MKCF)

**Watcharas Leelawath**  
**(Mekong Institute, Thailand)**

### Major Points of the Presentation

The Mekong – Republic of Korea Cooperation Fund (MKCF) aims to promote six areas of cooperation, namely: infrastructure; information and communications technology; green growth; water resources management; agriculture and rural development; and, human resources development. It consists of five Mekong countries (Cambodia, Lao PDR, Myanmar, Viet Nam and Thailand) and the ROK (Ministry of Foreign Affairs of Kingdom of Thailand, 2019). At present, a total of 20 implementing agencies are engaged with MKCF to foster cooperation and integration in the General Mekong Sub-region.

In order to support the catalytic and innovative activities of the six priority sectors, Dir. Watcharas Leelawath of the Mekong Institute (MI) mentioned that the five Mekong countries and the ROK agreed that the MKCF will be financed through an annual contribution from the ROK to MI. Relative to this, MKCF shows the increasing contribution of ROK from 2013-2018 which signifies that there is also an increasing number of project proposals from the implementing agencies. The report also shows that 50% of total fund allocation is for projects pertaining to human resources. The Mekong countries that have the highest funding allocation are Cambodia and Lao PDR, with both getting 20% of the total funding allocation.

With respect to project fund commitment under the MKCF, Dir. Leelawath highlighted that most of the projects covered issues on water resources management, promotion and facilitation of MSMEs, development of ICT, and human resources development. Likewise, he reported that a total of 103 concept papers were already received and evaluated based on priority sectors. From this figure, a good number of concept papers were submitted from Lao PDR and Myanmar with 21 percent and 27 percent, respectively.



In summary, Dir. Leelawath explained the grants for projects provided by the MKCF that are of regional in nature. In order to address the national issues, such projects should be within the priorities of the country. The benefits of these projects should be shared among Mekong countries and the ROK.

**Keywords:** Financial Progress, Mekong countries, Project Funding

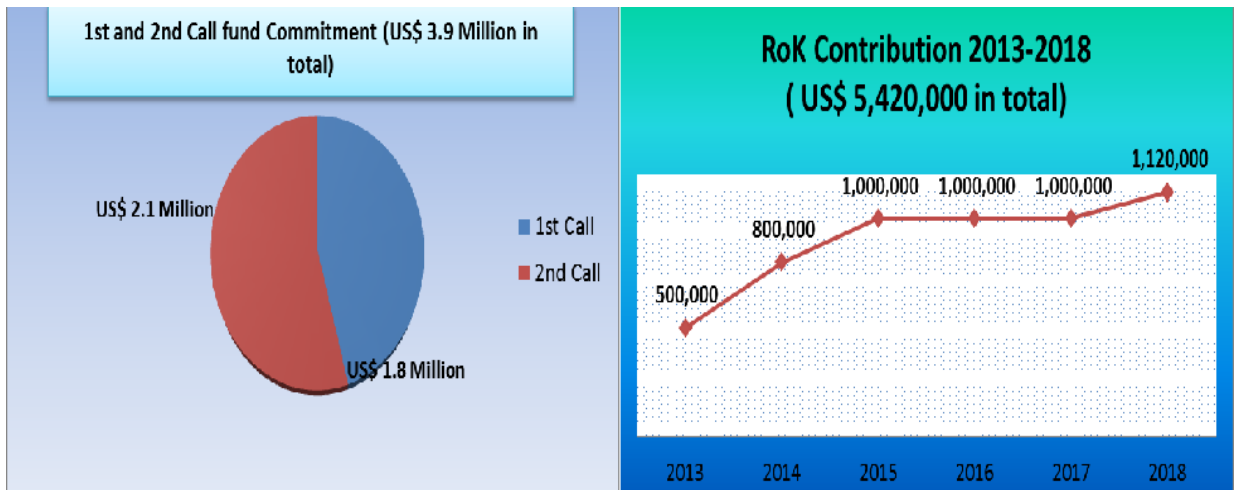


Figure 22. Financial Progress of Mekong Institute

## SPECIAL SESSION 5:

### S&T NETWORKS FOR SOUTH & NORTH KOREA WITH ASEAN



## **Some Thoughts on the Future Korea Peninsular via Economic Cooperation Between South Korea and North Korea**

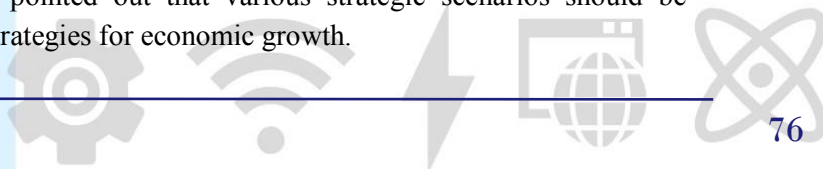
**JiYoung Park (University at Buffalo, The State University of New York, Korea)**

### **Major Points of the Presentation**

Initially, Dr. JiYoung Park shared the basic issues for the fine (chemical) materials of North Korea via the economic cooperation between South Korea and North Korea. In particular, these issues include: (1) the future of North Korea's (chemical) industry system and the strategic collaboration for the independence of its (chemical) industry; (2) assessment of locational optimization for the North Korea's (chemical) industry and the necessity to establish a collaborative network; (3) analysis for the future trade and economic cooperation between South Korea and North Korea; and (4) assessment for Technical/Social/Economic values related with independence of fine (chemical) material industry of the Korean Peninsula.

Aligning Korean economy with ASEAN has significant implications due to uncertainties in demography, economies, international relations, and environments. According to Dr. Park, independency in major material industries is directly connected to a nation's security and economic soundness in the nation, which will lead to long-term economic stability of the nation. Therefore, it is important to establish external, stable partners to collaborate together which will make the technical partnership in supply chain and secure material parts in economic aspects.

As to analytic methodology and the future prospect, the paper presented by Dr. Park suggested the use of dynamic network analysis in order to understand the temporal importance of change in a target industry such as fine chemicals. Multilevel multiregional input-output may be used to connect the different levels of geographical location in a way of multilevel structure. In order to determine the flexible input-output approach to be used for the scenario-based simulation, he pointed out that various strategic scenarios should be simulated to select the best future strategies for economic growth.



Currently, an economy-based land use model is not possible to construct due to the limitation of available IO models applied to the future. By applying Flex IO, dynamic and micro level of economic models can be constructed, which can be extended to an economy-based land use model. The land use model and Flex IO provides information of how domestic industrial systems can be evolved from various policies and international relations.

**Keywords:** Korea Peninsular, Economic Cooperation, Chemical Industry

## SPECIAL SESSION 5:

### S&T NETWORKS FOR SOUTH & NORTH KOREA WITH ASEAN



## **Paektu Geoscientific Group: A Model for Science Cooperation with North Korea**

**Richard Stone (Howard Hughes Medical Institute & American Association for the Advancement of Science)**

### **Major Points of the Presentation**

Mount Paektu, also known as Changbaishan (China) and Baekdusan (South Korea), is located on the border between North Korea and China. It has a crater lake, Heaven Lake, at the top of the mountain. A massive eruption in A.D. 946 created the caldera where the lake is located and deposited 2 in. (5 cm) of volcanic ash as far away as S. Hokkaido, Japan. The stratovolcano's last eruption was in 1903.

The presenter, who is also one of the founding members of the Mt. Paektu Geoscientific Group (MPGG), shared that the Democratic People's Republic of Korea invited a group of scientists and ecologists in September 2011 to discuss the impacts a future eruption may have on the unique ecology and environment of the area. Since then, MPGG has carried out field and laboratory studies concerning the environment, volcanology, and underlying structure of Mt. Paektu. Among salient findings of their geological studies revealed that: (1) most of the millennium eruption deposits are found in North Korea and scientists in the country have a large catalogue of unpublished borehole data. Consequently, the MPGG suggested to establish collaboration with North Korean government to bring unpublished work to the international community.

At present, MPGG, has conducted scientific studies and published articles on new insights on Mount Paektu's history and current state. The critical key elements of the project's success are inclusion of North Korean scientists as equal partners and mutual trust built both in the field and at the institutional level (Stone & Campbell, 2018). With this well-established effort in science engagement, MPGG continuously plans and collaborates for further projects and activities, thus, it served as a model for science cooperation with North Korea.

**Keywords: Mount Paektu, Volcano, Science Cooperation**







## SPECIAL SESSION 5:

### S&T NETWORKS FOR SOUTH & NORTH KOREA WITH ASEAN



## **North Korea (Introduction, Economics, Politics, Society, and Prospect)**

**Pravit Khaemasunu (Thammasat University, Thailand)**

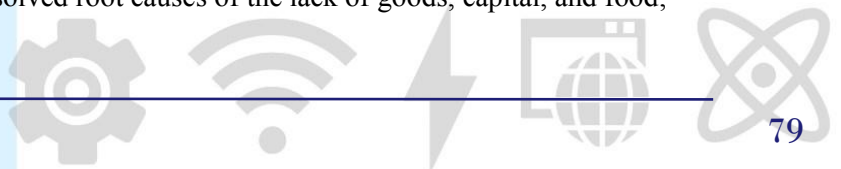
### **Major Points of the Presentation**

The Democratic People's Republic of Korea, usually known as North Korea, is a state that occupies the northern half of the Korean peninsula (Advameg, 2019). According to UN data as cited in the World Population Review (2019), it is home to approximately 25.67 million people, who live under a form of communist rule.

The paper presented by Prof. Pravit Khaemasunu featured the current state of North Korea along these aspects: politics, economy, and society; and of East Asia focusing on the changing regional order and major issues that include cooperation and conflict. According to him, the study investigated the North Korea's strategic directions and reforms including the prospect for success.

Among the main points of the study as mentioned by Prof. Khaemasunu were: (1) Kim dynasty knows too well that the nuclear weapons and missiles are the key to North Korea's survival; (2) any opening of the country's economy will cause the system to collapse; (3) double-take policy of nuclear and economic development is unrealistic; and (4) it is a classic 'Catch-22' for North Korean regime. While, the run-out options in the analysis included: (1) as for negotiations, there is little (if any) reason to believe that NK will give up its best guarantee of survival; (2) tougher sanctions are limited because China is reluctant to completely unplug North Korea of its lifelines; and (3) China should gradually reduce the quantity of energy provided through Dandong to Shineju.

