THE TRIPLE HELIX ASSOCIATION MAGAZINE

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TRIPLEHELIX
UNIVERSITY INDUSTRY GOVERNMENT association

Hélice

VOLUME 4 ISSUE 3 SEPTEMBER 2015

EDITORIAL WELCOME

Dear Hélice Friends

Welcome to the Fall 2015 issue of the Magazine.

We started the new academic year with the Triple Helix International Conference in P R China. The conference, held in Beijing on 21-23 August 2015, and was jointly organized by the Research Center for Technological Innovation (RCTI), Tsinghua University, and the Triple Helix Association (THA). It was a great success and we thank colleagues and students who worked very hard to organize the event.

We thank participants for presenting new, fresh, and challenging ideas. Novel presentations and lively discussion by established scholars, as well as an aspiring new generation of Triple Helix scholars, strengthened and highlighted what can be done with the help of a simple, yet powerful framework like "Triple Helix". Discussions revealed that the Triple Helix is still a fertile and versatile approach for those who want to understand and investigate "innovation and entrepreneurship", as well as sustainability, growth, equality, policy changes, revolutions, reforms or crisis.

For those who missed the conference,, we provide a brief summary of the conference and the keynote speeches. We acknowledge the number of outstanding papers, and the Conference Organizing Committee provides a list of Best Papers. We congratulate the authors for their significant contributions.

In President's Corner, Henry Etzkowitz addresses *The entrepreneurial university and its role in the development of knowledge economy*. Henry suggests that universities are taking an even more central societal role; the entrepreneurial university expands academic roles from teacher, to researcher, to entrepreneur. Synthesizing a wide variety of data drawn from in-depth interviews, participant observations, archival research, and secondary analysis, into a common model, he analyzes the role of the entrepreneurial university as a Launchpad of the knowledge economy.

We include an interesting scientific papers which were presented in Beijing. These include: *Are government incentives driving and intensifying the firms innovation capabilities in Mexico? (*Angelica Nunez Merchand, P Perez-Hernandez, Sanchez Aguilar Adolfo, Martinez Ma Guadalupe); *State logic and the government's role in the formation of the Shanghai state power industry (1945-1965) (*Ming Gao, Chunyan Zhou); and *Exploring the co-evolution between technical innovation and technology standardization in the mobile communications industry (*YE Weiwei, TIAN Hua*)*.

We present interesting publications. In particular, we congratulate Shiri M Breznitz, Henry Etzkowitz, and all the contributing authors for providing the literature with a very comprehensive book entitled: *"University Technology Transfer: The Globalization of Academic Innovation",* published by Routledge, 2015. The Triple Helix Journal is continuing its successful path since inception and is publishing interesting articles. The editor welcomes submissions with a promise of a fast but high-quality review process.

Our book review editor, Branca Terra, welcomes your interest in submitting "book reviews". In this issue, Michelle Baker reviews *Factory Man* by Beth Macy.

The THA Webinar Series next presentation is scheduled for 25 November 2015. The topic is *Evaluation of Entrepreneurial Universities: A Macro and Micro Perspective*, with speakers Dr Andrea -Rosalinde Hofer, economist, OECD, Skills for Entrepreneurship; and Professor Dr Klaus Sailer, Professor for Entrepreneurship, Munich University of Applied Sciences, and CEO, Strascheg Center for Entrepreneurship.

We have a number of interesting and ongoing activities of the Triple Helix Association: Thematic Research Groups News; Chapter News; and News from the Americas, as well as our new individual and organizational members. .

As Editors, *we* appreciate your interest in the *Hélice* Magazine, and invite you to publish articles or submit new items for publication. For further information, please contact Devrim Göktepe-Hultén (Editor in Chief) at devrimgoktepe@ gmail.com, or Sheila Forbes (Managing Editor) at sheila.forbes@strath.ac.uk.

We wish you pleasant and enjoyable Autumn days and look forward to hearing from you.

Devrim Goktepe-Hulten (Editor in Chief)
Sheila Forbes (Managing Editor)
September 2015

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The Triple Helix Association Magazine, *Hélice*, is published quarterly: March, June, September and December. Contributions are invited:

Articles dealing with aspects of the interaction between academy-industry-government (Triple Helix) for fostering research, innovation, economic competitiveness and growth. Contributions should be in MSWord, 2500-3000 words, and include a photograph of the author. Contact: devrimgoktepe@gmail.com and sheila.forbes@strath.ac.uk.

Book Reviews from publishers and writers/reviewers on new publications relating to Triple Helix themes. Reviews should be original and interesting, should be written clearly and concisely, and 1000-1500 words in MSWord.
Contact: brancaterra@gmail.com.

News Items related to conferences or events, call for papers, projects, job posting, and any other activity relevant to Triple Helix interactions you/your organization is organizing/have organized. Articles should be in MSWord, no longer than 1000 words, and include weblinks to any related activity
Contact: devrimgoktepe@gmail.com and sheila.forbes@strath.ac.uk.

Deadlines for submissions to be included in the related quarterly issue:

28 November 2015 for December 2015 issue
22 February 2016 for March 2016 issue
28 May 2016 for June 2016 issue.
29 August 2016 for the September 2016 issue.

SPECIAL REPORT

TRIPLE HELIX XIII INTERNATIONAL CONFERENCE

ACADEMIC-INDUSTRY-GOVERNMENT TRIPLE HELIX MODEL FOR FAST-DEVELOPING COUNTRIES

BEIJING, P R CHINA : 21-23 AUGUST 2015

[BY THE CONFERENCE ORGANISING COMMITTEE]

On August 21, 2015, the Triple Helix International Conference 2015 began in the Shunde Building of the School of Economics and Management, Tsinghua University, Beijing, China. The event was jointly organized by the Research Center for Technological Innovation (RCTI), Tsinghua University, and the Triple Helix Association (THA).

2015 saw the thirteenth in a series of annual conferences that began eighteen years ago, having previously been held in Tomsk, London, Bandung, Silicon Valley, Madrid, Glasgow, Singapore, Turin, Copenhagen/Lund, Rio de Janeiro, New York, and Amsterdam, and this was the first time the event was being held in China.

Professor Qing-ruiXu

The conference theme was "Academic-Industry-Government Triple Helix Model for Fast-Developing Countries", and around 180 professors and students from more than seventy institutions in the innovation area attended the meeting from around the world, including China, the United States, United Kingdom, Russia, Japan, the Netherlands, Brazil and South Korea.

Professor Qing-ruiXu, who is the Honorary Adviser of the Research Center for Technological Innovation academic committee, and a Chinese Academy of Engineering Fellow, delivered the Welcome Speech, which include a brief review of the development process of Triple Helix theory, and extending a warm welcome to all the participants.

Invited renowned experts made keynote speeches. They including: Professor Henry Etzkowitz, the president of the Triple Helix Association and Senior Fellow at Stanford University; Debra Amidon, the founder and CEO of ENTOVATION International Limited; Navi Radjou, the Innovation and Leadership Advisor, Palo Alto, California, USA and a Fellow of Cambridge Judge Business School; Professor Loet Leydesdorff, the co-founder of the THA and Professor at the University of Amsterdam; Professor Tariq Durrani, the Vice President of the Royal Society of Edinburgh; Professor Wim Vanhaverbeke from Hasselt University; Anders Karlsson, the Vice President of Global Academic Relations, Elsevier; Tao Wang, the President of Yangtze Delta Region Institute of Tsinghua University; and Professor Jin Chen, the Director of the Research Center for Technological Innovation at Tsinghua University. Sixty-four speakers made presentations in five

sessions: *Advancing Triple Helix Theories*; *the Changing Role of Government in Innovation Systems*; *Entrepreneurial University and Triple Helix's Development; Science, Technology and Innovation Policy; and University and Industry Relationships;* with Professor Woo Park, Yeungnam University; Professor Chux Daniels, University of Sussex; and Professor Poh Kam Wong, the National University of Singapore included.

On the evening of August 22, Professor Jin Chen, Chairman of the Conference, Professor Qing-ruiXu, and Professor Henry Etzkowitz respectively, presented eleven participants with the Best Paper Award, and presented cash prizes for the two Best Student Paper Award winners, with Professor Xudong Gao, Vice President of THC 2015 and Deputy Director of the RCTI at Tsinghua University.

By noon on August 23, the THC 2015 three-day sessions ended with great success. After the meeting, participants from both home and abroad watched a special traditional culture performance with Chinese characteristics in Laoshe Teahouse.

SUMMARY OF KEYNOTE PRESENTATIONS

PROFESSOR HENRY ETZKOWITZ
Innovative Governance: making a Triple Helix Innovation System

A Triple Helix of university-industry-government relations, as the basis of an innovation model, originated from both statist and laissez-faire societal regimes. The US experience took place in the context of scepticism of the government's role. Nevertheless, at various historical junctures, such as the mid-nineteenth century Civil War, World War II, and in response to the 1957 Soviet Sputnik success, government played an activist role to address specific national issues.

For example, direct links in the US among university, industry, and government formed during the Second World War, were dismantled immediately after the war, but have since been revived in a looser format. The post-war creation of innovation hubs in Boston, Silicon Valley, the Research Triangle, and elsewhere emanated from pre-war Triple Helix interactions in New England, a region unique in the early twentieth century for its concentration of academic resources.

Interaction among Triple Helix actors creates dynamics for an innovation system responding to different societal regimes. An innovative dynamic system comprises bottom up, top down, and lateral initiatives, among university, industry, and government, translating research into use and societal problems into collaborative opportunities to invent new innovation methods. In the US, ideological opposition to government-industry relationships is reduced by an indirect format of running such links through the university.

This has had the consequence of increasing the university's salience as an innovation actor. In Europe, a leading role for government is

accepted in many countries, especially those following the French Colbertist tradition, with industry seen as the main innovation actor under government's guidance.

What are the implications of the US Triple Helix experience, arising from a strong Civil Society base for contemporary fast developing countries, many with a weak Civil Society? Government is strongly involved in US innovation policy, both directly and indirectly. But why was this policy logic established, and how did resistance to its emplacement paradoxically strengthen implementation, transforming a public/private Double Helix into a university-industry-government Triple Helix during the early to mid-twentieth century? As the US was the fast developing country of the ninetieth and early twentieth century,

China is a contemporary fast developing country with serious issues accompanying this rise. How to make development sustainable in fast developing countries, as well as in late developing and already developed countries, is a significant topic for future decades.

DEBRA AMIDON
Vision of Knowledge Innovation: Vignettes from the Past, Present and Future

Over twenty years ago, there was minimal interaction across the sectors - government, industry and academe. Several initiatives were born, including the Triple Helix. We have observed, if not participated in, the creation of a variety of funding programs, science and technology parks, collaborations, and most recently the evolution of Knowledge Innovation Zones in the form of Digital Cities, Internet Villages, Knowledge Regions and more. These zones cross technologies, industries, geographies and even virtual communities. They require new methods to measure progress - value drivers in a new Triple Knowledge Lens for the economy, society and infrastructure. Where we have been, where we are, and where we might be headed, including the new game in town - the art of collaborative advantage, was discussed.

NAVI RADJOU

Frugal Innovation: an Inclusive and Sustainable Growth Strategy

Frugal innovation is the ability to "do more - and better - with less". It is an inclusive and sustainable growth strategy that enables businesses and governments to create more economic and social value using fewer natural resources. Long practiced in fast-growing economies like China, India, Africa, and Brazil, frugal innovation is now being adopted in developed economies like US, Europe, and Japan, to respond to the needs of cost-conscious and environmentally-aware citizens. In his presentation, Radjou described how frugal innovation is rapidly becoming a global phenomenon driven by mega-trends like peer-to-peer sharing, circular economy, and the Maker movement. He showed how policy-makers and CEOs can use frugal innovation to reconcile inclusive growth and sustainability, and how leading engineering and business schools worldwide are training next-generation leaders on frugal innovation. He explained how increased government-academia-industry collaboration across regions can accelerate adoption of frugal innovation that can improve quality of life of all citizens worldwide and build a sustainable planet.