To reach out to prospects, the result of the analysis revealed that prospective of the success for economic reform is difficult since there are still too many factors that are intact or not seriously addressed such as the unsolved root causes of the lack of goods, capital, and food;



and repercussion of the reform that includes the price increase in unofficial market, deteriorated living standard, and worsened shortage of goods.

Consequently, the study suggested that North Korea should earn hard currency (money from economic aid, foreign trade, FDI through special economic zone, sale of technology); develop its agriculture and infrastructure, and reform in state enterprises. With respect to economic reform, among the measures that need major change include price increase, wage rise, self-management of enterprise, farm reform, and partial open-door policy (legislation, administration, judicial power).

**Keywords:** North Korea, Closed Economy, Democratic Republic, Nuclear weapon

## SPECIAL SESSION 5:

### S&T NETWORKS FOR SOUTH & NORTH KOREA WITH ASEAN



## Industrialization and FDI in Cambodia

**Vanny Sok (Royal University of Phnom Penh, Cambodia)**

### Major Points of the Presentation

In 1953, Cambodia emerged a newly independent nation with ambitions for growth and development through the expansion of industry. Sixty years later, following decades of war and destruction, these ambitions are beginning to be realized with double-digit growth rates (Chhair, 2016). On the surface, Cambodia appears to be an emerging economic success story. It has embraced a market economy heavily dependent on foreign capital and foreign markets. As a result, the economy has experienced high economic growth rate yet with low linkage to domestic economy (Chhair & Ung, Luyna, 2016).

To achieve a sustainable economic growth path, Dr. Vanny Sok mentioned that Cambodia implements an industrial policy that is built upon: (1) developing labor-intensive industries, such as garments, toys, and footwear; (2) promoting SMEs, micro-enterprises and handicrafts by providing micro-finance, marketing services and training, and supplying information on sectoral development; (3) encouraging technology transfer and export product diversification by promoting the assembly of electrical appliances and electronic products and improving product quality; and (4) establishing industrial and export processing zones by developing infrastructure and improving service quality.

For an industrial policy to be successful, inward investment needs to be structured in a manner that is conducive to facilitating, upgrading, promoting spillovers, and increasing higher value-added activities (Buzdugan & Tüselmann, 2018). From this perspective, the paper of Dr. Sok was conceptualized to uncover the factors influencing inward foreign direct investment (FDI) in Cambodia by examining the Korean FDI and its contribution to local development.





Test results for FDI as revealed by Dr. Sok showed that FDI is positively associated with total international trade (imports plus exports) of Cambodia and was most successful in attracting FDI from its Asian neighbors despite of its limited investment from the developed countries. On the contrary, Asian crisis and China's membership in the WTO negatively affected FDI inflows into Cambodia and has a negative relationship between distance and inward FDI in Cambodia.

Moreover, findings in the case study conducted on Korean FDI revealed that (1) investment incentives provided are the main motivation for the companies to invest in agriculture; (2) investor behaves like an entrepreneur; (3) relationship of individual investors with their stakeholders in the local community is distant; and (4) Korean FDIs in agriculture have generated employment and business opportunities in Cambodia.

Based from the aforementioned findings, the study of Dr. Sok concluded that the impact of foreign direct investments (FDIs) on local development in poor recipient countries needs to focus not only on the outcomes of the investments but also the investment process, including interaction between the companies and their stakeholders, especially at the local community level. The growing interest of FDIs in land raises concerns over their adverse impact on local development in poor recipient countries. Social innovation and entrepreneurship spirit are the major contributing factors for any investor to be successful.

**Keywords:** Industrialization, FDI, Embeddedness, Local Development

GOVERNMENT SESSION 1:

**FUTURE OF SME AND STARTUP ECO-SYSTEM**

Moderator:     **Prof. Rupinder Tewari**  
                          India

List of Papers Presented

Title	Author
Future of Startup Ecosystem	Hyun Yim
Innovation Analyses Using R&D University Startup Database	Hideyuki Tsunoda
Taiwan Innovation and Entrepreneurship Ecosystem	Yi-Dan Huang
BIRAC - A Successful PPP Model for Stimulating Innovations (SMEs)	Rupinder Tewari
Examining the Mechanism and Pathways for Startups in India- Lessons for the Future Ecosystem	Avinash Prasad Kshitij





## GOVERNMENT SESSION 1:

### FUTURE OF SME AND STARTUP ECOSYSTEM

## Future of Startup Ecosystem

Hyun Yim (KISTEP, Korea)



### Major Points of the Presentation

Dr. Hyun Yim mentioned that the paper's objective is to understand the impact of technology development on the startup ecosystem in the national context. Foresight process involves spotting those technologies that could make changes in the startup ecosystem. It also includes the picture of the future ecosystem that is changed by technologies. The Futures Wheel, developed by Jerome C. Glenn, was also discussed. This is a simple method, with Post it, pen, and flip chart, where one asks, "If this happens, what next?"

The survey's participating institutions involved KISTEP, MiGHT, IPOS-I, etc. There were 106 respondents from Korea, 65 from Malaysia, 7 from Singapore, and 101 from Taiwan. In all countries, the current quality of startup ecosystems has been assessed to be insufficient, when it comes to the impact of technology development. On market future issues, impact was most highly assessed by respondents in Korea except for "decline of the influence of global platform. In terms of support future issues, impact, and plausibility of all future issues were most highly assessed by respondents in Korea, followed by Taiwan and Malaysia. For policy issues, future quality of the startup ecosystem was assessed to be sufficient in all countries. The most important policy issues that should be considered as priority were similarly perceived in Korea, Malaysia, and Taiwan.

In conclusion, national similarities and differences were identified in the impact of technology on startup ecosystems in the four countries. The important policy issues that should be considered as priority are education and skills, access to talent, and access to capital.

**Keywords:** Startup Ecosystem, Technology Development, Futures Wheel



## Startup ecosystem changed by technology development

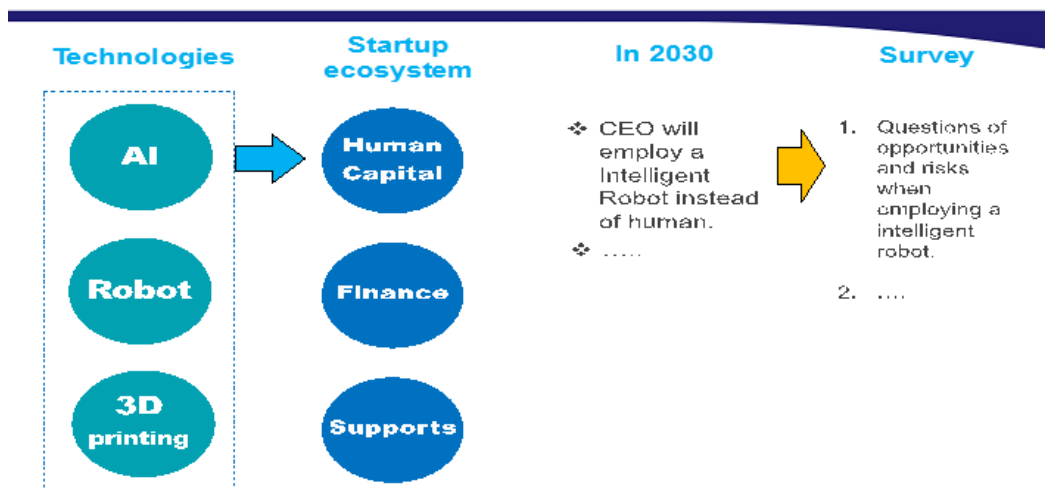


Figure 23. Conceptual Framework of the Future Startup Ecosystem

GOVERNMENT SESSION 1:  
**FUTURE OF SME AND STARTUP ECOSYSTEM**



**The Japanese National Innovation Survey 2018 and Innovation Analyses Using R&D Oriented University Startup Database- And Relating Researches from NISTEP**

**Hideyuki Tsunoda (NISTEP, Japan)**

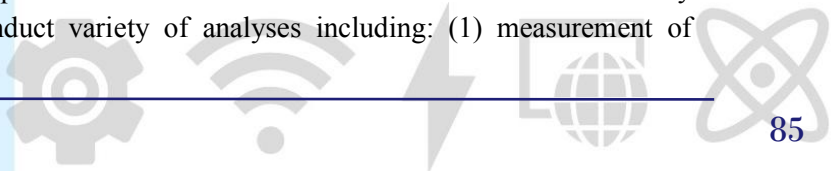
**Major Points of the Presentation**

The presenter, Deputy Director General Hideyuki Tsunoda, gave an overview of the National Institute of Science and Technology Policy (NISTEP) then subsequently related it to the Japanese National Innovation Survey 2018 (J-NIS 2018) and Innovation analyses using R&D Oriented University Startup Database. Such studies served as references in conceptualizing the future of S&T Framework.

NISTEP is a national institution established under the direct jurisdiction of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) to be engaged in the Japanese government's science and technology policy-planning process. To realize this vision, NISTEP commits to forecast future policy issues and investigate them through autonomous research, carry out research in response to requests from government agencies, and be a core institution in the field of science and technology policy research.

The Japanese National Innovation Survey 2018 covered economic activities that included agriculture, forestry, and fisheries; mining; construction; manufacturing; electricity, gas, heat supply and water; and services of enterprises with 10 or more persons employed, located in Japan. In the survey conducted, the sample of 30,280 enterprises were selected through stratified random sampling without replacement. Among the salient findings of the survey were: (1) product innovative SMEs were not inferior to those large firms in the products as similar as large firms; (2) SMEs produced 14% of gross national turnover from new-to-market product innovations in Japan as a whole; (3) higher education institutions, such as universities, were the major co-operation partners for innovation activities.

The presenter also shared that comprehensive data was collected on R&D-oriented university startups in Japan in order to conduct variety of analyses including: (1) measurement of



socio-economic impact of science and technology investments; (2) observation of signs of local innovations; and (3) assessment of growth factors in university startups. Relative to this, he also presented the study conducted by Kazuhisa (2018) on the contribution of university research outputs regarding establishment of R&D startups between FY 2010 and 2016, which served as baseline of the present study. With the response rate of 653/947 enterprises, findings in the study revealed that there were difficulties in human resources, facilities and equipment/intellectual property rights, financing in the early stage of startups establishment. The conclusion of the study gave emphasis on the development of analytical bases with data and the importance of international comparison based on characteristics of nations and regions.