PROFESSOR LOET LEYDESDORFF
The Triple Helix of Knowledge Production, Wealth Generation, and Normative Control: A Neo-evolutionary Model of Innovation Ecosystems

When three sub-dynamics can operate as selection environments on the variations among one another, a communication field can be generated that proliferates auto-catalytically using each third actor as a feedback or feed forward operating on mutual relations in clockwise or counter-clockwise rotations. This model improves on the neo-Schumpeterian models of innovation systems in evolutionary economics and technology studies, while these models assume a dialectics or co-evolution, for example, between trajectories and selection environments. By extending the Lotka-Volterra equations from two to three dimensions, Ivanova and Leydesdorff (2014) proved the possible emergence of a communication field ("overlay") as an emerging (fourth) subdynamic. In the communication field, new options can be generated by sharing meaning provided to the events (Leydesdorff and Ivanova, 2014). This extension of innovative options can be measured as redundancy in terms of bits of information.

Petersen, Rotolo and Leydesdorff (in preparation) analyzed Medicals Subject Headings (MEDLINE/PubMed) of approximately 100,000 articles in three research areas including technological breakthroughs in medical innovation (honored with Nobel Prizes in Physiology and Medicine) in terms of "Diseases" (demand), "Drugs and Chemicals" (supply), and "Techniques" (control). Periods of synergy (operationalized as redundancy) can be distinguished from periods in which outward exploration prevails. Innovation systems (eg, at national or regional levels, but also sectorial ones such as in medicine) provide institutional mediation between wealth

generation, knowledge production, and governance as different perspectives.

In the case of China, Leydesdorff and Zhou (2014) found, for example, that the four municipalities play a mediating role above expectation between knowledge production and wealth generation. Note that the three dimensions can differently be operationalized depending on the research design (eg, as 'university', 'industry', and 'government'); but the dimensions have to be specified as analytically independent so that the three co-variations can be measured (Leydesdorff, Park, and Lengyel, 2014).

PROFESSOR WANG TAO
Construction of Total Ecosystem with Innovation and Entrepreneurship: the Practice Exploration of Constructing New Innovative Carrier in Yangtze Delta Region Institute of Tsinghua University, Zhejiang

This presentation mainly focussed on the construction of total ecosystem with innovation and entrepreneurship, with the case of constructing new innovative carrier in Yangtze Delta Region Institute of Tsinghua University. Firstly, the speech put forward the platform strategy of the university, industry, and institute, which serves as a new model for the Triple Helix theory, with analyzing a lot of types of innovations of region research institute, such as mechanism, management etc.

It then considered the case study of the Yangtze Delta Region Institute of Tsinghua University with the "Big Dipper" Model which is the integration of Government, Industry, Academia, Institution, Capital, Intermediary and Clientele, compared with the traditional Triple Helix model.

Professor Wang Tao concluded that the institute should fully rely on the advantage of THU Based on the demand of regional development, and construct the total ecosystem with talent, technology and resources, industry, capital and market, incubation, investment, and operation at the era of innovation and the times of entrepreneurship.

PROFESSOR WIM VANHAVERBEKE
From Open Innovation to Innovation Ecosystems

Open innovation - the ability of a company to source knowledge from other organizations and to find external routes to market for its own unused knowledge - is rapidly expanding as a management practice around the globe.

The concept will further gain popularity as it has been mainly applied in the context of large manufacturing companies but it is equally applicable to services. Its application range is much broader than originally thought: several companies - in the FMCG sector for instance - do not only collaborate on technology, but build profitable new businesses by combining their own assets with complementary assets of their partners including, brands, access to suppliers, and route to market.

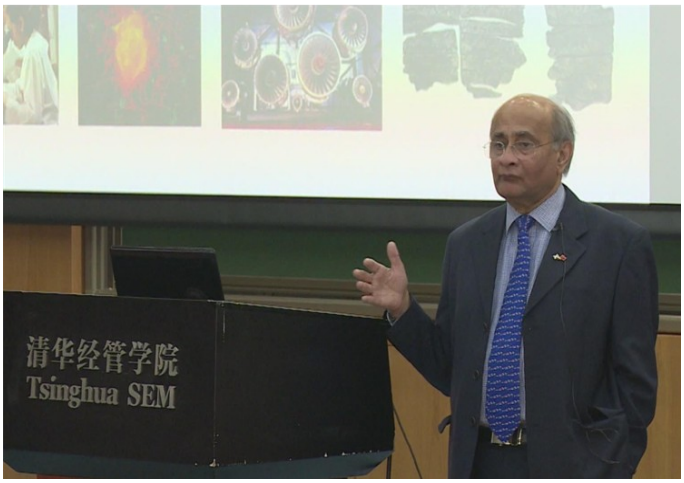
This extended version of open innovation is unexplored by most companies. Finally, companies can apply open innovation, be it in an indirect way, to commodity markets: this requires a broadening of the scope from technological knowledge to all possible strategic drivers in an industry. By extending open innovation in this way I connect this field of research with the emerging innovation ecosystems literature. Different types of innovation ecosystems and a focus on the importance of the organisation and the orchestration of ecosystems were presented.

ANDERS KARLSSON
University Industry Interactions in a Regional Context - recent case studies mapping competiveness of European Cities, and United States

In the knowledge economy, the role of the entrepreneurial university as driver of economic growth is gaining increasing recognition. Universities provide a region with an educated workforce; they contribute to local employment and the local economy, as well as to innovation in the local, regional, or wider geographical context. In a (institutional) Triple-Helix perspective, this represents a shift to a balanced Triple-Helix model, with universities acting in partnership with government and industry.

Traditionally, university-industry interaction is captured for instance via co-authored publications, patents, reference to publications in patents, joint industry contracts, technology licensing, or the number of start-up companies exiting from the university. The challenge is to put the results in context where a comparison can be made of the strengths between different research areas and cities/regions of different size, allowing cities or regions to be benchmarked against each other without distortions. Using Scopus, the world's largest abstract and citation database, as well as patent- and other data-bases, Elsevier is increasingly supporting with comparative benchmarking to the benefit of Triple-Helix actors, eg, policy makers, industry and other businesses, such as real-estate developers obtaining insights for policy or investment decisions.

Topics discussed studies done in partnership: one European-focused study done together with the Urban Innovation Network comparing eleven major cities, among them Berlin, Stockholm, Brussels, Manchester and Amsterdam; a second United States-focused study, looking at the competiveness of the state of Illinois done in partnership Illinois Science and Technology Coalition (ISTC). He then examined several aspects of the Triple-Helix knowledge exchange process, such as capacity to attract and retain talent, capability to commercialise research in terms of patents and patent citations. Of special interest were novel indicators of proxies for scientific quality in terms of citations and downloads of scientific works, which allow for a comparative benchmarking of cities of regions.



PROFESSOR TARIQ S DURRANI
The Role of Learned Societies and Professional Organizations in Nurturing Triple Helix Interactions for Knowledge Exchange

Traditionally, learned societies and professional organisations are scholarly entities that exist to promote an academic discipline or profession, through conferences, invited lectures, and academic journals that record original research. Learned societies also play a key role in promoting international exchanges and collaborative research.

This presentation highlighted the emerging role of the learned societies in promoting Triple Helix interactions. Through examples, the presentation discussed new paradigms for international cooperation which bring together industry and academia, catalysed by support from government, to develop initiatives that lead to contributions in support of economic growth; under the aegis of learned societies.

Using the experience of the Royal Society of Edinburgh, UK; the Royal Society (of London), UK; and the Royal Academy of Engineering, UK; the presentation illustrated the efficacy of the new approach. Working with Technology Innovation Centres, Catapult Centres, and Innovate UK, activities were illustrated that have led to innovation, technology transfer, knowledge exchange and commercialisation.

PROFESSOR JIN CHEN
University Industry Strategic Alliance in China

This speech mainly focussed on the topic of the University-Industry Strategic Alliance in China, including three parts: innovation and China's Economy, university and Industry Relation in China, and university industry strategic alliance for China. China is in the transition from technology follower to technology leader. In order to maximize the firm's collaboration efficiency, firms should place great attention on the use of unabsorbed slack resource, enabling better cooperation and technology transfer between firms and knowledge partners. The presentation put forward four policies to promote university/industry relations in China: implement collaborative innovation strategy, form a new university strategy, adjust university research strategy and provide high incentive for technology transfer. Then comparing with the west strategy, the talk provided a new strategy for China, such as collaborative innovation, innovative university. Finally, Professor Jin CHEN concluded that strong university industry strategic alliance in China should be provided.

RECIPIENTS OF THE BEST PAPER AWARD

Paper	Authors	Title
THC2015_001	Ana Carolina Kayser, Douglas Wegner, Rafael Stoffel Dal Ri	Management of collaborative innovation projects between universities and companies analysis
THC2015_017	Ng Su Juan Crystal, Ho Yuen Ping ,Wong Poh Kam	Research orientation and university-industry linkages: an exploratory study of researchers at the National University of Singapore
THC2015_033	GAO Yuchen,WANG Jingyi, HU Yimei	Private-owned venture capital's investment on university spin-offs: a case study of Tsinghua University based on Triple Helix model
THC2015_037	Yuen-Ping Ho, Chang-Chieh Hang, Yi Ruan, Poh-Kam Wong	Transferring knowledge from PRIs to SMEs via manpower secondment: the case of Singapore's GET-UP program
THC2015_043	Inga Ivanova, Øivind Strand, Loet Leydesdorff	The efficiency of Triple-Helix relations in innovation systems: measuring the connection between a country's net income and its knowledge base
THC2015_059	Julio A Pertuze	How do industry university relationships coevolve with firm strategy?
THC2015_083	Marina van Geenhuizen, Qing Ye, Mozhdeh Taheri	Hidden activity of university spin-offs in Triple Helix networks: the role of mediator
THC2015_094	Nenad Penezic, Jelena Jesic	Triple Helix model development in Serbia: the case of Educons University as an entrepreneurial university
THC2015_104	Riccardo Fini, Rosa Grimaldi, Azzurra Meoli	Institutional and contextual factors as fonts of entrepreneurship: the case of Italian university departments
THC2015_128	Yuan-Chieh Chang, Phil Yuhsing Yang, Tung-Fei Tsai-Lin, Hui-Ru Chi	Developing Pasteurian orientation for entrepreneurial universities: antecedents, mediation and performance
THC2015_131	Han Zhang, Yuzhuo Cai and Zhengfeng Li	Towards a typology of university technology transfer organizations in China

PRESIDENT'S CORNER

THE ENTREPRENEURIAL UNIVERSITY: LAUNCHPAD OF THE KNOWLEDGE ECONOMY[1]

HENRY ETZKOWITZ

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The University's entrepreneurial role, taking advantage of opportunities that appear through its customary teaching and research missions as well as an emerging third mission to advance innovation, is fundamental rather than accidental. Formerly only an indirect contributor to local economies through salaries, supplies, and services spend; universities directly contribute to economic development, formally transferring technologies, rather than relying on informal ties. The entrepreneurial university presumes a considerable degree of independence from and involvement with government, industry, and ecclesiastical sponsors. It seeks out the practical as well as theoretical implications of research, assists technology transfer and firm formation with training programs in entrepreneurship, completing a virtuous circle.

'Hotspots' in co-authorship data reveal deep intellectual structures and transformations at the industry-higher education coalface as "university" and "industry" scientists in research groups and their spin-offs and large firms and their academic collaborators operate as virtual hybrid entities (Zhou, Tijssen and Leydesdorff, 2015). An overlay, built on these implicit structures, has infused the university with new purpose, as many look to it as a source of innovation to be diffused to the larger society (OECD, 2012). A university technology transfer officer said that, "Each year I have 3,000 new inventors" (the student intake). Not that it was meant literally, but it was the potential for invention coming from an educational process. Attracting the best students and professors in fields with future theoretical and practical relevance is an academic and economic development strategy at one and the same time. Renowned institutions attain a new badge of academic status while up-and-comers find a pathway to recognition.