Relating the above researches from NISTEP, the presenter consequently explained the historical development of NISTEP foresight and an overview of the 11<sup>th</sup> foresight's preliminary report where it depicts the S&T/Social Trends that feature the future of society (visioning) and future of S&T (Delphi Survey).

**Keywords:** Japanese National Innovation Survey 2018, Innovation Analyses, R&D Oriented University Startup Database

## GOVERNMENT SESSION 1:

### FUTURE OF SME AND STARTUP ECOSYSTEM

## Taiwan Innovation and Entrepreneurship Ecosystem

**Yi-Dan Huang (STPI, Taiwan)**

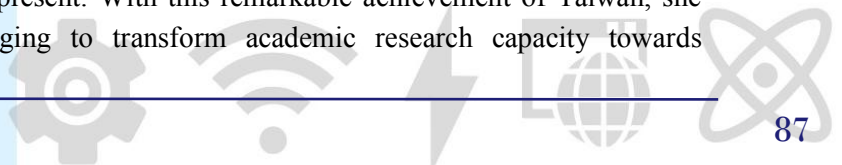


### Major Points of the Presentation

The presentation of Dr. Yi-Dan Huang focused on Taiwan's high-tech clusters, and entrepreneurship challenges and performance. According to her, there are three Science Parks and three Region Clusters that create the strong network for tech industry and support startups to grow, namely: Hsinchu Science Park at the Northern Region Cluster that offers bio-tech and healthcare, IC design and manufacturing, and photoelectric industry; Central Taiwan Science Park at the Central Region Cluster that offers bio-tech and healthcare, precision machinery and manufacturing, and photoelectric industry; and metal processing; and Southern Taiwan Science Park at the Southern Region Cluster that offers petrochemical and steel industry, metal processing, automotive component industry, and optical industry.

With today's era of entrepreneurship which marked the emergence of innovation economy, Dr. Huang shared that although the Taiwanese government has invested more than \$4 billion annually on research budgets, the greatest challenge still lies on how to turn these research budgets into research results that will result into economic development of Taiwan. Considering the entrepreneurship challenges of Taiwan on technology, markets, human capital, finance, culture, supports, she shared the policy programs to address such challenges that include regulatory amendment on new ventures and technology transfer, provision of an early entrepreneurship training program, establishment of platform for Global Funding and Networking, provision of talent programs and strengthening of linkage between Taiwan Technology Ecosystem and Global High-Technology Ecosystem.

As to performance, Dr. Huang presented the Taiwan startup trends in which she highlighted that there are over 3,000 proposals submitted, 372 companies were established, and US\$ 385 million was raised from 2012 to present. With this remarkable achievement of Taiwan, she stressed that it is very challenging to transform academic research capacity towards



marketable innovations, but Taiwan's innovation and entrepreneurial ecosystem has been gradually improved, and its entrepreneurship in the country also has significantly leaped.

**Keywords:** Taiwan Innovation, Entrepreneurship Ecosystem, Taiwan Startup Trends

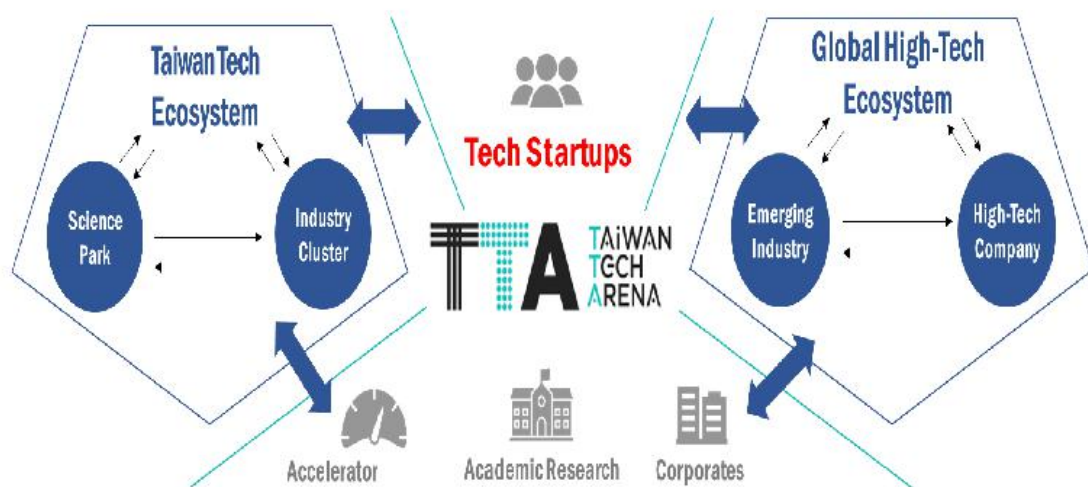


Figure 24. Framework of Innovation and Ecosystem Linkages Policy



## GOVERNMENT SESSION 1:

### FUTURE OF SME AND STARTUP ECOSYSTEM

## **BIRAC - A Successful PPP Model for Stimulating Innovations (SMEs)**

**Rupinder Tewari (DST-CPR, India)**

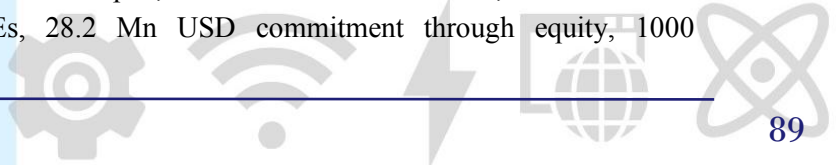


### Major Points of the Presentation

Prof. Rupinder Tewari gave a brief background of the Science, Technology and Innovation (STI) Policy 2013 of India in which he emphasized that the policy focuses on promoting translational research. To implement this policy, he mentioned that the Department of Science and Technology (DST), under the Ministry of Science and Technology, had established the Policy Research Cell (PRC) to coordinate the activities of DST. In 2014, the PRC subsequently established the Center for Policy Research (CPR) which was mandated to design the country's specific models for Public-Private Partnership (PPP) in R&D, stimulate private sector investments in R&D, and identify gaps in IP ecosystem and suggest ways to fill these gaps.

Under the STI Policy 2013, it is important to note that within the government's institutional structure, the scope of public policies related to STI is not limited to the Ministry of Science and Technology but cuts across a range of other ministries, departments, and agencies (Basha, 2019). Among these departments is the Department of Biotechnology (DBT), an Indian government department which serves as an interface to strengthen and empower the emerging biotech enterprise to undertake strategic research and innovation, addressing nationally relevant product development needs (BIRAC, 2019). Through the initiative of DBT, the Biotechnology Industry Research and Assistance Council (BIRAC) was established in 2013 as a PPP enterprise, not-for-profit, and company that caters to all sections of Biotechnologies, and promotes entrepreneurship/start-up culture and assists SMEs in the Innovation Ecosystem.

Among the impacts that BIRAC has generated in such a short span, as enumerated by Prof. Tewari, included 130 technologies developed, 138 Mn USD investment, 132 Mn USD industry commitment, 233 SMEs, 28.2 Mn USD commitment through equity, 1000



beneficiaries, 330 startups, 4 regional centers, 41 bio-incubators and 175 IPs filed. Moreover, he also presented the framework depicting the BIRAC's schemes/programs in which he explained the five stages of innovation, namely: ideation to early stage, ideation to late stage, PoC stage, translation research, and equity.

Another scheme under BIRAC, Prof. Tewari also presented the Small Business Innovation Research Initiative (SBIRI), a scheme under the DBT, launched to boost PPP effort in the country. Among the impacts of SBIRI has generated included 248 projects, 36 Mn USD invested, 34 products/technologies commercialized, 14 follow on Projects, 28 IPs filed, and 64 collaborators. Concerning IP creation, he also shared that BIRAC has Biotechnology Industry Partnership Programme (BIPP), a government partnership with industries for support on a cost sharing basis for pathbreaking research. These high risk innovations included drugs, vaccines and clinical trials, biosimilars and stem cells, devices and diagnostics, agriculture, industrial biotechnology and bioinformatics. Impacts generated from this program included 191 projects supported, 40 Mn USD invested, 47 products/technologies commercialized, 31 IPs generated, 8 facilities created as research resources, and 61 collaborations.

To sum up, Prof. Tewari provided some recommendations for stimulating R&D undertaken by SMEs which included (1) position moderators between industries and academia; (2) create academic clusters as single window for SMEs; (3) consider a part of the CSR fund for carrying out research in collaborative mode; (4) provide sabbatical leave (industry) for academia; (4) create Industry R&D Group (IRDG); (5) introduce Fast-Track R&D funding for MSMEs, (6) create innovation hubs (SMEs) or CoEs; (7) encourage R&D by small businesses, government may provide financial guarantee, as is the case in Germany; (8) securing of loans against IP of the companies; and (9) set a fixed percentage of commercial products, developed through private sector R&D.

**Keywords:** Biotechnology Industry Research and Assistance Council (BIRAC), PPP Model, Science, Technology and Innovation (STI) Policy 2013

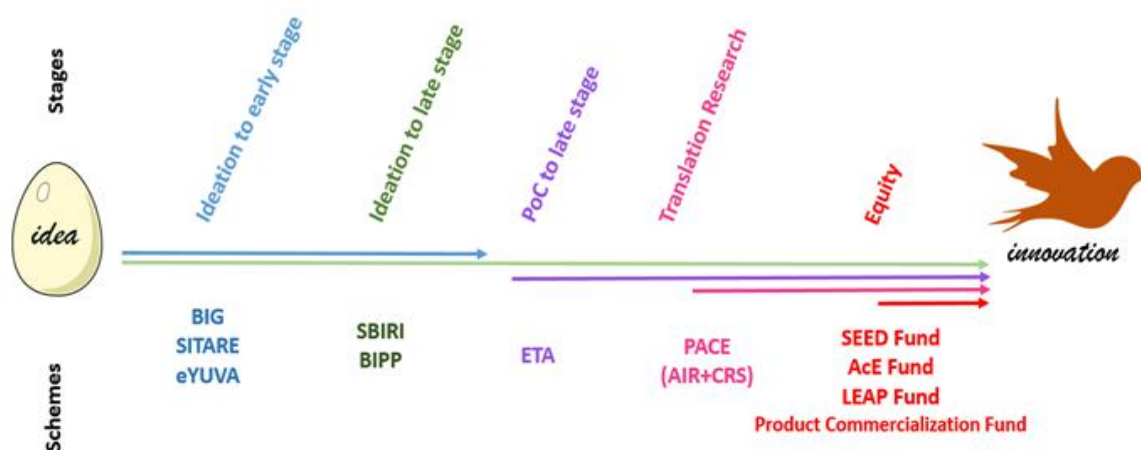


Figure 25. Framework of BIRAC Schemes/Programmes

## GOVERNMENT SESSION 1:

### FUTURE OF SME AND STARTUP ECOSYSTEM

## Examining the Mechanism and Pathways for Startups in India- Lessons for the Future Ecosystem

**Avinash Prasad Kshitij (NISTADS, India)**



### Major Points of the Presentation

Mr. Avinash Kshitij gave a brief background of the current state of startups in India in which he explained that the Indian government enacted a law entitled “Micro, Small, and Medium Enterprises (MSME) Act” which aims to facilitate the promotion and development, and enhance the competitiveness of micro, small, and medium enterprises. Relative to this, he cited the case of Bangalore often referred to as the “Silicon Valley of India as one of the manifestations of the positive results of MSME Act in India. Bangalore was identified as having the 19th best ecosystem for start-ups in 2012 (Start-up Genome, 2012) due to its high-quality R&D workforce, R&D environment and skilled human resource which helped the city to emerge as a start-up hub in IT and BY sector industries.