The entrepreneurial university supersedes and incorporates the contrasting nineteenth century Newmanian and Humboldtian academic paradigms, respectively focused on teaching and research. Whereas Dublin's Cardinal Newman celebrated the character building potential of the teaching college with faculty serving as role models for their students, Alexander Von Humboldt, founder of the University of Berlin, emphasized the research university's contribution to nation-building, with the humanities as well as the sciences contributing to this objective (Brander, 2006). Taking an even more central societal role, the entrepreneurial university expands academic roles from teacher, to researcher, to entrepreneur. Synthesizing a wide variety of data drawn from in-depth interviews, participant observation, archival research and secondary analysis into a common model, we analyze the role of the entrepreneurial university as Launchpad of the knowledge economy.

THE RISE OF THE ENTREPRENEURIAL UNIVERSITY

The rise of the entrepreneurial university occurs in tandem with the evolution of the social norms of science, from disinterested to entrepreneurial science. While the social norms are subject to historical variability, the technical norms of science are essential for epistemological validity (Merton, 1942). Classical humanistic knowledge is also a source of contemporary economic development. For example, a drama teacher at Southern Oregon State College initiated a Shakespeare Festival during the 1930's Depression, providing a student training ground that supported development of a nationally renowned theatre school through continuing ties. An arts cluster, with ancillary tourist facilities, made possible transition from a resource-based economy as Ashland re-conceptualized itself as a humanities town (Etzkowitz, 2014).

Changes in the structure of knowledge and the shift from industrial innovation to a knowledge-based economy drive government research funding policy and practice. Quantitative change in funding patterns morph into qualitative change in organizational innovations in teaching and research that foster entrepreneurship. The key elements include (1) the organization of group research, (2) the creation of a research base with commercial potential, (3) the development of organizational mechanisms to move research out of the university as protected intellectual property, (4) the

[1] Excerpt from *The Entrepreneurial University: Launchpad of the Knowledge Economy* (work-in-progress) For a specific case, see: Entrepreneurial Universities for the UK: A "Stanford University" at Bamburgh Castle. *Industry and Higher Education,* July 2010.

capacity to organize firms within the university, and (5) integration of academic and business elements into new formats such as university-industry research centres.

The first two elements are within the framework of the research university; the third is part of the transition from the research to entrepreneurial academic models; and the fourth and fifth elements are special features of the Entrepreneurial University. Elements one and two may also be institutional principles of a research university; it is the confluence of all four elements that make for a full-fledged entrepreneurial university.

The entrepreneurial university model is expressed in four interrelated propositions:

Proposition 1: *Interaction*	The entrepreneurial university interacts closely with industry and government; it is not an ivory tower university isolated from society.
Proposition 2: *Independence*	The entrepreneurial university is a relatively independent institution; it is not a dependent creature of another institutional sphere.
Proposition 3: *Hybridization*	The resolution of the tensions between the principles of interaction and independence are an impetus to the creation of hybrid organizational formats to realize both objectives simultaneously.
Proposition. 4: *Reciprocality*	There is a continuing renovation of the internal structure of the university as its relation to industry and government changes and of industry and government as their relationship to the university is revised.

Expansion of Traditional Missions

Universities creatively synthesize available resources in experiential learning programs, ranging from simulation to real projects with financial resources at stake (Jones-Evans and Klofsten, 1997). Teams of graduate students representing disciplines from across the university, present their solutions to problems posed by firms during Demo Day at the close of the year long Mechanical Engineering 310 course at Stanford. A new PhD program in the biological sciences, at the University of California Irvine includes training in intellectual property and business development, provided by the university's business and law faculties (2013). Entrepreneurship, intellectual property recognition, and research management training, is included in leading edge PhD programs, and incubator and accelerator spaces appear alongside laboratories and seminar rooms in academic buildings.

Stanford University, widely recognized as the world's leading entrepreneurial university, has underestimated its entrepreneurial potential. Stanford's Office of Technology Licensing (OTL) role model for the university technology transfer profession, performed limited outreach; so busy was it serving the university's cadre of serial entrepreneurs. A series of faculty, staff and student initiated translational research and entrepreneurial mentoring initiatives (Spark, Epicenter, Ignite, Biodesign and StartX) filled the gap during the past decade much as OTL's founding director, Niels Reimers, had addressed an earlier era's patenting shortfall. When university research administrators held that, "if its not broken; don't fix it;" aspiring student entrepreneurs saw room for improvement, founding the StartX Accelerator with student government and alumni support. The university's rate of spin-off creation increased significantly as Silicon Valley's ecosystem drew closer to the university's orbit by mentoring its aspiring entrepreneurs (Etzkowitz, 2013).

Impetuses of Entrepreneurial Academic Transition

Universities assume an entrepreneurial role and identity due to perception of opportunity, civic duty, and external pressures (OECD, 2003). The first step towards an entrepreneurial academic ethos is increased sensitivity to the economic potential of knowledge, whether scientific or humanistic, followed by a willingness to realize this potential. When a university first essays entrepreneurship, it may be inspired by an important discovery that was not patented, like a significant advance in Nuclear Magnetic Resonance Imaging Technology at Stony Brook University, a proverbial, "big fish that got away" according to John Marberger, the University's then President. A technology transfer office may then be created to protect intellectual property and market inventions.

On the demand side, a local firm, industry association, or government, may request assistance in solving a production or governance problem. On the supply side, devolution of the academic enterprise includes change from block funding as a matter of right in academic systems based on this principle to competitive research grants. A turbulent environment encourages academic researchers to manage risk by fund raising from multiple sources, introducing an entrepreneurial element into the faculty role as a matter of academic survival. There is also a shift in the center of academic gravity from departments of individual scholars to networks of research groups and centers to capture larger funds, often only available to such collaborations.

Paradoxically, expanded research funding as well as financial stringency increases uncertainty for existing players as teaching universities, incentivized by regional authorities, aspire to get into the game. Less research-intensive regions press for funding increase, recognizing its salience to economic growth, while research-intensive regions struggle to maintain pre-eminence. Demand for knowledge to promote disease cures and technological fixes for environmental crises create a hypercompetitive struggle for resources. An academic "steady state" envisioned by John Ziman (1994), following significant post-war expansion, is unlikely as contraction and expansionary forces oscillate, disrupting traditional academic structures.

From Informal to Formal Technology Transfer

The university's potential as a generator of discontinuous innovation opens the way to policy initiatives encouraging academic

institutions to realize economic value from their research. The first step is the development of organizational capacities to work with firms in solving their specific problems, through consultation arrangements that may be formalized in longer–term contracts. This phase typically winds down when formal arrangements offer little beyond what individual faculty members informally provide. Archives of letters of intent, Memoranda of Understanding are created, and payments may be made, but too often content is missing in these general arrangements.

Nevertheless, The MIT "Technology Plan" initiated during the 1920's, Mexico's UNAM Center for Technological Innovation in the 1980's, and the Pontifical Catholic University of Rio de Janeiro effort in Brazil in the 1990's, to develop contracts with firms provided a learning platform for more targeted initiatives. MIT's office to manage industry contracts was reoriented to manage government contracts at the onset of the Second World War, providing a template for a widespread system of university-government relations. The sponsored research offices that were created at American universities in the post-war came full-circle to industry when Stanford spun its Office of Technology Licensing (OTL) out of its research office in 1969.

A second step, the development of organizational capacity for university technology transfer, is based on research that produces useful results as an unexpected outcome. Results were traditionally conveyed through informal ties between professors and former students working in industry. However, a gap emerges when a firm is not interested and the inventor is unable to carry the commercialization process forward, or find someone to do it on his or her behalf. University technology transfer offices, are Janus-faced search mechanisms that winnow candidates for protection, identify licensees, and negotiate agreements. Originating as intermediaries, they have been internalized within the university's administrative infrastructure and diffused globally (Bresnitz and Etzkowitz, 2015).

A third step is the encouragement of start-ups based upon technologies that do not find a fit within existing firms or have greater potential for growth as an independent entity. Incubation candidates are drawn from both advanced technologies in emerging industries, or to replicate existing firms and fill gaps in expanding traditional industrial clusters. Entrepreneurship training programs, translational research and university venture capital initiatives, on the supply side, are coupled with regional initiatives such as Technopoles and science parks on the demand side, with incubator facilities sponsored by both sides. Just as a research ethos was universalized throughout academia, so is an economic role that was formerly limited to specialized academic sectors such as the US land grant universities and European polytechnics (Veysey, 1965; Artz, 1966).

Universities spawn start-ups of various kinds, both commercial and non-commercially oriented, with diverse economic and social effects, from advanced research in science and technology, and from traditional sources of knowledge in the humanities (Colyvas and Powell, 2007). StartX offers an opportunity to actualize the entrepreneurial potential in discoveries made in Stanford's research groups. It operates outside the official boundary of the university with students taking leave of absence to pursue entrepreneurial training as an extra-curricular activity As professorial opportunities become sparser, a start-up based on one's PhD project is an increasingly attractive alternative. For example, Bell Biosytems, currently located in the QB3 incubator at the University of California, San Francisco (UCSF), grew out of Caleb Bell's Stanford PhD; its early development stage assisted by StartX.

The entrepreneurial university has spread globally. Impetuses include perception of opportunity as well as loss of industry as in New England, Singapore, and Finland. Twente University in Holland, tasked with renewing a declining industrial region, identified itself as an "enterprising university" in the 1970's. Helsinki's Aalto University was recently founded to speed diffusion of the model. The concept may be introduced by new faculty members who have received their training in an entrepreneurial university, or by senior faculty who have made a sabbatical visit. In a reprise of the medieval pattern of fission of universities over religious schisms, students at the University of Ljublana, frustrated by the unwillingness of their university to develop entrepreneurial education, broke off and founded the Hekovnik start-up school, with branches in Ljublana and San Francisco.

Variations on an Entrepreneurial Academic Theme

There are several variants of the entrepreneurial university model, including but not limited to direct involvement in economic activities (Etzkowitz, 1983). Industrial research funding and receipts from licensing of intellectual property rights are small in absolute terms in comparison to government funding sources. Nevertheless, academic patenting, technology transfer and spin-offs are a long-term growth trajectory (AUTM, 2015). A charitable, eleemosynary institution is being transformed into a training platform for new organizations, both profit and non-profit. Following a venture capital model, enterprises were spun-off from Boston's concentration of academic institutions in the early post-war, becoming members of the Fortune 500, like EG&G, DEC and Ionics, before their merger or decline.

A civic university model promotes enhanced university engagement in society, but is largely limited to an extension of existing teaching and research roles, keeping traditional boundaries intact (Goddard, 2009). John Goddard's concept of the "civic university" signals that the university's role in society should not be seen solely through the lens of economic development, but should include cultural activities and the transfer of social innovations that may not have an immediately observable economic impact (2009, 11). Other scholarship on the "engaged campus" similarly points to activities such as service learning (placing students in volunteer roles for class credit), and other kinds of community partnerships as examples of the social impact universities can have on their surrounding region (Holland and Gelmon, 1998). Such partnerships are not just adjuncts to the university's primary goals of teaching and research, but are increasingly integrated with them as knowledge production becomes more multidisciplinary, collaborative, and problem-oriented (Hall and Tandon; Gibbons et al, 1994).

Finally, there is the sense in which "entrepreneurial university" is used by Burton Clark in his analysis of European universities extracting themselves from virtually total Ministry control down, to the number of students that may be recruited in each discipline, in order to achieve a modicum of autonomy and self-direction. Clark developed his analysis of the "entrepreneurial university" through a study of five European universities in the 1990s (later expanded internationally). Significantly, the entrepreneurial university refers to deliberate changes in the organization and operation of the university as an institution that actively and intentionally responds to societal changes. Positing an entrepreneurial university as a non-economic format, Clark focuses on the transition of the government-sponsored university to a more independent status (Clark, 1998).

Stages and Phases of Academic Entrepreneurship

These different conceptions of the university within the larger socio-economic system may be viewed as stages and phases in the development of the university as an entrepreneur, with each modality building upon the other, in a usual but by no means necessary order. In an initial phase (*University Entrepreneur One*) the academic institution takes a strategic view of its direction and gains some ability to set its own priorities, either by raising its own resources through donations, tuition fees, and grant income, or through negotiations with resource providers. European universities, that formerly received almost their entire income by government subvention, are undergoing the painful process of diversification, forming alumni associations to connect with their graduates and establishing fund raising offices, long a staple of US academia.

A prerequisite for the university taking the role of entrepreneur is the ability to set its own strategic direction. If a university system operates as it formerly did in Sweden where the Ministry of Higher Education decided how many students would be admitted each year to each discipline, there is hardly a possibility to have sufficient autonomy on which to base an entrepreneurial university. Universities in France did not have an independent existence until the 1970's devolution that occurred as a side effect of reforms made in response to the student protest movements of the 1960's. Until quite recently, the various faculties were directly linked to the National Ministry, and universities hardly had an organizational framework, let alone autonomy (Musselin, 2001).

A facilitative legal framework is a necessary but not sufficient condition of creating an entrepreneurial university. France changed its laws in 1999, legalizing academic entrepreneurship. Previously it was illegal for a faculty member to participate in spinning off an enterprise from their research. Indeed, the Innovation law went much further and provided significant resources to encourage technology transfer and firm formation. However, a study of a new university, established in a declining industrial region, found that these incentives were insufficient to create an entrepreneurial university in an inhospitable setting (Laperche, 2002).

Commercialization of Research

In a second phase (*University Entrepreneur Two*) the academic institution takes an active role in commercializing the intellectual property arising from the activities of its faculty, staff and students. In this phase, a university typically establishes its own technology transfer capabilities, in-sourcing them from firms to which they may have been contracted, such as the Research Corporation in the US, or through devolution of system-wide offices as in the State University of New York and the University of California to individual campuses. Universities with significant intellectual property potential, like Stanford, received an immediate boost in income from having their own staff in more direct contact with the faculty.

Similarly, research powerhouses, like Oxford, Cambridge, and Imperial in the UK, and Johns Hopkins, Yale, and Columbia in the US, quickly became leaders in technology transfer and firm-formation once they turned their minds to it and opened their pocketbooks. Universities with fewer research resources to commercialize, not surprisingly, take a longer time to ramp up. However, schools like Arizona State and the University of Utah, that have made tech transfer and firm formation an equal priority with education and research, have achieved higher rates of valorization than many of their resource rich competitors.

The University's Role in Regional Renewal

In a third phase (University Entrepreneur Three), the academic institution takes a proactive role in improving the efficacy of its regional innovation environment, often in collaboration with industry and government actors. In this stage, a university wishes to build upon these relationships, raise its profile, and play a strategic role in encouraging innovation in its region. This typically occurs through local actors from academia, industry, and government, coming together at the invitation of a respected person with convening power, to formulate and implement a strategy to promote regional development via a "High-tech Council" or "Knowledge Circle," often supported by governmental initiatives.

The scientific and technological innovation produced by universities is widely recognized as a contributor to both regional and national economic growth. Stated another way, universities play a role in national and regional "innovation systems," and a significant body of literature investigates this role. Researchers studying this subject have used a variety of methods to measure the economic impact that universities have on regions (Drucker and Goldstein, 2005). Universities contribute to regional development through the spin-off of new firms, or more indirectly, the cultivation of cultural norms that help foster innovation (Genasekara), perhaps through the participation of university employees in local and regional governance as they serve on boards and councils (Chatterton and Goddard 481).

George Mason University's rise is attributed to its involvement with regional business and political actors in the emerging high tech offshoot of the Pentagon in northern Virginia whose firms lacked an academic interlocutor (Ceruzzi, 2008). President Johnson saw the opportunity to develop IT and systems

engineering programs, interfacing with firms meeting US government systems engineering needs. Becoming active in the Chamber of Commerce, he gained the support of technology industry leaders and local developers for the university, and in alliance with them, played a key role in the region's governance while raising the university's level. On the other hand, a 'paradox of success' inhibits the world's leading entrepreneurial university from taking further steps given Silicon Valley's abundant firm-formation resources. "Stanford is a natural incubator" is the response to visitors inquires about the location of the university's incubator.

Is Silicon Valley Replicable?

Questions have been raised about the relevance of Silicon Valley to aspiring regions elsewhere. Rather than focusing on transformational technologies and formation of high-growth firms; they are advised to adopt a more modest strategy of using IT to raise the level of traditional industries and/or developing application niches of IT based on existing platforms rather than attempting platform development themselves (Brodolinl, 2015). Conceptualized as "smart specialization;" this follower strategy has become the European Union innovation policy. Surely, there is room for additional discontinuous as well as incremental innovation regions, globally?

While not every region can develop multiple technological platforms characteristic of Silicon Valley, why have more not appeared (Caspar, 2007)? Countries, like the UK, have universities that are the equal of Stanford and Berkeley, the academic linchpins of Silicon Valley. A green belt restriction on Cambridge's growth is an insufficient explanation as firms have jumped over these hurdles, locating in neighboring towns (Koepp, 2003). Oxford University is investing in a highly capitalized venture capital fund to fill the financing gap that has inhibited the Oxford Vale region. The "Golden Triangle" metaphor of London/Oxford/Cambridge is belied by hypercompetitive universities and shortsighted transportation policies, like the "Beecher cuts" that destroyed the "varsity line" between Oxford and Cambridge in the early post-war. While each leg develops significant spin-offs, commanding prices in the billions like Autonomy's purchase by Hewlett Packard, high growth firms are seemingly beyond reach (Lawton-Smith and Waters, 2015).

Boston and Silicon Valley emanated from Brownfield and Greenfield sites, respectively. MIT and Stanford were founded with a culture of innovation in their institutional DNA and attained world-class status in tandem with the development of their regions. Massachusetts's Route 128, the world leader not too many decades ago, was displaced by Silicon Valley (Saxenian, 1994). Boston's university complex, a creative source of innovative economic activity, continues to grow even as Silicon Valley's giant firms replace an earlier era's fluid networks as the region's dominant characteristic, suggesting regional leadership reversion as a future possibility (Etzkowitz, 2013).

We safely hazard the prediction that Silicon Valley is the leading edge of a knowledge-based innovation model that is subject to further development. The innovation pre-eminence of Silicon Valley is a fairly recent phenomenon. Not too long ago, Bell Laboratories, integrated within the AT&T telecommunications monopoly was the US innovation leader, along with its peers at IBM and General Electric. Elements of the Silicon Valley innovation eco-system such as venture capital firms focused on high growth potential start-ups, legal firms with start-up expertise, universities with porous boundaries hosting academic serial entrepreneurs are fairly well known. Zurich, Tel Aviv, London, Barcelona, Beijing, Rio de Janeiro, and Berlin, among others, are developing similar characteristics and may break through the "innovation barrier" inhibiting regions from becoming self-renewing (Etzkowitz and Klofsten, 2005).

Launchpad of the Knowledge Economy

In his *New Yorker* article Ken Auletta (2012) asked whether Stanford University and Silicon Valley had become too close, citing among other facts the participation of President John Henessey on boards of various firms that had grown out of the university as well being a successful entrepreneur himself. This is not a unique distinction as both a former Vice Chancellor of Newcastle University, and the incoming President of Tsinghua University had their start-ups, and we will no doubt hear of other academic leaders.

The converse hypothesis that Silicon Valley and Stanford are not close enough should also be explored. An iconic firm, Hewlett Packard, lost its ties to the university in recent years and is working to recover them, according to its director of university relations. On the other hand, design consultancy Ideo, founded by a PhD dropout, maintained its links, helping grow the university's highly successful Design School, providing part-time teachers and eventually its Director. Ideo's founder, David Kelly, a full Professor whose tenure was awarded on the basis of "impact," maintains offices and a busy schedule in both venues, shaping a virtual university/firm entity.

Whereas a full time faculty devoting their careers to disciplinary pursuits was the epitome of the ivory tower research university, an entrepreneurial university faculty has a mix of cross-disciplinary, interdisciplinary, internal and external commitments. The academic role is a bundle of tasks, pursued in varying proportions and integrated or separated in a variety of ways. The Brazilian "community universities" Feevale and Univale, dedicated to regional development, have established a matrix organizational format to organize these different tasks systematically. Interdisciplinary groups pursuing research to meet local needs are located in separate facilities from regular research and teaching activities. Faculty members divide their day between the two venues and tasks. Similarly, the University of California at Berkeley established a series of centers in the early post-war where faculty pursued extensive research activities apart from their departmental academic tasks (Kruytbosch and Messinger, 1968). UC Berkeley and other institutions continue to use the organizational structure of centers integrating different disciplines, as well as industry and academia, a phenomenon that has been described by Birx et al (2013) as the "open laboratory" format.

Academics operate in multiple worlds, simultaneously and successively, no longer necessarily giving up one world when they enter another. Indeed, industrial funds are often used to

supplement government funded research projects and vice versa. Entrepreneurial initiatives arise bottom up, top down and laterally in ever shifting patters. For example, Orin Hershkowitz, the head of Columbia Technology Ventures, the University's Innovation arm, noted that he looked forward to working with Columbia Professor Sia's New York City supported incubator project. Would any contemporary academic administrator say otherwise in an era where the Vice Chancellor of Oxford University finds time to attend a reception opening the Said Business School's new launch space for start-ups and give it his blessing?

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TRIPLE HELIX SCIENTIFIC NEWS

ARE GOVERNMENT INCENTIVES DRIVING AND INTENSIFYING THE FIRMS INNOVATION CAPABILITIES IN MEXICO?

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INTRODUCTION

The analysis of innovation has become a complex issue, since innovation is an interactive process, with no linear and systemic interrelationship (Cooke, 1996). Within the system of innovation are different stakeholders who participate in the innovation process and system that may influence interaction and collaboration among them. For instance, Sunitiyoso (2012) formulates a holistic and dynamic approach in formulating and developing policies to address a nation's problems that have to do with stakeholder's interactions and interrelations with each other. Such interactions are between universities, government agencies, ministries, and industries, in order to identify problems and find solutions to formulate better policies. Those approaches amongst others point out that innovation is not only dependent on firms, since interactions among stakeholders comprehend social and economic context, equally incentivizing policies plays an important outcome in the whole innovation system.

On the other hand, an enterprises innovation capacities traditionally measure and intensely research since the condition inside and outside organizations influence the development of firms' innovation. The capacity of innovation of a firm is a complex process that is influenced by internal and external factors. Innovation obstacles are extensively examined in a country perspective, likewise a firm's position, where firm´s innovation capacities are studied and comprehended by several approaches.

For instance, Elmquist and Le Masson (2009), and Guan and Ma (2003), establish that innovative capability allows the organization to adapt to competition, the market, and environment. Since innovation is a driver for economic growth and social impact, it can be studied from several perspectives.

The purpose of this paper is to have a general outlook and understanding of enterprise innovation activities, and recognise how firms interact in the innovation national system. Additionally, this study will focus on the effects of one of the leading government incentives that were specifically designed for enterprises. To make this possible, macro data, including reports and several government sources were used to analyse government funds, such as external outcome assessments. Due to the lack of information and data availability, enterprises were studied by main industrial sectors such as primary, secondary, and tertiary segments. It was not possible to study and compare each sector because information was not completely reported.

THE STATE OF ART

Today, innovation is a driver to build-up country competitiveness. A nation achieves technological advantage when it creates new knowledge, as research and development evolve to generate economic growth and social benefits. Innovation activity is shaped by a dynamic system of stakeholders who are connected, integrated, and interrelated; these are government, universities and enterprises, the Triple Helix system (Etzkowitz, 1997). Developed countries have built innovation capacities through specific and effective public systems and policy (Guan, 2015). Government policies can positively and negatively influence a firm's growth (Cooke, 1997). Additionally, there are several concerns regarding how government policies influence technology infrastructure to support R&D activities towards encouraging innovation in SMEs (Laranja, 2009). In addition, Šoltés (2014) argues that Small- and Medium-sized enterprises (SMEs) play an important role, and the approach to create conditions to foster innovation effectively requires the existence of functional innovation systems comprising of institutions, policies, and tools. Moreover, Radas (2015) studied and discussed that public instruments increase R&D expenditure to some degree, finding that most studies show positive effects on R&D intensity.

The Oslo Manual is a fundamental instrument that establishes innovation activities and how they can be measured. Innovation activities, according to the Manual, are those directly connected with knowledge and technology, such actions comes from R&D and the amount of investment. Several R&D activities accomplished by firms can lead to increased innovation capacities.