Recognizing the contribution of start-ups to the economic development in India, Prof. Kshitij subsequently presented the government initiatives to promote start-ups that included: (1) Start-up India mission; (2) connect entrepreneurs with angel investors; (3) simplify the regulatory framework; (4) ensure skilled manpower; (5) ASPIRE scheme; (6) Micro Units Development & Refinancing Agency (MUDRA) scheme; (7) Atal Innovation Mission (AIM); (8) Self Employment and Talent Utilization (SETU); (9) Electronics Development Fund; (10) India Aspiration Fund. According to him, there are also taxation regulations on start-ups such as the 25 percent corporate tax slab for companies with an annual turnover of less than INR 250 crores and exemption from levy of income tax (angel tax) on share premium received by eligible start-ups which were implemented in February and April 2018, respectively, and other policy initiatives that included regulations pertaining to banking and commercial borrowing, and investment. State level initiatives for start-ups include online accessibility, innovation society, mentor network, partnership, women entrepreneurship, and nodal agency.





In relation to this, the survey conducted on start-up from DELHI-NCR focused on skill development, IT services and professional services. Among the benefits which the startups aim to avail of with respect to co-working environment include: (1) environment that breeds creative and collaborative thoughts; (2) interaction with like-minded people; (3) meet people from diverse backgrounds, discuss new ideas, and collaborate; (4) infrastructure & logistics, location; and (5) facilities e.g. conference, secure internet, board meeting, recreation facilities; and (6) work timing.

Considering the aforementioned mechanism, Prof. Kshitij presented the future prospects for startups in India that include: (1) creation of opportunities for tech start-ups through several initiatives e.g. smart cities mission; (2) low productivity in agriculture vis-a-vis biggest agri-market and less access to the solution has significant scopes for start-ups to fill the gap; (3) several other sectors with tremendous potential for start-ups such as FoodTech, Wellness, and Tourism; (4) quality health care is limited to 1 or 2 cities; (5) lack of education in rural area and skilled human resources creating opportunities for start-ups to offer online education; and (6) tourism and travel sector is also expected to grow by 16% by 2021.

In conclusion, Prof. Kshitij explained that a start-up ecosystem has been created in India through the new policy initiatives. However, most of the start-ups, especially the technology intensive startups have not yet entered the production cycle and so the effect is yet to be understood.

**Keywords:** Mechanism and Pathways for Startups, Future Ecosystem, Micro, Small and Medium Enterprises (MSME) Act

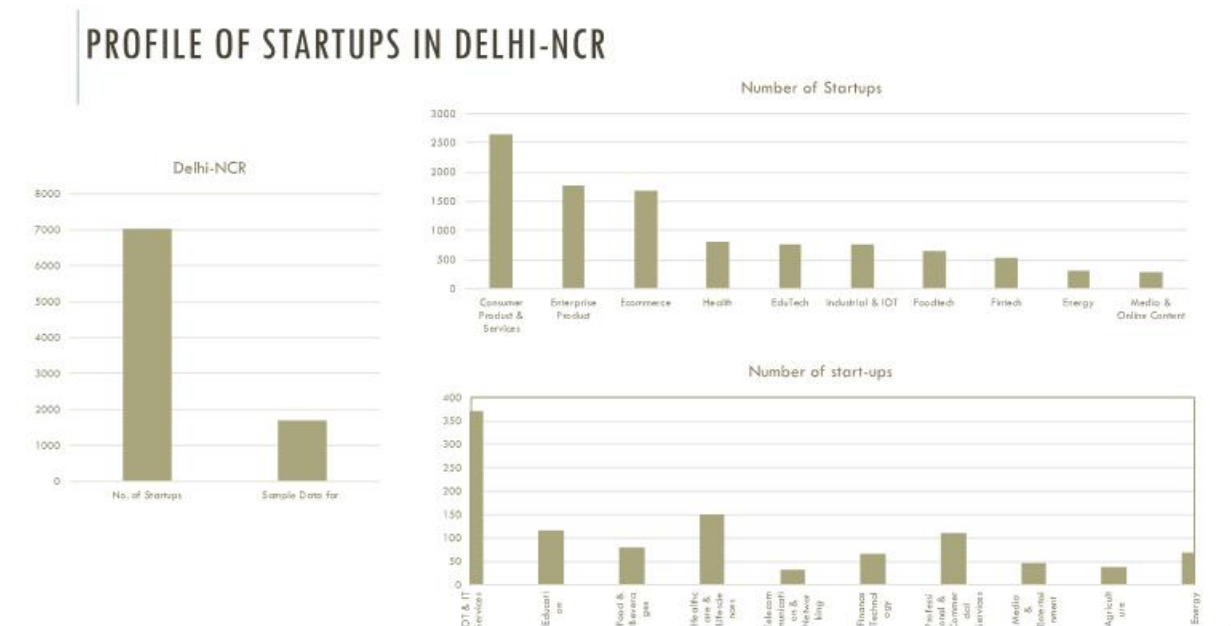


Figure 26. Profile of Start-ups in Delhi-NCR

GOVERNMENT SESSION 2:

NATIONAL R&D INVESTMENT: ITS AD-EQUACY AND IMPLEMENTATION

Moderator: Dr. Jang-Jae Lee  
KISTEP, Korea

List of Papers Presented

Title	Author
R&D Investment and Its Impact on Technology Development in Asia and Other Countries	Mohsin Khan
An Analysis on the Optimal Ratio of R&D Investment Using Multiple Imputation	Ik-Cheon Um
R&D Investment in India: Analyzing Trends and Focus	Kasturi Mandal
Stimulating R&D Investments in Russian State-Owned Companies	Mikhail Gershman





## GOVERNMENT SESSION 2:

### NATIONAL R&D INVESTMENT: ITS ADEQUACY AND IMPLEMENTATION



## Government Interventions in Promoting Innovation Driven Economy in Asia Focusing on India

**Mohsin Khan (Plekhanov State University of Economics, Moscow)**

### Major Points of the Presentation

Dr. Mohsin Khan presented the government interventions of India and China in promoting innovation driven economy that include efficient use of resources, improvement in global innovation ranking, knowledge intensity of manufacturing industries, and international competitiveness in high technology.

As to efficient use of resources, Dr. Khan explained that productivity growth is well recognized as a measure of an economy's health. Economists measure this efficient use of resource by computing a summary of measures such as Total Factor Productivity Growth (TFPG).

Concerning global innovation ranking, Dr. Khan commented that China rose from 59<sup>th</sup> to 54<sup>th</sup> in this index between 2002-2004 and 2004-2008. One reason for the jump is that China made a concerted effort to build a more innovative economy by investing heavily in R&D and education. India, on the other hand is, advancing at a steady pace up the innovation ranking from 58<sup>th</sup> in 2002-2006 to 56<sup>th</sup> in 2009-2013.

In terms of China's international competitiveness in high technology, Dr. Khan mentioned that it has become the largest exporter of telecommunication equipment in the world. Its share in the world market has actually increased from 2.36 percent in 1992 to about 23 percent in 2008. Approximately 40 percent of India's exports are in the form of services: 1) IT Services; 2) R&D Services; 3) Architectural, Engineering and Technical Services; 4) Communication Service. Its combined share of export services has increased from 55 percent in 1999-2000 to about 80 percent in 2007-2008.





As to international competitiveness in certain high technology areas such as astronautics technology, Dr. Khan mentioned that both India and China have active research programs and spend considerable amount of public funds on space research and have increasingly demonstrated technological capabilities in designing satellite launch vehicles and even undertaking commercial launches of satellites on behalf of other countries.

From the larger context, Dr. Khan explained the Science Technology and Innovation Policy 2013 as one of the major government interventions in promoting innovation driven economy in India. According to him, the guiding vision of aspiring Indian STI enterprise is to accelerate the pace of discovery and delivery of science-led solutions for faster, sustainable inclusive growth. A strong and viable Science Research and Innovation System for High Technology-led path for India (SRISHTI) is the goal of the new STI.