METHODOLOGY

This study has used documented information, such as assessment reports, scientific publications, and secondary information, to apply qualitative methods to identify if the innovation stimulus programme implemented by CONACyT has impacted enterprise innovation capacities, according to the Oslo Manual indicators. Additional statistical Government sources were applied, such as the economic census and special productivity reports which completed the secondary information.

As a final point to complement this research, interviews were carried out on selected public research centres that collaborate actively with enterprises in the PEI programme. The interviews identify in which public research centres contribute on collaboration and qualitatively collaborate on technology transfer with enterprises.

RESEARCH FOCUS

In Mexico, the Science and Technology National Council, CONACyT (Spanish Acronym), is a key public stakeholder to accomplish national goals regarding Science, Research, Technological Development and Innovation (SRTD&I). Government Ministries within CONACyT design public funds and incentives to reach the National Strategic Plans.

There are broad public schemes for SRTD&I that reach different purposes and objectives. One of CONACyT funding programmes concentrates on a firm´s innovation stimulus, which is called PEI (Special Innovation Programme, Spanish acronym). The programme has been supported since 2009, and is designed to build-up a firm's innovation capacities. The main purpose of this scheme comprises increasing firms innovation investment through technology development projects mainly connected with Research Centres or Universities. Additionally, PEI funding is one of the highest public subsidies or financial incentive assigned for a project among other incentives. Table 1 exhibits how the PEI programme has been receiving the highest funding from government comparing to other grants. Only data available was reported, since information varies in format and content each year. Other funds were not reported because their funding was much less.

The PEI programme has three modes and only applied for private organizations as project proponents. The main aims prevailing during 2009 to 2015 show four purposes, namely:

a) Increase enterprise competitiveness and innovation investment.
b) Increase value added from national industry.
c) Encourage collaboration between enterprise and academia.
d) Promote innovation culture.

The first PEI mode is oriented for projects based on collaboration from research centres (RCs), and Higher Education Institutions (HEIs). This type of stimulus is called PROINNOVA and there is no restriction regarding enterprise size, because projects must be accomplished only with a RC and or a HIE collaboration; the second type is INNOVAPYME which concentrates in technology innovation for Micro, Small and Medium Enterprise (MSME) projects which could be accomplish with or without collaboration. The third mode is designed only for large enterprises as a proponent and is named INNOVATEC. INNOVATC and INNOVAPYME projects could or could not be executed in collaboration with academia. Though collaboration provides an advantage, companies could be granted higher wages rates according with total project cost and PEI type.

PEI economic support varies according to mode, for instance a project can be subsidize by up to 50% of the enterprise project expenses, and could pay up to 75% for one or two collaborating entities such as a RC and or HEI. Furthermore, on average a project can receive more than one million USD dollars.

The core of PEI concentrates mainly as a collaboration incentive and increasing firm's innovation investment, because public funds allocated for each enterprise and a percentage of funds go indirectly to the RC and the HEI if collaboration exits. However, data is not available to know the value added for firms that were granted with this stimulus. Besides from external assessments, is not possible to specify accurately qualitative or quantitative the degree of impact and performance on the national innovation system. For this reason, supplementary data and information was applied for this study.

The first aim of this article is to present a general outlook of enterprise innovation activities and participation in the innovation system. The second purpose is to determine how PEI's has evolved, ever since PEI became the major governmental scheme in terms of the amount of funds and projects. A third intention is to find which industrial sector is playing a major role in innovation activities, and the forth aim is determine how the industrial sector has grown and its productivity.

Table 1 Leading government funds to foster SRTD&I capabilities

Government Grant Incentive Name	Amount of Million US Dollars	Period	% Variation with Respect to PEI
FORDECYT	$74.92	2009-2012	89.7%
FOMIX	$497.98	2007-2012	31.5%
SENER	$500.31	2009-2012	31.2%
PEI	$726.91	2009-2013	
Other Innovation Funds	$84.54	2010-2013	88.4%

Reference: Auto evaluation CONACyT reports www.conacyt,gob,mx

Due to the lack of government incentive outcomes and impact indicators, this study makes use of secondary information to complement data. Reports and statistics from the National Institute of Geography and Informatics (INEGI Spanish acronym) support this study.

The economic censuses of 2004, 2009, and 2014, and the productivity activity for the three main sectors, primary, secondary, and tertiary, were taken from INEGI's Information. To determine innovation activities, a special study called ESIDET was used to determine innovation activity in enterprises during 2010-2011. From the economic census and productivity factors, it was possible to determine industrial activity and performance. The ESIDET report specifies and reports OCDE innovation activity indicators. ESIDET shows firms innovation activities, and this study is the only one available in the nation, which measures the degree of impact of R&DI from enterprises. Additional information, such as CONACyT's self-assessment reports, and the external evaluation of government incentives apply for this research.

A related study helped to identify how public research centres have advanced on knowledge commercialization. Five interviews were carried out with RC directors; the purpose was mainly to identify barriers and opportunities when collaborating with industry. RC organizations purpose differs; some RC's advocate basic science, others are more connected with technology development and collaboration with the productive sector, and collaboration is mainly supported by PEI funds, because the PEI pays real engineering project hours in contrast with some other type of Ministries - CONACyT funds.

Findings and Interpretation

In Mexico, the Federal Official Diary specifies enterprise classification; the last modification published in 2009 defines the stratification of micro enterprises that involves ten employees, for small and medium classification depends on a factor that contains the number of workers, sector, and amount of income. In accordance with that classification, and taking into account the last economic survey, Mexico shows the following firm composition; micro enterprises comprise 95%, small firms are 3.6%, medium enterprises account for 0.799%, and large firms represent only 0.18%. The rate of growth according to a firm's stratification was positive and around 0.9% and 0.1% only for micro and small enterprises respectively between 2009 and 2013. Medium and large firm grow indices decrease between 0.1% and 0.9% correspondingly during the same period.

The classification of firms corresponding to the industrial sector can be divided into four large sectors as follow: sector 11 comprises agriculture, animal feeding and exploitation, forest, fishing and animal exploitation; sector 21 includes mining; sector 22 involves generation, transmission and distribution of electric energy, water and natural distribution; and sector 31-33 accounts for manufacturing industries. The rest of the sectors correspond to the tertiary sector (all services) and the building industry was included together in this analysis.

Among those sectors, the major activity as a function of number of economic units corresponds to the tertiary sector within construction that represents 88%, follow by manufacturing industry with 12%, subsequent by sector 11 with 0.5%, sector 21 with 0.07%, and sector 22 with 0.06%. The rate of growth of economic units between 2003 and 2013 is less than 1% for sector 11, 22 and 21, and for the manufacturing industry was approximately 2.23%, being the leading sector with highest rate of growth.

The manufacturing industry has an important rate of growth and income that have a key impact on the general industry in Mexico. Even though tertiary industry accounts for 88% of the economic units, this sector represents only 43% of total revenue, and manufacturing 32%. It cannot compare with the amount of revenue from the manufacturing subsector and tertiary subsector income, which are significantly inferior. For this reason, a further analysis on the manufacture industry was done to understand its composition and influence, as can be seen in Exhibit 2. This shows the highest percentage of the five foremost manufacturing subsectors, and how the impact of revenue drastically changes position versus economic units. As can be seen, the food industry maintains in the three foremost subsectors, either for number of economic units and percentage of revenue, because the food industry has a wider composition of different firm sizes. This does not happened with the manufacture of transport equipment and petroleum and coal products, where the size of the enterprise corresponds to large firms, which represent only 0.18% of the total economic units.

Exhibit 2 Contribution of the five foremost manufacturing subsectors according to the major percentage of number of economic units and revenue in 2013

Subsector	Percentage of Economic Units	Subsector	Percentage of Revenue
Food industry	35.3%	Manufacture of transport equipment	16.91%
Manufacturing of metallic products	14.1%	Manufacture of petroleum and coal products	16.14%
Manufacturing of nonmetallic minerals products	6.4%	Food industry	15.56%
Manufacturing of furniture, mattresses and blinds	6.2%	Chemical industry	14.55%
Manufacturing of garments	6.2%	Industry of basic metallic	6.49%

Source: www.inegi.org.mx

An additional indicator used for this study is the total productivity factor. This indicator, obtained by the value of production, was used to recognize which manufacture subsector provided the greater value through 2005-2011. Data was build and constructed by INEGI using diverse data sets, and in accordance with the recommendations of the productivity manual, OCDE provisions, and EU KLEMS experience.

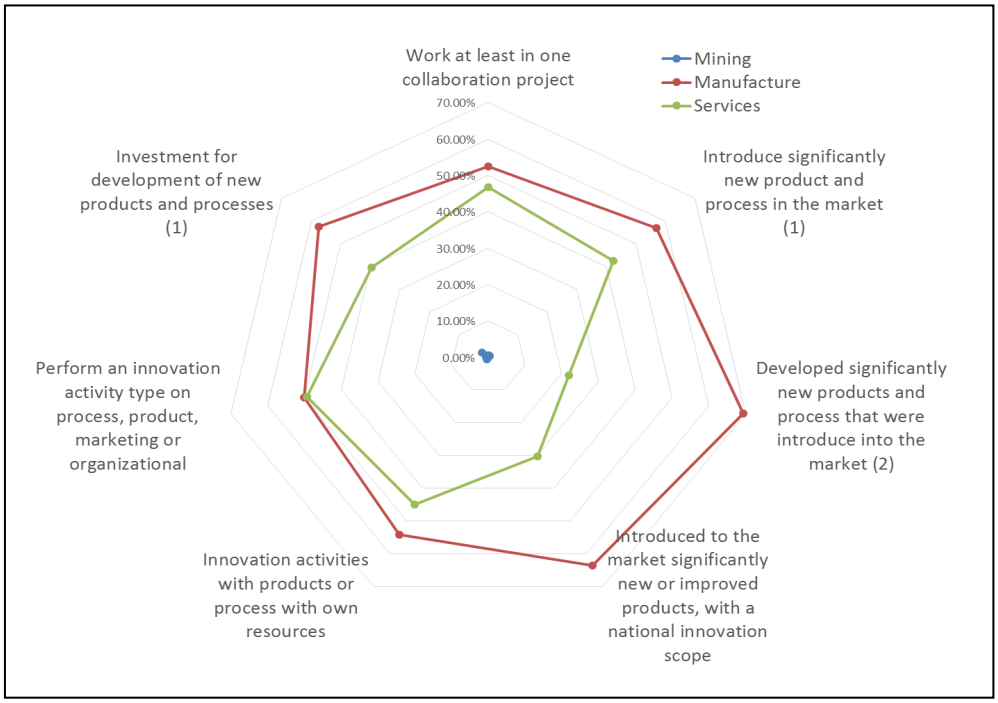
Exhibit 3 shows the five foremost subsectors in manufacturing, that show positive indices among others that display negative indexes through those years. As can be seen, the manufacture of transportation equipment has the highest average index, as well as, the major percentage of revenue. The classification of manufacture of transport equipment corresponded mainly to the automotive industry and suppliers that have an active participation in foreign markets.

Exhibit 3 Average productivity factors of the five foremost manufacturing subsectors (2005-2011)

Manufacture Subsector	Average Productivity Indicator
Drinks and Tobacco	0.04
Machine and equipment	0.12
Computer, communication, measurement and other equipment, electronic components and accessories	0.11
Transportation equipment	0.89
Metallic products	-0.10

Source: www.inegi.org.mx

Exhibit 4 Firm's motives to carry out innovation activities
Percentage of enterprises by sector



(1) includes product, services, and methodologies (2) developing new products and processes without any collaboration

Source: ESIDET 2010-2011, www.inegi.org.mx

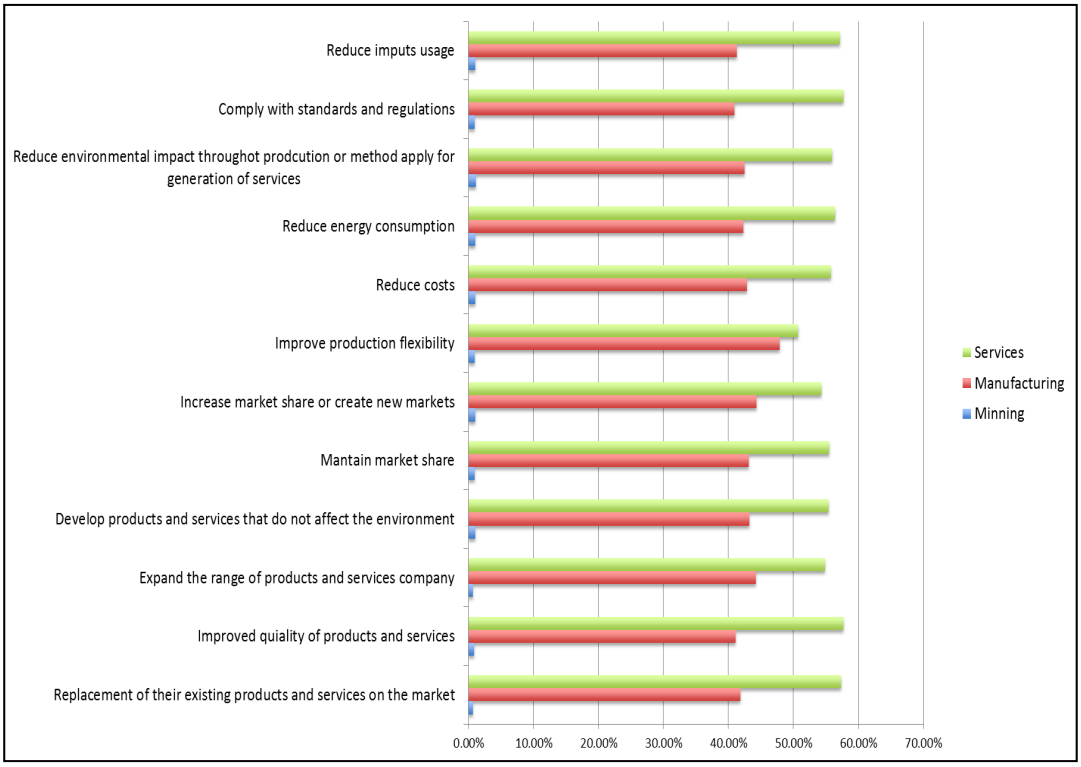
With this classification, we can confirm that the manufacture industry is fundamental for economic development and growth in Mexico with the five foremost subsectors that drive growth displayed in exhibit 2.

The indicators for innovation activities where complemented by the ESIDET study which presents a section of OCDE indicators. Results were grouped and presented in exhibits 4, 5 and 6. Exhibit 4 describes the motive of enterprises to carry out innovation activities, and it can be demonstrated that 60% of the manufacture industry have a major interest in accomplishing innovation activities in contrast with other sectors.

The main reason for firms to undertake innovation activities are presented in Exhibit 5. This shows that the manufacture industry, as well as, the tertiary sector, accomplished percentages greater than 40%. However, manufacture firms think more about the importance of flexibility in production (47.92%) and expanding the range of products and company services (44.23%), while tertiary firms look to comply with regulation and standards (57.74%) and improved quality of products and services (57.33%).

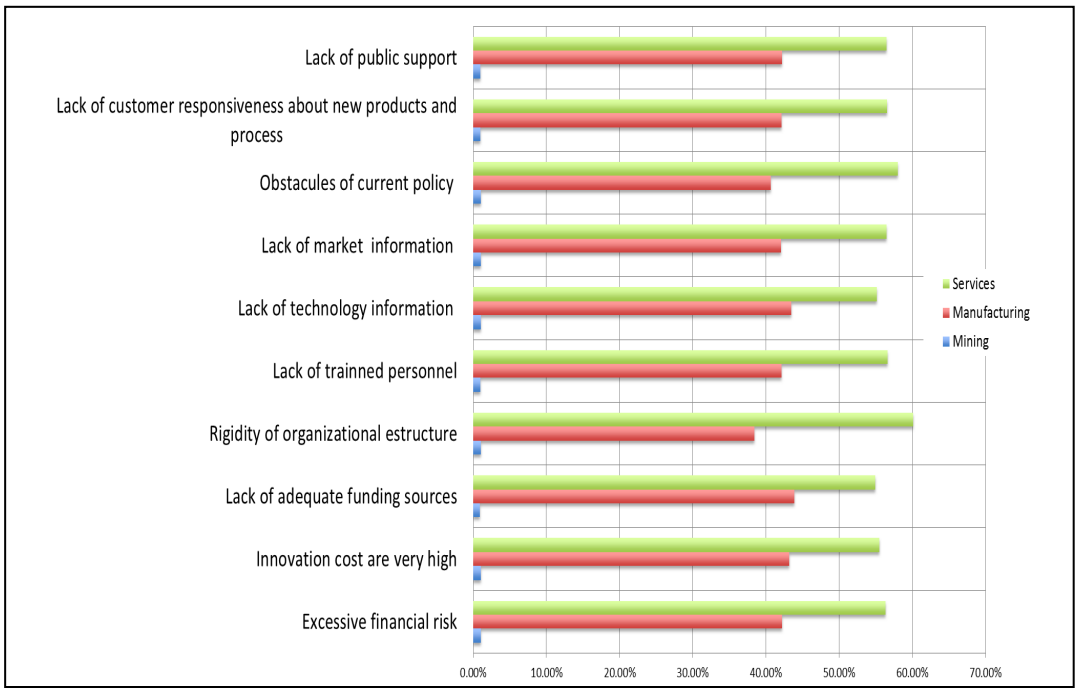
Furthermore, exhibit 6 illustrates the percentage of enterprises that manifest difficulties to impede innovation activities. In this table the highest percentage that firms reported are over 40%.

Exhibit 5 Main innovation purpose that firms accomplish by industrial sector



Source: ESIDET 2010-2011, www.inegi.org.mx

Exhibit 6 Percentage of enterprises that reveal type of difficulties that inhibit innovation activities



Source: ESIDET 2010-2011, www.inegi.org.mx

Indeed, the manufacture firms care about all difficulties, though the major percentage concentrate on the high cost of innovation (43.25%), and the lack of funding (43.88%), while the service sector responses concentrated on obstacles of current policy (58.02%), and rigidity of organizational structure (60.14%). Even though the responses differ, it can be viewed that problems have external and internal contexts. External drawbacks refer to the system.

The PEI performance evaluation studies come from public entities such as the National Council of Evaluation of Development Politics, CONEVAL, while other reports come from public or private entities. It was reported that the PEI programme has been intensely evaluated to determine performance and impact. Results from those evaluations pointed out the following issues: there is no real definition of what involves technology development; there are not indicators that can be directly attributable to programme results; consequently impact cannot possibly be identify, there is no impact information or indicators discernible to know whether or not companies have generated innovation, or how such firms granted with PEI had built innovation capacities. Some other significant problems reported were: lack of project results information, and redefined criteria and evaluation methodologies for project selection. Recommendations include potential target firms that can potentially developed innovations, but have not been incorporated as a target for this programme.

Through the PEI, CONACyT have decreased 3,373 companies during 2009 to 2014; from the same period, the number of enterprises supported by the programme has risen, with an average increased rate of 9.02% each year. Regarding the total amount of funding, it is shown an average increase rate of 21.5% each year, starting from around $109 million dollars in 2009 to about $260 million dollars in 2014. Exhibit 7 shows the number of projects approved in each programme from 2009-2014. It can be seen that the PROINNOVA funding mode prevails collaboration with RCs and HEIs, and the exhibit shows that collaboration have quadrupled with an average number of project per year of 253.

Besides, INNOVATEC shows that large enterprise project numbers have decreased with an average number of projects per year of 173, while small enterprises have an increased rate with an average number of projects of 203 per year.

The PEI programme has national coverage from 32 states there are eight top Mexican States that receive greater public resources. The quantity of funds and number of companies participating varies from programme modes and years, so the sponsorship amount varies from $2 million to $6 million dollars for such top states. Such subsidies have gone mainly to Nuevo Leon, Coahuila, Jalisco, Estado de Mexico, Distrito Federal, Guanajuato, Queretaro and Baja California. That is quite rational, since those States have a leading concentration of industries. Additionally, during the same period, it is shown that the PROINNOVA mode have received half of the funding with 51% of resources, 26% INNOVATEC, and 24% accounts for INNOVAPYME. PEIs have supported all type of enterprise collaboration to RCs and HEIs. This indirectly increases R&D capacities. Additionally, it was observed that sectors that have been benefited from PEIs through enterprises, have obtained more than two incentives were the automotive industry, oil and gas, information technologies sector and pharmaceutical industry.

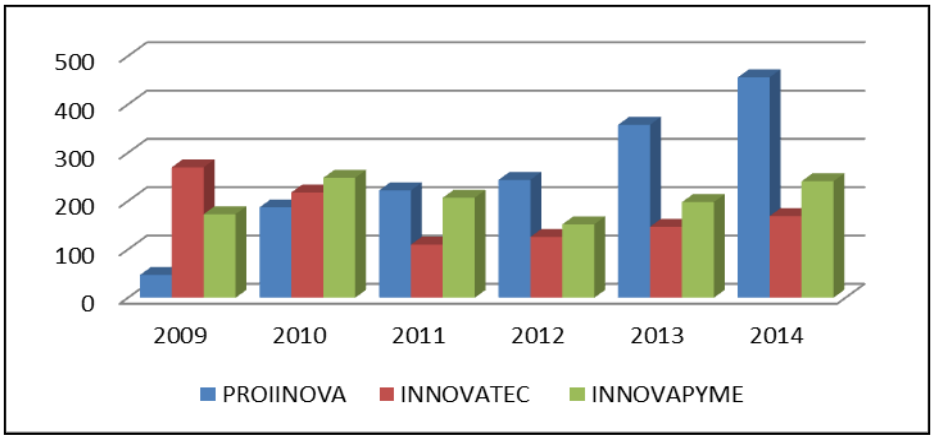
Public RC interviews showed few centres are advocated for PEIs collaboration in 80% from whole R&D activities. Additionally, few PEI projects have ended in a technology commercialization scheme with companies, since PRCs have differences on intellectual property policies for such collaboration projects. Outcomes from the RCs in terms of technology commercialization are presented in exhibit 8:

Conclusion

It can be concluded that the manufacture sector is the leading sector with above 2% of increase in rate of growth of economic units with an important contribution in revenues. The transport equipment subsector has the highest productivity index and revenue rates when comparing all sectors, including the leading sector in the PEI participation programme.

It has been demonstrated that the manufacture and tertiary sectors achieve a wide range of activities in innovation. Nevertheless, is not possible to determine how innovation capacities are building up in terms of system, and how it will affect macroeconomic performance because the majority of sectors have negative productivity average rates. Although productivity indices are not directly linked to innovation stimuli, they can help to view

Exhibit 7 Number of firms projects approved by the PEI programme in three modes



Source: www.conacyt.gob.mx

Exhibit 8 Interview results from Public Research Centres

VARIABLES	OUTCOMES
Institutional development for industry – academia collaboration	Collaboration with industry depends on organisation foundation objectives. Research institutions advocated to solve technological problems are more active on R&D and collaboration projects with productive and public sector. Specifically on PEI, which is the only incentive that allows funding to wage engineering hours for RC? For those centers, R&DI projects rise to 60%-90% of their main activities.
Patent activity	Determined by project negotiation, project purposes and intellectual property policies for each centre.. IP could be 50%-50%, or 80% (for RC), 20% (enterprise), or 100% for enterprise contracts projects. Patent applications varied according to RC, and the rank of patent application varied from two and up to ten each year.
Technology commercialization	Modest activity 1-2 licenses, unique opportunities.

Source: IPN Research Project 2014012

productivity as a whole in macro economic performance.

It can be concluded that PEIs have pushed firms to increase innovation investment, since the number of projects reflect an increase on firm's participation and investing. Viewing national innovation system as a whole, project results could not envisage performance and impact in economic terms, how firms developi innovation capacities, or how these capacities would add value. Collaboration has definitely increased because PROIINOVA, which is designed for foreseeing collaboration, have reached more than 400 projects compared with the other two PEI modes.

In case of RCs, it is envisage that they will become a strong technology development partner for enterprises, due to the fact that they have S&DT capacities, taking into account that major firms, specially small and medium firms have not been able to gain resources to maintain their own R&D infrastructure. Short advances in terms of technology commercialization were also deduced from interviews.