**Keywords:** Innovation Driven Economy, Science Research and Innovation System for High Technology-led path for India (SRISHTI), Global Innovation

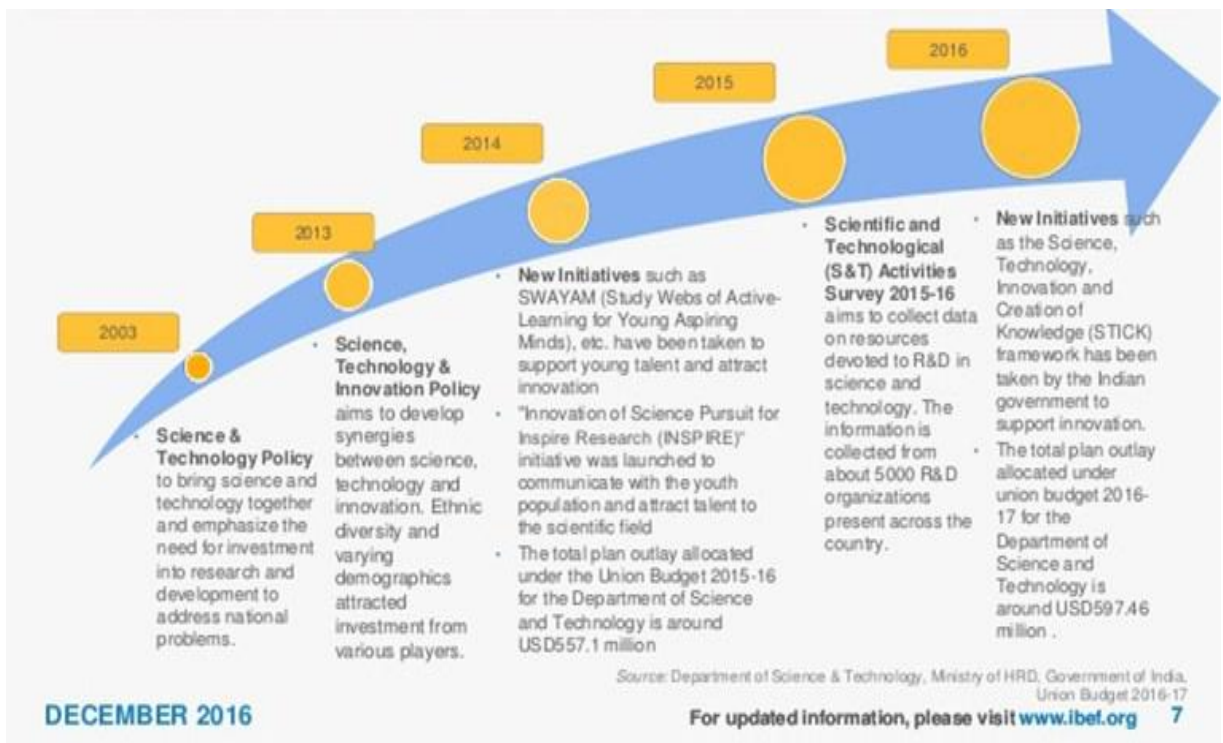


Figure 27. S&T Policy Framework in India

## GOVERNMENT SESSION 2:

### NATIONAL R&D INVESTMENT: ITS ADEQUACY AND IMPLEMENTATION

## An Analysis on the Optimal Ratio of R&D Investment Using Multiple Imputation

**Ik-Cheon Um (KISTEP, South Korea)**



### Major Points of the Presentation

For countries to evolve from “factor-driven countries” to “innovation-driven countries,” Dr. Ik-Cheon Um said a sustainable R&D investment is required. Due to externalities and market failures, R&D investment can be underinvested or overinvested, thus, it is a necessity to analyze the optimal ratio of R&D investment to achieve sustainable economic growth and productivity.

To accurately analyze the optimal ratio of R&D investment, Dr. Um mentioned that it is necessary to construct panel data for 72 countries for the last 33 years (1985-2017). For this purpose, the study addressed these questions: (1) Does the Armey curve of R&D investment exist in developing countries other than OECD countries? (2) What is the optimal ratio of gross domestic expenditure on R&D's Gross Domestic Expenditure (GERD) to GDP and government R&D funding out of GERD in order to maximize economic growth?

Subsequently, Dr. Um discussed salient results of the analysis, to wit: (1) there is a huge gap between the analysis indicators of 72 countries; (2) the Panel root test results in unstable time series as all variables cannot reject null hypothesis; (3) Kao's (1999) panel cointegration test confirms the cointegration relationship by rejecting the null hypothesis that there is no cointegration relationship; (4) optimal ratio of GERD to GDP for maximizing economic growth is 3.8% of GDP; and (5) developing countries have greater contribution to government R&D funding to economic growth than advanced countries.



Given the results, Dr. Um discussed the conclusion of the study along the following perspectives: (1) long-term view of R&D investment and differentiated approach in each country; (2) improving the efficiency of R&D investment; (3) developing an innovation growth strategy considering country specificities; and (4) enhancing the strategic planning capability of government R&D. Further, he commended the contribution of this research since it demonstrated the existence of the Arney curve which shows the long-term balance between R&D investment and economic growth in each country. Among its limitations, however, is the necessity to interpret carefully the optimal R&D intensity of this study since it was derived from an economic perspective in *ceteris paribus*, and was a dynamic matter dependent on the specificity of each country. For further research endeavor, he suggested to conduct studies on calculating the optimal ratio of R&D investment from the viewpoint of social welfare that considers future generations at the same time, not from maximizing economic growth.

**Keywords:** R&D Investment, Optimal Ratio, Multiple Imputation

## GOVERNMENT SESSION 2:

### NATIONAL R&D INVESTMENT: ITS ADEQUACY AND IMPLEMENTATION

## R&D Investment in India: Analyzing Trends and Focus

**Kasturi Mandal (CSIR-NISTADS, India)**



### Major Points of the Presentation

Initially, Dr. Kasturi Mandal shared the current state of the R&D investment in India in which she highlighted the increasing R&D investment and expenditures over the years. However, as a fraction of GDP, Dr. Mandal explained that the public expenditures on research have been stagnant at 0.7% of GDP on average—in the last two decades.

In this context, the paper attempted to capture the extent and modes as well as structures of such spending/investment which is primarily by the government in the case of India. According to the Research and Development Statistics 2017–18 of the Department of Science & Technology, she cited that the Indian expenditure on R&D in the country has been consistently increasing over the years and has tripled in a decade from 2004-2005 to 2014-2015. The gross expenditure on R&D (GERD) is mainly driven by the government sector comprising of Central Government (45.1%), State Governments (7.4%), Higher Education (3.9%) and Public Sector Industries (5.5%) with Private Sector Industries contributing (38.1%) during 2014-2015.

As to the recent scenario, Dr. Mandal presented the government's initiatives with regard to R&D investment that includes: (1) implementation of 'Prime Minister Research Fellows (PMRF)' scheme; (2) provision of grant of Rs 1,000 crore (US\$ 155.55 million) for the second phase of Impacting Research Innovation and Technology (IMPRINT); (3) implementation of Atal Innovation Mission; (4) provision of 4.03 percent increase on budget allocation for the Department of Science and Technology projects; (5) provision of 19.71 percent increase on budget allocation for the Department of Atomic Energy projects; (6) provision of 5.65 percent increase on budget allocation for the Ministry of Earth Sciences; and (7) compulsory investment by private industries to CSR-fund (at least 2% of its average net profit) in R&D along with other social causes. While for the private sector, the companies that have R&D investment in India

are the GridRaster Inc, Intel India, Tata Motors, Robert Bosch Engineering and Business Solutions (RBEI), MNCs like IBM, Apple.

To sum up, Dr. Mandal pointed out that the maximum R&D expenditures are from the central government, the private sector is spending on R&D, but mostly by some large corporations. According to her, manufacturing industry needs a boost in terms of incentives in order to attract more collaborative R&D projects between public and private sectors. R&D expenditure has been increased recently to provide direct benefit to the SMEs and startups through mission programs like AIM. Along with increasing R&D investment there is a need for policy reforms in the R&D system with focus on other gaps. For better planning and effective fund allocation, she suggested that R&D investment can be better calculated through more structured data management system.

**Keywords:** R&D Investment, R&D Expenditures, Research Trends and Focus

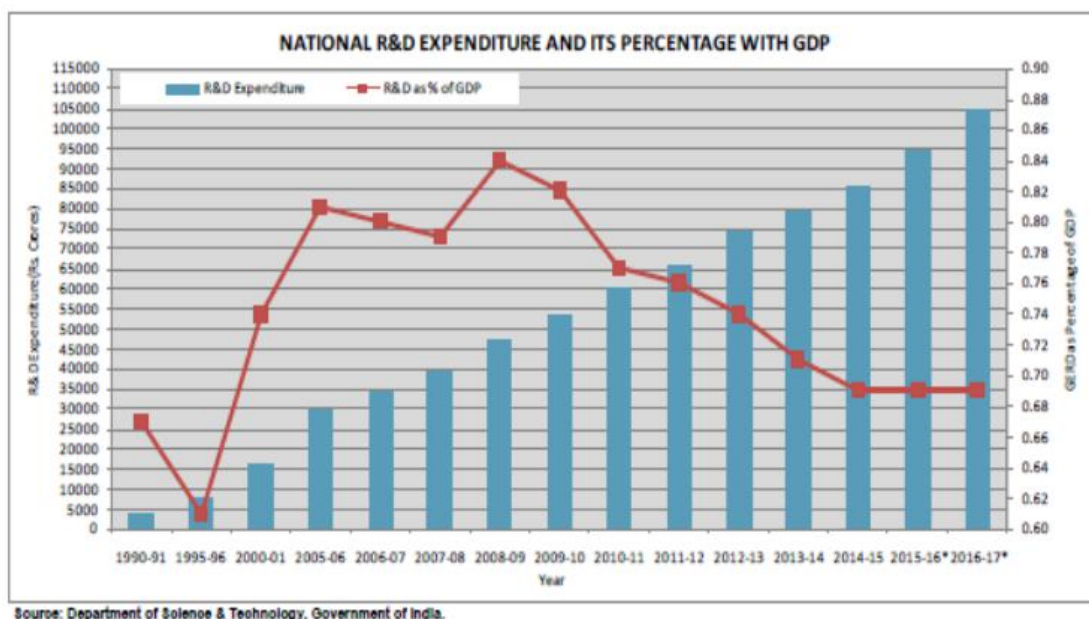


Figure 28. R&D Investment in India



## GOVERNMENT SESSION 2:

### NATIONAL R&D INVESTMENT: ITS ADEQUACY AND IMPLEMENTATION

## Stimulating R&D Investments in Russian State-Owned Companies

**Mikhail Gershman (HSE, Russia)**

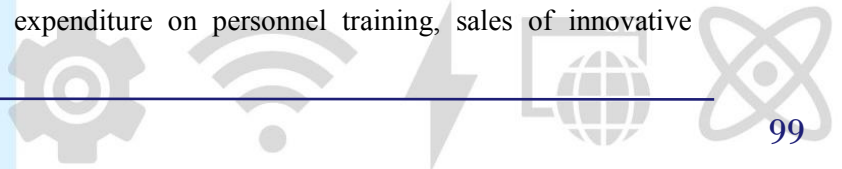


### Major Points of the Presentation

According to the Higher School of Economics (HSE) - Institute for Statistical Studies and Economics of Knowledge (ISSEK), the Russian R&D sector is one of the largest in the world as of 2017. However, it develops inertially in the recent years due to: (1) slow growth of R&D expenditures, and the R&D sector's small contribution to the economy; (2) state-owned organizational model of science remains; (3) specialization areas of the Russian R&D sector did not change much since the Soviet times; (4) research career is not among the most attractive; and (5) stagnation of innovation processes in most sectors of the economy.

Due to these predicaments, Dr. Gershman mentioned that numerous strategies and policies were adopted by the Russian government that included the Innovative Development Strategy up to 2020, Presidential Decrees on May 2012, Roadmaps for the New Sectors of the Economy, National Technology Initiative, Strategy of S&T Development, S&T Strategy Implementation Plan, President's Decree of May 2018 and National Project "Science" in order to boost science, technology and innovation (STI) development.

According to Dr. Gershman, one of these policies is the innovation development programs of large state-owned enterprises (SOEs). Through these programs, a total of 47 largest Russian SOEs were obliged by the government to develop and implement 5-7 year innovation development programs (IPDs) in 2014. The programs covered a broad range of issues that included: building up an innovation management system; establishing links with universities and R&D institutions; providing staff training; increasing R&D expenditures; taking part in Russian technology platforms; and conducting systematic technology audit and foresight. The major key performance indicators across the IDP included productivity, innovation expenditures, R&D expenditures, expenditure on personnel training, sales of innovative



expenditures, R&D expenditures, expenditure on personnel training, sales of innovative goods, and patent granted.

Dr. Gershman concluded that the policy of fostering innovation in Russia has led to the growth of innovation inputs and outputs. Due to largely outdated physical infrastructure, modernization remains priority for most SOEs. Thus, he suggested that SOEs should focus on digitalization, participate in national projects and most importantly, strengthen innovation policy or path dependency.

**Keywords:** R&D Investments, Russian State-owned Companies, Innovation Development Programs

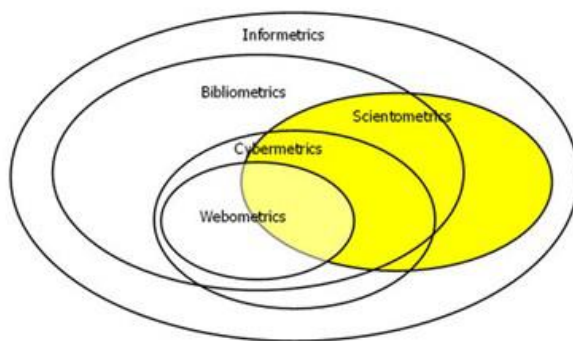


## SCIENTOMETRIC TOOLS FOR INNOVATION STUDIES

### Background

Innovation is increasingly recognized as an important social and economic phenomenon worthy of serious research study (Fagerberg, 2009). In most cases, a good number of researches are being conducted by firms on their innovation ability, particularly relative to their competitors. Scholarly literature on innovation is also rapidly increasing in new journals, professional associations, and organizational units within universities. By presenting existing literature on specific topics, journals can provide a forum of information exchange within a discipline; and by examining current journals, researchers can assess the intellectual, structure and health of a given discipline (Smith, 2009). Indeed, it is essential to systematize the knowledge gained from the literature found in journals in order to understand how to exploit their effects to the full and what we still need to know (Fagerberg, Martin, Ben R., & Andersen, 2019).

In accordance with this phenomenon, it would be enlightening to examine the scholarly literature to identify, classify, and prioritize key issues on innovation through publication analysis. This is done assuming that research publication patterns – to a large extent – mirror research patterns (Ingwersen, 2014). The figure on the right illustrates the entire range of metrics belong to the overall field of *Informetrics*, the quantitative study of information in all its forms (Tague, 1992). If the publications are of academic nature one would name the analysis *Scientometrics* (Moed, 2005).



*Figure 29. The Framework of Informetrics  
(from Björneborn & Ingwersen, 2004, p.  
1217).*

This holistic analysis of innovation studies through the use of scientometric techniques will provide a perspective in the field and recent trends on innovation. Further, this analysis establishes situational

awareness of innovative ideas in technology focused organizations (Yildiz, 2016).

Considering the need and significance of scientometric studies, a tutorial session on the application of scientometric tools for innovative studies was organized on October 5, 2019, in conjunction with the 9<sup>th</sup> ASIP conference. This year's tutorial session was facilitated by Dr. Ki-Seok Kwon of the Department of Public Policy, Hanbat National University, South Korea in which he demonstrated the different tools used in scientometric analysis.

## Tutorial on Scientometrics

### *Objective*

The objective of the tutorial session was to impart in-depth knowledge on scientometrics specifically on software for paper and patent analysis and visualization using VOS viewer to construct and visualize bibliometric networks; and knowledge matrix plus to construct and visualize papers and patents.

### *Coverage*

The tutorial session focused on the use of different tools in the analysis of scientometric data. This session was designed for SMEs, researchers, extension specialists, and professional staff working in the library and information centers.

### *Learning Outcome*

After successful completion of the tutorial session, participants were expected to gain in-depth knowledge about scientometric, develop skills to collect, analyze, and evaluate scientometric data using VOS viewer and knowledge matrix plus and be able to carry out research in scientometric studies.

### *Scope of Topics*

- Big data
- Network science
  - ◊ Network, A new way of Lenses for Social Phenomenon
  - ◊ Random Network vs. Scale-free Network
  - ◊ Hubs: Efficiency vs. Vulnerability
- Scientometric analysis
  - ◊ Social Network Analysis (SNA) & Hyperlink Network Analysis (HNA)
  - ◊ Universities in Asia (at least 20 hyperlinks)
  - ◊ Global Language Network
  - ◊ Evolutionary Economics





## STUDENT CONTEST:

# TECHNOLOGY AND INNOVATION FOR SMEs

We live in an age where science and technology is just within our reach, changing the way we do things and making our lives so much easier.

So when the younger generation, with their wit and grit and the passion to make a difference, harnesses the power of science and technology, what do we get? Innovations that will change our lives and the society for the better.

On the last day of the ASIP Conference, three students from UP Diliman College of Engineering presented their innovative concepts that could help SMEs and the society, in general.

### ***Cloop: Disrupting the recycling industry***

Glenn Adrian Ongpin talked about "Cloop", a start-up company that develops plastics recycling technology and makes it accessible to underserved communities.

Cloop aims to help communities, such as those in urban dumpsites and coastal areas, which do not have proper waste management system because of lack of access to large recycling facilities (as these require large amounts of investment).

Cloop develops a package of four recycling machines: a shredder, an extruder, an injection molder, and a compression molder. It aims to create a network of microenterprises and SMEs specializing in upcycling plastic waste operating in areas that need it the most.

Cloop (formerly InPHinite Loop) started as a one-time activity called "Project Plastikan" under the UP Diliman Humanitarian Engineering, Entrepreneurship, and Design Group which aimed to help a women's community in Malabon have sustainable income by providing plastic recycling machines.

Ongpin co-founded Cloop with two of his friends who were also involved with Project Plastikan.

### ***Rethinking wastewater treatment***

Miguel Lawrence Keith SJ. Celebre discussed about the technology he is currently working on, which treats textile wastewater for methylene blue and other cationic dyes.

Methylene blue (MB) is a non-biodegradable synthetic dye that is widely used in the textile industry. It has a very strong color even in dilute concentrations. The textile and dyeing industries are some of the

most water-intensive industries globally, producing approximately 100 tons of dye-contaminated wastewater per year — the highest amount produced by one industry alone. If discharged to the environment untreated, dye-contaminated wastewater poses health and environmental threats. Further, the presence of color in bodies of water reduces the amount of transmitted light that is available for use of photosynthesizing aquatic organisms like plants, algae, and bacteria.

Celebre said "polymeric adsorbent beads", the technology he is working on, was found to have a maximum MB sorption capacity of 1081.62 milligrams of MB per gram of adsorbent. This is higher compared to other adsorbents for MB that have been studied for the past six (6) years, the adsorption capacities of which are only around the hundreds. Kinetic studies were also conducted, and it was found that the beads only require 2.5 hours to reach equilibrium—the state where there is no longer any observed removal of MB.

With this technology, operating costs can be reduced by recycling of the purified water and costs for third-party wastewater treatment will be cut down almost entirely. MB will be sequestered in the adsorbent and can be stored until time for disposal or treatment, without any risk of fugitive MB emissions.

### ***Exploring potential treatments for kidney stone disease***

While the first two technologies focus on the environment, Ma. Charlene C. Tapia's innovative concept aims to respond to the increasing incidence of kidney stone disease (nephrolithiasis), particularly the calcium phosphates (CaP) stones.

Tapia explained that while the current commercially available medication is able to slow down the growth of these stones, it can however increase urine pH, a condition in which the most stable form of CaP is formed.

She said her project aimed to explore for other possible inhibitors that will prevent the increasing occurrence of kidney stones and allow more choices of treatments for patients.

Tapia then explained that based on earlier studies and her initial experiments, hydroxycitrate (HCA) was found to be an effective inhibitor. Found in some plants such as *Garcinia cambogia* and *Hibiscus sabdariffa*, HCA can change the shape of the crystal, reduce the number of crystals formed and can even dissolve the CaP crystal.

Tapia said that the results of her study may serve as a step in understanding the effect of HCA on CaP crystals and to aid SMEs in designing formulation of drugs or food supplements targeting kidney stone disease.

The three students presented their projects to a panel composed of ASIP President Prof. Sung-Soo Seol, Prof. Mohan Avvari of Nottingham University, Prof. Chi Renyong of Zhejiang University of Technology and UP ISSI Director Aleli Bawagan.