PEI's from 2009 to 2014 had not measured or showed an indicator directly associated with economic growth and impact. Additionally, it is not possible to identify value added from national industry. Neither has determined how the programme has promoted and embeded the innovation culture. Little change from the PEI programme has been done even though external assessments denote important points such as to identify firms with innovation potential, who innovate or conduct R&TDI activities.

Finally, in terms of policy in the innovation system, it can be inferred that the PEI programme has not really evolved in its objectives and external recommendation, since it has not been possible to outline even a competitive economy.

Policy Implication

Very few changes have done in PEI's design, however, policy makers could enforce and specifically measure stakeholder's articulation and integration. Interaction could not certainly ensure efficiency and performance, or specific impact, since the whole system is disaggregated, pulling in all directions and goals. Besides, it is important to design programme indicators that help to understand if government funds are really introducing a change or bringing tangible benefits.

Further Research

It is quite a challenge to understand and determine a firm's innovation needs and capacities and how government incentives impact on the whole system. A particular study could be carried out by industrial subsectors using specific methodologies that enable recognition and measurement of tangible innovation capacitates inside an organization. Other research studies could focus specifically on how the PEI incentives have supported innovation directly, and measure the degree of value added for their own sector. Finally some additional studies on technology and knowledge management could be carried out.

Acknowledgement

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State Logic and the Government's Dominant Role in the Formation of the Shanghai State Electric Power Industry (1945-1965)

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Abstract

The focus of this paper is the Government's dominant role in the formation of Shanghai state electric power in the transition period (1945 -1965) for government administration, the economic system and the ruling party, based on "state logic - putting national interests above all else". This is a case study of government-driven Triple Helix. When World War II ended in 1945, the American-run Shanghai Electric Power Corporation struggled to maintain electricity production. The Shanghai municipal government decided to form the "Shanghai Joint Electric Power Corporation" in 1948, but the project was not approved by Kuomintang's central national government. However, the People's Republic of China Government nationalized the key plants in 1950 that led to the establishment of a state electric power enterprise.

Introduction

The Triple Helix concept arose from an analysis of government's relations with university and industry, and the role it played in innovation (Etzkowitz and Leydesdorff, 1995; 2000). The study of the university-industry-government Triple Helix model dates back to the initial exploration on government-industry interaction by Henry Etzkowitz (1984). He highlighted government's critical role in the development of new high-tech industry, including the American government's key investment in developing the nuclear industry after World War II. He indicated that the solar industry did not receive much support from the government. He argued that the United States decided to develop a nuclear power industry in part to justify the continued development of its nuclear weapons program. One result of this decision was the repression of solar energy technology.

> *Nuclear energy became institutionalized as a "big science" in the United States immediately after the Second World War. Government research laboratories, university engineering departments, and divisions of major industrial corporations were committed to developing nuclear energy. Solar energy, meanwhile, remained a "little science." Solar research was limited to researchers at small companies and universities, with only occasional involvement by government and large corporate research laboratories (Etzkowitz, 1984).*

Etzkowitz and Leydesdorff defined this historical situation as a specific model of Triple Helix configurations, in which the nation state encompasses academia and industry and directs the relations between them (Etzkowitz and Leydesdorff, 2000). Even in the USA's social system with a free market economy, government plays an indispensable role directly and indirectly in industrial development, in war and peacetime (Etzkowitz, 2000). In contrast, state ownership is still dominant in the social system of the P R China, where universities and industries are mainly owned and run by the government - Statist model, or government-driven Triple Helix, is formed for innovation and sustainable development (Zhou, 2008; 2015).

Inspired by the studies above, this paper explores government's dominant role in the development of Chinese industry, on the grounds of the research in government-driven Triple Helix (Zhou, 2011), and a doctorate dissertation, "The research on electrical industry in Shanghai 1945-1965" (Gao, 2014), in which the state-of-the-art development of the Electric Power industry in Chinese's modernization has been analyzed based on the theme of "state electric power".

As an important part of "the Making of Modern China", the development of the electrical industry has attracted academic attention from the diverse fields of history, politics, and economics. It is has been shown that the electric power sector, as a fundamental support of national industrialization, interacts with the government administrative apparatus under the leadership of the Communist Party of China (CPC) to achieve industrialization. Since individual units in the electric power industry made dramatic contributions to this development, the government's dominant role in electric power higher education is investigated to confirm the government's 'pulling effect'.

Considering the Chinese electric power industry as a typical instance, and looking into its history, this research focuses on three basic issues:

- The government's dominant role in Chinese electrical industrialization: how is the top-down dynamic mechanism driven by the government in Shanghai;
- State logic of the electric power industry development: why different, even opposing, administrations, Kuomintang, and the CPC made similar decisions for nationalizing this industry

although different capital input and resource allocation methods were chosen;
- The development of China's Triple Helix model under state logic and government drive: how are electrical higher education institutions and electric power enterprises are managed or administrated by the government?

The Chinese electric power industry, with a complex industry capital composition, was established in order to provide the power supply infrastructure for lighting. Government originally did not have a dominant power position in the development of the industry. The government-oriented strategy arose from the Kuomintang government's plan for the construction of power stations in the home front during World War II.

A 'state logic' of electric power was formed in the postwar period, and has systemically been implemented both in Chinese Taiwan and mainland China since 1949. Furthermore, under Communist Party governance, China has developed an educational system within the electric power sector, and brought to bear the intellectual and technological resources to work in the development of a national electric power system.

Electrical Higher Education Institutions (EHEIs) have played a critical role in the industry's growth. The EHEIs development in China can be divided into three periods: the prior period (1950-1966), the Culture revolution period (1966-1978), and the latest period (since 1978). In all these periods, both the political power and state logic have affected EHEIs' development. The trajectories of the Triple Helix interaction such as university-industry linkage, government-industry relationship, and government-university relationship, have also been oriented by political power and state logic.

The domination of government is a key element for a fast-developing country, especially in the field of foundational industries and infrastructure. Electric power is viewed as a national strategic resource, and thus the electric power industry is recognized as a state-controlled industry. As the industry and the EHEIs are both owned by the state (government and the CPC), it clearly exemplified a statist model, a government-driven Triple Helix.

Literature Review

In the early stages of the Chinese electric power industry, facilities were owned and operated by foreign capital, native merchant, regional community, or local government (Wang, 1997; 2002). The diversity of investment sources led to a frequent circumstance of electric power companies and their plant alternating their ownership between private management and public-owned control, partially supported by individual investors when there was a shortage of funds.

Before the 1930s, the electric power industry, representing the power supply infrastructure for lighting, had gone through a period of privatization. Yingjia Tan described the nationalization of the electric power industry driven by Party-State authority in 1937-1957 as 'Revolutionary Undercurrent' (Tan, 2015). Tan's research investigated the Chinese electric power industry with different historical scenes including North China in the Sino-Japanese War, Tennessee in the Pacific War, and Chiang's Taiwan in 1950s. Tan argued that, under the situation of 'War Time', national authority controlling grid construction and price setting were aimed at getting energy security and electric constancy driven by limited time and resources, although the plan of 'State Electric Power' consumed the significant wealth of the nation.

Since 1949, 'State Electric Power' in the Chinese Mainland had been driven by measures that were concerned with unifications and mergers in the field of industrial capital, fixed assets, transmission network, and sales management. Within the regional economic plan, Shanghai became the center of the electrical system of East China, instead of an isolated urban area between the provinces of Jiangsu and Zhejiang (Jun, 2008). Jun's research clarified that 'State Electric Power' implemented a synergetic strategy on electrical construction that realized holistic enhancement in an across-province region, instead of separate improvements in developed cities. What's more, before the global electricity reform in the 1990's, electricity provision in Asian developing countries was an activity dominated by the state. Electricity's central role in industrialization and modern living standards, made electrification an urgent priority for every national government. For the majority, regardless of political system, government was seen as the appropriate vehicle for the construction and operation of national electric grids, and the only entity capable of mobilizing the necessary human and financial capital (Williams and Dubash, 2004).

Methodology

A government-industry-university interaction Triple Helix is used as a basic framework in this paper, with a focus on a top-down government role in developing the electric power industry as a national strategic resource. Combining historical and logical methods based on facts and narratives from multiple media data resources, such as archive documentation on China's electric power industry development; this article analyzes the effect of the government drive on a state strategic industry. Some actual cases and systemic data are used. Moreover, the exploration targets 1945-1965, because it is a period of Chinese state electric power system formation. Since Shanghai is the city that first utilized electricity in China and became a typical city that can reflect what took place in other cities hereafter, it is chosen as an exemplary case.

The Statist Model in China: A Government-Driven Triple Helix

The path to the Triple Helix formation begins from two opposing standpoints: a statist model of government controlling academia and industry (Figure 1), and a laissez faire model, with industry, academia, and government separate and apart from each other, interacting only modestly across strong boundaries. From both of these standpoints, there is a movement toward greater independence of university and industry from the state. The interaction among institutional spheres of university, industry, and government, playing both their traditional role and each other's, in various combinations, is a stimulant to organizational creativity. New organizational innovations especially arise from interactions among the three helices (Etzkowitz, 2008).

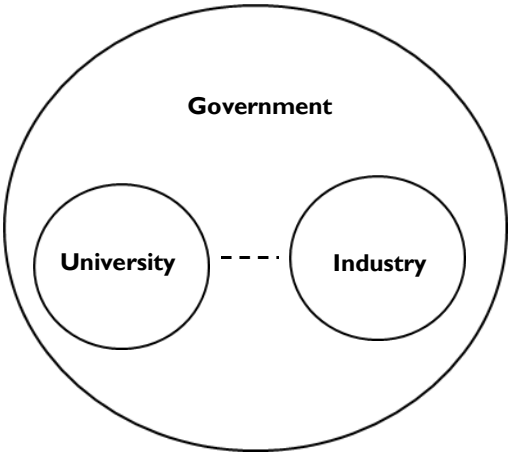

Figure 1 the Statist Model

In a Statist model, government is the dominant institutional sphere. Industry and the university are subordinate parts of the state. When relationships are organized among the institutional spheres, government plays the coordinating role. In this model, government is expected to take the lead in developing projects and providing the resources for new initiatives. Industry and academia are seen to require strong guidance, if not control. The statist model is characterized by specialized basic and applied research institutes, including sectoral units for particular industries. Universities are largely teaching institutions, distant from industry. The model relies on government to link each other in a top-down way (Etzkowitz, 2008).

STATE LOGIC: FROM PROPAGANDA AND WHITE BOOK TO SOCIALISM TRANSFORMATION

A statist model caused by dominant state-ownership, hierarchy administration, and coordinated resource arrangements, characterized as government's "pulling" role, rather than "pushing", in a technology following society. In this study, state is considered as a concept that consists of four elements: relatively stable land size, relatively stable population, and relatively stable political and economic system(s); and the culture and history. A State is defined as the sum of politics, economy, and culture, forming a group of people in a piece of land, including its history. According to the "*Modern Chinese Dictionary*" *(2012),* Government is a political institution that is defined as "authority of a state" and responsible for the administration; and Party is a political organization that represents a social group to achieve its benefit per se.

"State logic" has three cornerstones:

- All wealth belongs to the state, Ò state-ownership.
- The national interest is above all else, Ò Government becomes the highest authority.
- The Party and the State are one, and the Party represents the State, Ò the supreme leadership of the ruling party.

"State Logic" mentioned here respects the reality that government administers significant economic sectors with foundational strategic resources, eg, energy, transportation, and communication. It is necessary to understand State Logic through historical backtracking, in which plan designers or policy makers are viewed as specifically political authorities. The Party and government take the lead and have a pivotal impact on the evolution of the country.