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## CONFERENCE PROGRAMME



### October 3 Thursday

08:30-09:00	Registration (National College of Public Administration and Governance, UP Diliman)	
09:00-09:10	<b>Welcome Address</b> <i>National College of Public Administration</i> Moderator: Fidel R. Nemenzo, Vice Chancellor for R&D Dr. Michael L. Tan, Chancellor, UP Diliman Prof. Sung-Soo Seol, President, ASIP	
09:10-10:40	<b>Keynote Speeches</b> Usec. Brenda L. Nazareth-Manzano (Undersecretary, Department of S&T, Philippines) Prof. Ky-young Park, Former Presidential Advisor for S&T, Korea; Soonchun U Prof. Youngil Park, Former Vice Minister, Ministry of S&T; Ewha Womans U	
10:40-11:00	Coffee break	
11:00-12:00	<b>Keynote Speeches</b> Prof. Jung-wha Han, Former Minister, Ministry of SMEs, Korea; Hanyang U Dir. Jerry T. Clavesillas (Director, Department of Trade and Industry, Philippines) Dr. Hee-yoon Choi, President, Korean Institute of Science & Technology Information	
12:00-13:30	Lunch	
13:40-14:10	<b>Keynote Speeches</b> <i>ISSI Rm. 301</i> Dr. Hee-yoon Choi (President, Korean Institute of Science & Technology Information)	
14:10-15:50	<b>RS 1 Technology Innovation</b> <i>ISSI Rm. 301</i> Moderator: Prof. Sujit Bhattacharya, India	<b>RS 2 Management of Technology</b> <i>ISSI Rm. 302</i> Moderator: Prof. Linda Ting-Lin Lee, Taiwan
15:50-16:10	Coffee break	
16:10-18:00	<b>RS 3 Economics of Technology</b> <i>ISSI Rm. 303</i> Moderator: Prof. MH Bala Subramanya, India	<b>RS 4 Technology Policy</b> <i>ISSI Rm. 300</i> Moderator: Prof. Hong-Tak Lim, Korea
18:30-20:30	Banquet - Hosted by UP Diliman - ISSI Plaza	

### October 4 Friday – (ISSI)

09:00-09:20	<b>Keynote Speeches</b> <i>ISSI Rm. 301</i> Director, Watcharas Leelawath, Mekong Institute	
09:20-10:40	<b>SS1 Evaluation of Korean Policy for the 4th Industrial Revolution</b> <i>ISSI Rm. 301</i> Moderator: Prof. Chan-Goo Yi, Korea	<b>SS2 Entrepreneurship Education for SMEs</b> <i>ISSI Rm. 300</i> Moderator: Prof. Rolando Ramon Diaz, Philippines
10:40-11:00	Coffee break	
11:00-12:30	<b>SS3 Entrepreneurship</b> <i>ISSI Rm. 301</i> Moderator: Prof. Renyong Chi, China	<b>SS4 SME Policy</b> <i>ISSI Rm. 300</i> Moderator: Prof. Angelina Yee, Malaysia
12:30-14:00	Lunch	
14:00-15:40	<b>GS 1 Future of SME &amp; Startup Ecosystem</b> <i>ISSI Rm. 301</i> Moderator: Dr. Rupinder Tewari, India	14:00-17:00 <b>SS5 S&amp;T Networks for South &amp; North Korea with ASEAN</b> <i>ISSI Rm. 300</i> Moderator: Young Joo Ko, Korea
15:40-16:10	Coffee break	
16:10-17:50	<b>GS 2 National R&amp;D Investment: Its Adequacy and Implementation</b> <i>ISSI Rm. 301</i> Moderator: Dr. Jangjae Lee, Korea	17:00-18:00 <b>SS6 Innovation for Circular Economy-RoundTable</b> <i>ISSI Rm. 302</i> Moderator: Prof. Mohan Avvari, Malaysia
18:00-20:30	Banquet - ISSI Plaza	

### October 5 Saturday – (ISSI)

09:00-09:20	<b>Students Opportunity:</b> Director's Office, 4th Floor, UP ISSI Speaker: Prof. Chan-Goo Yi	
09:20-13:00	<b>Students Contest: Technology and Innovation for SMEs</b> <i>Director's Office, 4th Floor, UP ISSI</i> Moderator: Prof. Aleli Bawagan, Philippines Speaker: Prof. Chi Renyong, China	<b>Tutorial Session: Tools for Scientometric Analysis</b> <i>ISSI Rm. 304</i> Moderator: Prof. Ki-Seok Kwon, Korea



## ***APPENDIX B***

### **CHAIRS OF THE LOCAL CONFERENCE COMMITTEE**

Over-all Chair:	Gloria S. Recio
Program:	Melanie V. Cabotaje
Invite and Welcome:	Joanna Rose T. Laddaran
Administrative Support :	Rolando Ramon C. Diaz
Technical Support:	Bernie F. Villaluna
Special Event:	Jefferson C. Sumalabe
Saturday Event:	Severina P. Bañaga
Documentation:	Marilou N. Andres
Assistant Moderators:	Blesilda A. Clerigo
Lay-out Artist:	Kimberly E. Alo
Master of Ceremonies/ Moderators for Plenary Sessions	Fidel R. Nemenzo/Aleli B. Bawagan
Finance :	Severina P. Bañaga
Registration Support :	Jaylyn D. Manglicmot





DIRECTORY

1. Moderators

1.1. Foreign

	NAME	COMPANY	POSITION
1.	Bhattacharya, Sujit	CSIR-NISTADS, INDIA	Chief Scientist
2.	Chi, Renyong	Zhenjiang University of Technology, CHINA	Professor
3.	Ko, Young Joo	Korea Research Council of S&T, KOREA	
4.	Ikcheon, Um	KISTEP, KOREA	
5.	Lee, Jang-Jae	KISTEP, KOREA	Director
6.	Lee, Linda Ting-Lin	National University of Kaohsiung, TAIWAN	Associate Professor of Business
7.	Lim, Hong-Tak	Pukyong National University, KOREA	Professor
8.	Subramanya, MH Bala	Indian Institute of Science, INDIA	Professor
9.	Tewari, Rupinder	DST-CPR, INDIA	Professor
10.	Yee, Angelina	Nottingham University, MALAYSIA	Associate Professor
11.	Yi, Chan-Goo	Chungnam National University, KOREA	Associate Dean

1.2. Local

	NAME	COMPANY	POSITION
1.	Bawagan, Aleli B.	University of the Philippines – Diliman - ISSI	Director
2.	Diaz, Rolando Ramon C.	University of the Philippines – Diliman - ISSI	University Extension Specialist
3.	Nemenzo, Fidel R.	University of the Philippines – Diliman	Vice Chancellor for Research and Development

2. Tutorial Session Lecturer

	NAME	COMPANY	POSITION
1	Kwon, Ki-Seok	Hanbat National University, KOREA	Professor

	NAME	COMPANY	POSITION
1.	Bhattacharya, Sujit	Academy of Scientific & Innovative Research, INDIA	Chief Scientist
2.	Chang, Yu-Yun	National University of Kaohsiung, TAIWAN	
3.	Chi, Renyong	Institute of SMB Zhejiang University of Technology, CHINA	
4.	Cho, Yongrae	STEPI, KOREA	Research Fellow
5.	Chong, Aik Lee	UCSI College, MALAYSIA	
6.	Gershman, Mikhail	National Research University Higher School of Economics (HSE), RUSSIA	Deputy Head
7.	Huang, Yi-Dan	S&T Policy Research and Information Center (STPI), TAIWAN	Assistant Researcher
8.	Hwang, Byung-Sang	Korea Basic Science Institute, KOREA	
9.	Jeon, Jeonghwan	Gyeongsang National University, KOREA	Professor
10.	Khaemasunun, Pravit	Thammasat University, THAILAND	Professor
11.	Khan, Mohsin	ZSF, INDIA	Chairman
12.	Kim, Janghoon	Chungnam National University, KOREA	
13.	Kim, Young Jun	Korea University, KOREA	
14.	Ko, Chang-Ryong	Hannam University, KOREA	Professor
15.	Ko, Young-Joo	Korea Research Institute of Chemical Technology, KOREA	
16.	Kshitij, Avinash Prasad	National Institute of Science, Technology and Development Studies (NISTADS), INDIA	Senior Scientist
17.	Kwon, Ki-Seok	Hanbat University, KOREA	
18.	Leelawath, Watcharas	Mekong Institute, THAILAND	
19.	Lim, Hong-Tak	Pukyong National University, KOREA	
20.	Liu, Daoxue	Zhejiang University of Technology, CHINA	
21.	Mandal, Kasturi	National Institute of Science, Technology and Development Studies (NISTADS), INDIA	Senior Scientist
22.	Mohan, Avvari V	Nottingham University, MALAYSIA	Malaysia
23.	Park, Jiyoung	University of Buffalo, The State University of New York, KOREA	
24.	Park, Soo-Hyun	University of Science and Technology, KOREA	
25.	Seol, Sung-Soo	ASIP, KOREA; Hannam University, Korea	President
26.	Stone, Richard	AAAS, USA	International News Editor
27.	Subrahmanya, Bala M H	Indian Institute of Science, INDIA	
28.	Tewari, Rupinder	DST- Centre for Policy Research (DST-CPR), INDIA	Chief Coordinator
29.	Tsunoda, Hideyuki	National Institute of Science and Technology Policy (NISTEP), JAPAN	Deputy Director General
30.	Um, Ikcheon	KISTEP, KOREA	
31.	Vanny, Sok	Royal University of Phnom Penh, CAMBODIA	Vice Rector Research & Graduate Studies
31.	Yee, Angelina	Nottingham University, MALAYSIA	
32.	Yi, Chan-Goo	Chungnam National University, KOREA	
33.	Yim, Hyun	KISTEP, KOREA	Senior Research Fellow

### 3.2. Local

	NAME	COMPANY	POSITION
1.	Capadosa, Rose Nonette	University of the Philippines – Diliman - NCPAG	University Researcher IV
2.	Diaz, Paz H.	Small Enterprises Research and Development Foundation (SERDEF)	Trustee
3.	Dimaano, Janmar P.	Easybus PH	Chief Executive Officer
4.	Jandok, Karl Robert	University of the Philippines and RSM Erasmus University Rotterdam	Assistant Professor
5.	Manegdeg, Reynold Ferdinand G.	University of the Philippines – Diliman - ISSI	University Extension Specialist
6.	Manlapas, Marvin M.	University of the Philippines – Diliman - ISSI	Program Staff
7.	Palmares, Mary Rose	Polytechnic University of the Philippines	Professor
8.	Racelis, Aliza D.	University of the Philippines – Diliman	Associate Professor
9.	Tiglao, Nestor Michael	Adapsense; University of the Philippines – Diliman	Founder and CEO; Associate Professor
10.	Uyanguren, Glennis S.	University of the Philippines – Diliman - ISSI	University Extension Specialist

## 4. Delegates

### 4.1. Foreign

	NAME	COMPANY	POSITION
1.	Cho, Keeheon	Korea Valuation Association (KVA), KOREA	Secretary General
2.	Hyeon, Byung-Hwan	Daejeon University, KOREA; ASIP, KOREA	Organizer
3.	Kim, Jaesoo	KISTI, KOREA	Director
4.	Kim, Jinha	KISTEP, KOREA	Director/Associate Research Fellow
5.	Kim, Min-Jae	KISTEP, KOREA	Staff
6.	Lee, Byungmin	University of Science and Technology, KOREA	Professor
7.	Lee, Joonwoo	KISTI, KOREA	Manager
8.	Park, Soohyun	KISTI, KOREA	Research fellow
9.	Yoo, Nari	KISTEP, KOREA	Staff

4.2. Local

	NAME	COMPANY	POSITION
1.	Abilay, Jose Marie M.	University of the Philippines - Los Baños	DMO III
2.	Abilay, Ma. Josefina P.	DOST - MIMAROPA	Regional Director
3.	Alamani, Bryan G.	University of the Philippines - Diliman	Assist. Professor
4.	Aljani, Nuhman M.	University of the Philippines - Diliman	Student (Graduate)
5.	Alo, Kimberly	University of the Philippines – Diliman - ISSI	Program Staff
6.	Animas, Gerard Sam J.	Mapua University	Student
7.	Andres, Marilou N.	University of the Philippines – Diliman - ISSI	College Librarian
8.	Bona, Ma. Clyde R.	Palawan State University	Instructor
9.	Cabotaje, Melanie V.	University of the Philippines – Diliman - ISSI	University Extension Specialist
10.	Campos, Jofrey R.	Bulacan State University	Faculty
11.	Campos, Josephine Diana S.	Bulacan State University	Faculty
12.	De Jesus, Jomar B.	Partido State University	Student
13.	de Vera, Ian Jester	University of the Philippines – Diliman - ISSI	University Extension Specialist
14.	De Vera, Loida J.	University of the Philippines – Diliman - ISSI	Administrative Assistant
15.	Delfinado, Marsha Lee A.	University of the Philippines – Diliman - ISSI	University Extension Specialist
16.	Delos Reyes, Senedith A.	University of the Philippines – Diliman - ISSI	University Extension Specialist
17.	Dumlao, Jerome P.	PUP Open University System	Faculty
18.	Escoto, Bernadette D.	University of the Philippines – Diliman - ISSI	University Extension Specialist
19.	Laddaran, Joanna Rose T.	University of the Philippines – Diliman - ISSI	University Extension Specialist
20.	Layson, Theresa G.	Palawan State University	Instructor
21.	Magsaysay, Gideon G.	Compassion International	Program Support Specialist
22.	Mamaril, Jocelle P.	University of the Philippines – Diliman - ISSI	University Extension Specialist
23.	Manglicmot, Jaylyn D.	University of the Philippines – Diliman - ISSI	University Research Associate
24.	Momongan, Alyssa Juliet Y.	Mapua University	Student
25.	Nacino, Dexter G.	Palawan State University	Director - PITBI
26.	Navo, Nova Z.	University of the Philippines – Diliman - ISSI	University Extension Specialist

	NAME	COMPANY	POSITION
27	Olegario, Doris Z.	University of the Philippines – Diliman - ISSI	University Extension Associate
28	Ondoy, Rica Jan C.	University of the Philippines Diliman	Student
29	Pacia, Adeline A.	University of the Philippines Diliman	Director - TTBD
30	Pilapil, Joachim S.	Partido State University	Instructor
31	Raquiza, Marivic	University of the Philippines – Diliman - NCPAG	Assistant Professor
32	Recio, Gloria S.	University of the Philippines – Diliman - ISSI	University Extension Specialist
33	Reyes, Maria Corazon C.	University of the Philippines - Diliman - Center for Integrative and Development Studies	REPS
34	Reyes, Maria Fe SE.	University of the Philippines – Diliman - ISSI	University Extension Specialist
35	Rodriguez, Czarina	Easybus PH	Creative Director
36	Salang, Jorge Juan	University of the Philippines - Diliman - OVCRD	University Research Associate II
37	San Gabriel, Carlito A.	Jas Advertising	Researcher, Freelance
38	San Gabriel, Hilda F.	Polytechnic University of the Philippines	Faculty; Chairperson - Dept. Coop. & Social Dev't
39	Sanico, Maria Rosita Q.	DOST - MIMAROPA	Senior Research Specialist II
40	Sumalabe, Jefferson C.	University of the Philippines – Diliman - ISSI	University Extension Specialist
41	Tapia, Ma. Charlene C.	University of the Philippines - Diliman	Student (Graduate)
42	Vea, Jose Aldrin B.	University of the Philippines - Diliman	Student (Graduate)
43	Villaluna, Bernie F.	University of the Philippines – Diliman - ISSI	University Extension Specialist
44	Villarante, Daisy G.	Polytechnic University of the Philippines	Instructor
45	Villete, Jhon Lorence L.	Partido State University	Student



## 5. Student Contestants

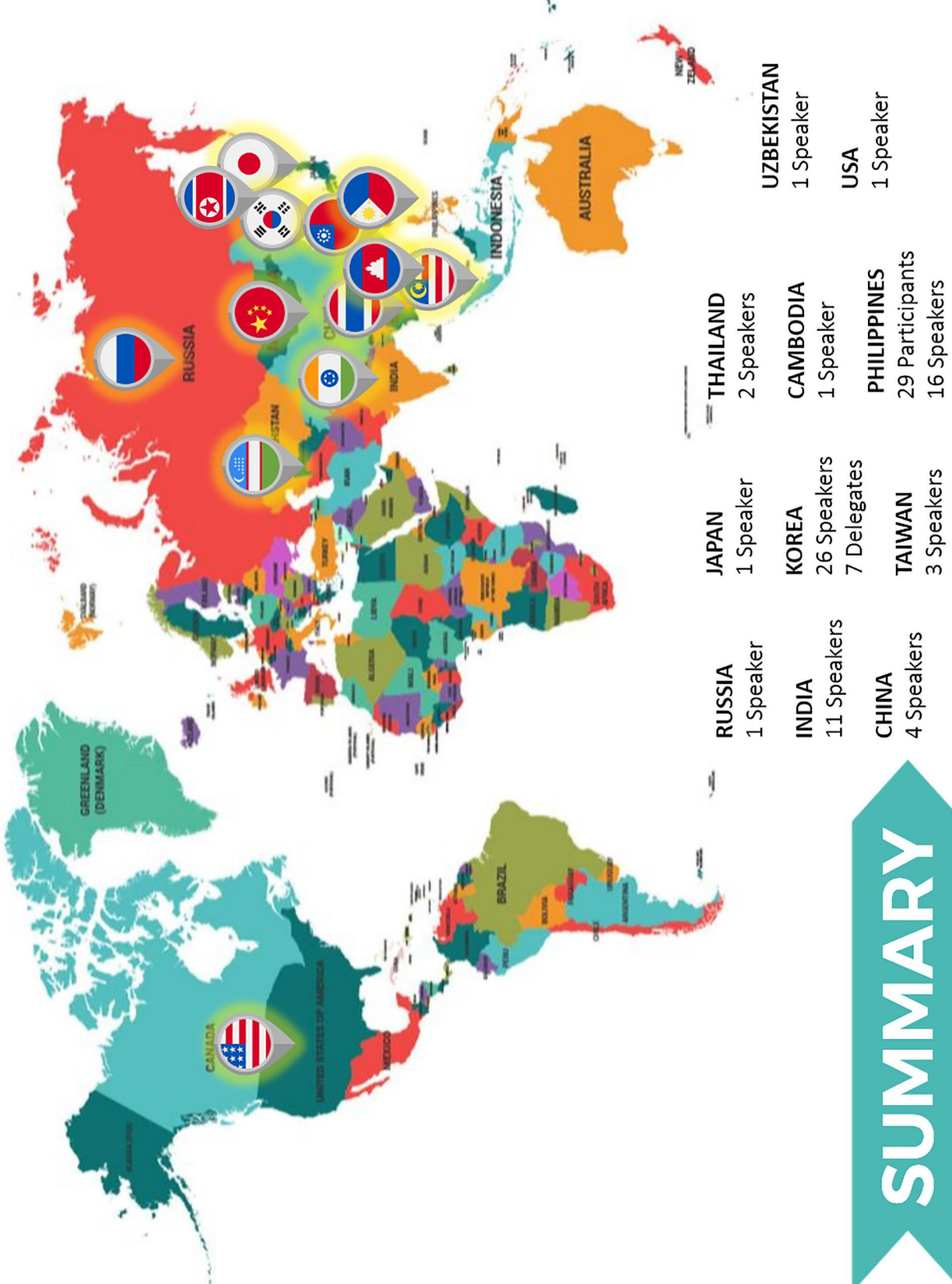
	NAME	COMPANY	POSITION
1	Celebre, Keith S.J.	University of the Philippines	Graduate Student
2	Ongpin, Glenn	University of the Philippines/CLOOP	Co-Founder and CEO
3	Tapia, Ma. Charlene	University of the Philippines	Student (Graduate)

## 6. Tutorial Session Participants

	NAME	COMPANY	POSITION
1	Andres, Marilou N.	University of the Philippines – Diliman - ISSI	College Librarian
2	Bautista, Isabel	FGEN	Project Engineer
3	Caperina, Jason	Sandpines Spices & Condiments Corp.	Process Trainor
4	Custodio, Mark		
5	De Luna, Omar	AIRCOND.NETWORK	Sales Manager
6	Delos Reyes, Senedith A.	University of the Philippines – Diliman - ISSI	University Extension Specialist
7	Ebalo, Chuck G.	I & CS	Technical Director
8	Henson, Luzale	NEU	Math Coordinator
9	Lagar, Dominick	Hiyas Press	Production Supervisor
10	Mamaril, Jocelle P.	University of the Philippines – Diliman - ISSI	University Extension Specialist
11	Quilicol, Rosalie T.	University of the Philippines – Diliman - CSWCD	Asst. Professor
12	Ros, Jamelson		Seafarer
13	Satore, Leo Francis		
14	Sumalabe, Jefferson C.	University of the Philippines – Diliman - ISSI	University Extension Specialist
15	Villaluna, Bernie F.	University of the Philippines – Diliman - ISSI	University Extension Specialist
16	Villanueva, Alexander James E.		



## SUMMARY







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