Chinese modernization and industrialization was launched through the Westernization Movement (1861-1895), and New Policy in the late Qing Dynasty. The ideology of the modern nation was first clarified in the form of authority by Sun Yat-sen in *The International Development of China (《建国方略》),* published in both Chinese and English in the 1920s. In the book, Sun as one of the founders of the modern nation of China, described a dual pattern of industrial economy as follows:

> *Development of Chinese industry should depend on private proprietorship and national operation both. The business accessible or more appropriate to individuals than state ownership is supposed to be open to private economy. By national awards and legislative protection we shall pursue to realize the prosperity of personal enterprises (Sun Yat-sen, 1928).*

Sun had a blueprint for the modern country based on his *Three Principles of the People (三民主义)*, ie, *"Nationalism" (民族主义), "Democracy" (民权主义),* and *"People's Livelihood" (民生主义)*, which was never realized in his time. The quotation above seemed a description of an open space for a private economy whose future would be actually delineated under an institutional and executive atmosphere. According to the Principle of People's Livelihood, the government of modern China should cultivate state capital instead of private economic composition; the development of the latter would be governed by the policies of restriction. In the decade following the 1920s, multiple sources of capital poured into the industries that propelled them to prominence. NB. This was called the "Golden Ten Years" of Chinese economy before World War II.

The year of 1937 was a very critical point in modernization history, because then government reviewed economic achievement and drafted the modernization construction of China, while Japanese military power increasingly invaded the land. Considering the electric power industry growth as a national strategy, the Kuomintang Government denoted its reliance to both public-owned and private industry without any division of province and city, in order to keep the domestic balance between supply and demand, and the State would not remove private ownership but rather expect economic improvement through the private sector.[1] Moreover, central government worked towards taking administrative control gradually to drive the electric power industry without any interference from private enterprises.

[1] ianshe weiyuanhui quanguo dianqishiye zhidao weiyuanhui 建设委员会全国电气事业指导委员会 [Electric Utility Regulation Board of The National Construction Commission],"*Zhongguo dianli*" 中国电力 [*Electrical China*],Vol1, No.1, (1937), 1.

The *National Economic Plan Committee of Kuomintang Central Department (国民党中央党部国民经济 计划委员会)* restated the national strategy for developing the electric power industry, and proposed that "massive power plants should be operated under public ownership, and that electric power distribution and sales are relatively accessible to local communities or firms to manage"[2]. The reality of the situation was that the domestic private electric power industry was indeed on a huge scale, with more than a 92% share held by individuals in total Electric Power facilities, and more than 72% in total generating capacities. Therefore, government decided to modify private business by supervision and prohibition in case of the abuse of credits from the public and, on the positive side, by communication and cooperation to regulate its development. On the other hand, government aimed to push small electric power plants to combine with each other, or turn to operations for transmission and distribution.

The Sino-Japanese War interrupted the regular progress of China's modernization, while the republican government launched electrical construction to support mainly war defense and military industries. After the strategic retreat to Chungking, the Kuomintang Government in Mid-West China had invested and built the massive electric power infrastructure. At the end of the War, the nationalization of China's power grid became, aiming at state reconstruction, a postwar continuation of wartime energy policies (Tan, 2014). The new President, Chiang Kai-shek, reaffirmed guidelines on industrialization in China by retrospection about what the Father of the Nation (Sun Yat-sen) had said:

> *"The tendency of modern economics is to substitute economic concentration for free competition". His plan for dealing with this situation was: 'In China, two revolutions must be launched simultaneously: the replacement of hand labor by machinery, and unification under government-ownership'. Only if this policy is adopted can Chinese industry hope to achieve unimpeded progress" (Chiang, 1947).*

Chiang deemed that politics were affected and even controlled by economics in capitalist countries. If China desired to replace a hundred-year-old, restricted, unbalanced, semi colonial economy, with a free and independent economy that would satisfy the requirements of national defense, the state must employ political power to guide economic development. China had been subjected to the bondage of so many unequal treaties, since the late Qing Dynasty that she could not compete with the advanced industrial nations and therefore needed to adopt a protectionist policy with regard to foreign trade, and a policy of economic planning with respect to her industrial development.

Under the economic circumstance above, the ruling Party of the People's Republic of China considered that private capital alone would not be sufficient to operate on a large scale, or to compete with the trusts and government-operated enterprises of foreign nations. This was the great weakness of laissez-faire economic theory and why it was unsuitable for China. However, financial shortage and political struggle stalled the implementation of the national reconstruction plan (or White Book) drafted by Chiang and Kuomingtang in the field of key industrial sectors, to direct the next two decades of development of Taiwan. Meanwhile, China's economic construction in the Mainland was steered by the waves of socialistic transformation and the Chinese Communist Party government under different political faith and diplomatic situations from Taiwan, also adopted State Logic to push the industrialization in the Chinese Mainland after 1949.

For early modern Chinese industries, the private economy, (surviving among domestic oligarchs relative to old empire and overseas capitalists landing with warship and technology) has never played the role of foundation, which needed a powerful leadership to build. Government constituted by political leaders and intellectual elites was the most suitable choice to lead the industrialization and make the strategic decisions. Since the 1920s, there was an evolution about State Logic happening continually with political climate change. At the very beginning, founders of modern China judged private capital and business as important as state properties. Chiang's government in the 1940s, started to integrate, especially in the field of public utilities, private ownership that could not support itself with interference of state capital. Postwar policies about national reconstruction were the continuation of wartime, and the tendency of state operation extended from public services and facilities to basic industries, such as the national post, metallurgy, military project, artery of railway transportation and large-scale hydropower station.

Under the leadership of the CPC, the economic system based on socialistic state ownership was built quickly by the movement of Socialistic Transformation in the 1950s, and the government's decision on economic development and industrial system establishment was carried on in a top-down way by interconnected national economic plans with five-year expiration for each. By the first half of the twentieth century, the government-driven model in China had been set up gradually by several generations of political leaderships.

How the Chinese government realized state logic in the electric power industry will be explained in the following sections.

State Electric Power: from the Rejected Project of Shanghai Joint Electric Power Corporation, to the Formation of the National Electric Power System

State Electric Power has two relevant implications: (a) all the electric power resources are state-owned; and (b) the development pattern of the electric power industry depends on the powerful authority of the state. In terms of history and reality, the will of state as performed by government's authority, has dominated the electric power industry and various resources adherent to it, implemented by legislation, administration, or entrepreneurial

[2] Guomindang zhongyang dangbu guominjingjijihua weiyuanhui 国民党中央党部国民经济计划委员会 [National Economic Plan Commission of KMT Central Department],"*Shinianlai zhi zhongguo jingji jianshe yijiuerqi zhi yijiusanqi*" 十年来之中国经济建设 1927-1937 [*Chinese Economic Construction in the Last Decade 1927-1937*] (Nanjing fulun ribaoshe, 1937), Chapter 6, 6.

management under state-ownership. In this case, the government's decision on electric power development involved more economic calculations, and fewer political factors that were very significant to this sector in the early period.

In order to discuss the industrialization in modern China, let us start with a project of the *"Shanghai United Power Company" (上海联合电力公司)* in 1946-1948.

As mentioned above, Chiang's government was not able to achieve success with the postwar electric power industry reconstruction in Mainland China, and created Taiwan's electricity model instead, which would become a general consensus about Kuomintang government's ruling experience on the national economy, however, was ignorant about the ambition and determination of the leadership of a great independent country after World War II. The case of the "*Shanghai United Power Company*" shows how the Chiang and Mao government carried out their plans about postwar electrical reconstruction.

In 1929, the American Far Eastern Bond and Share Company controlled by the Rockefeller Group purchased the riverside power station from the Municipal Council of Concession in Shanghai and established the Shanghai Electric Power Company that became the biggest electric power business in pre-war East Asia. In 1945, the electric power system of Shanghai fought with the American-run Shanghai Electric Power Company against the shortage of electricity. Meanwhile, a proposal to establish the Shanghai United Power Company, with the American-run Shanghai Electric Power Company as leader and several native companies as partners, was jointly worked out by the Shanghai government and the American-run Shanghai Electric Power Company; during the negotiation on the solution of electrical shortage between Shanghai and central government. However, the Kuomintang central government rejected the proposal because of the worry that the delegating contract between the government and the company would open a chance of creating a monopoly on the electrical industry to foreign capitalists.

The incident of the "Shanghai United Power Company" displayed an interactive mechanism between central administration and local governance on industrial development, which could be interpreted as a post-war intensification of the government's antebellum strategy that the *National Steering Committee of Electric Enterprise (全国电气事业指导委员会)* instituted under the *Construction Committee of National Government (国民政府建设委员会)* in 1928, with strict rules and regulations, supervised public electric power enterprise and consolidated electrical companies that were already of a certain scale and quantity. On the contrary, the electric power firms operated by foreign capital were exceptions to the regular administrative system of the national government. They had always taken advantage technically and financially of the competition with native electric power companies.

Accompanied by foreign settlements abolished in Shanghai post-war, the American-run Shanghai Electric Power Company (the real designer and proposer of the "Shanghai United Power Company") supported by the urban administration, was a product of the government's compromise that allowed the existence of foreign ownership of public utilities in the pre-concession area, expropriated by the Japanese during the war, because it was realized that Shanghai couldn't solve the shortage of urban electrical supply without the support from American capital. [3]

On the other hand, the *Central Resources Committee (中央资源委员会)* instituted the *Preparatory Office of Jiangnan Electric Power Bureau (江南电 力局筹备处)* in order to remedy the electricity supply of Shanghai and expedite power grid construction in the area of the *Taihu Lake Basin (太湖流域)*.[4] This constructive plan built the *Longhuazui Power Station (龙华嘴发电厂)* along the eastern bank of the Huangpu River, which offered especially in the field of public utilities an open opportunity, declared by the Central Resources Committee, for all private power enterprises in Shanghai to subscribe to its shares.

However, there was a dilemma, especially in the field of public utilities in that the new power station needed most was an electric generator unit that had to depend on war indemnity from Japan (whose machines were old and out of repair). This was obviously unhelpful for the plan of the Jiangnan Electric Power Bureau. According to *Regulative Items for Public Utilities Operated by Private Enterprise (《民营公用事业监督条例》)*, foreign capital was prohibited to run or join the operation of public utilities, except where permission was granted by central government. The KMT government accepted the fact that instead of persisting in the regulation to find a solution to Shanghai's power shortage in economic reconstruction; this did not mean that foreign companies and capitalists could break the baseline of restrictions and monopolize the electrical business in Shanghai; even though the Chinese government did not have enough financial resources to put into postbellum reconstruction. Chiang's government instead took loans from the White House rather than allowing American capitalists to pour into the Chinese market after 1945, which was an alternative strategy to keep the control of the indigenous industries and to direct the native economy by State Logic for a new independent country under the Yalta System.

It should be noted that the discussion about the reconstruction and industrialization of China after World War II should knock down the wall of politics between the Chinese Nationalist Party (KMT) and CPC, because both governments emphasized the

[3] "waijiaobu guanyu shanghai lianhe dianli gongsi ti'an de yijian" 外交部关于"上海联合电力公司"提案的意见 (Comments on the Proposal of "Shanghai United Power Company" from Ministry of Foreign Affairs), 1947, Record Number: Q5-3-5468, Shanghai Municipal Archive, Shanghai.

[4] "Shanghaishi canyihui yaoqiu ziweihui jiang fadianji zhuanshou bing jiang lianhe dianli gongsi ji jieshou dianji juti banfa bingzhuanhe de han" 上海市参议会要求资委会将发电机转售并将联合电力公司及接收电机具体办法并转核的函 (The Letter of City Council Asking Central Resources Commission for Electric Generator traded to Shanghai United Power Company and Checking the Reception of Facilities), 1947, Record Number: Q1-14-456, Shanghai Municipal Archive, Shanghai.

importance of state-ownership in the system of the national economy, and the domination of government's decisions and policies (Gao, 2014). The construction of "State Electric Power" was completed by "Red China", through the Socialistic Transformation in 1952-1956.

Historically, the "*Joint State-Private Partnership (公私合营)*" was a socialistic movement, with both economic and political significance, occurring in the fields of agriculture, industry, and handicrafts in 1953-1956. Actually, this procedure was initiated at the very beginning of the CPC taking over the economy of the Chinese Mainland, especially for industrial estates. After 1949, the central government of CPC focused seriously on the situation in Shanghai, that had been the greatest city of private economy in the period of Republican China and was, therefore, a most supportive place for socialistic construction in Red China. The Riverside Power Station was restricted by the *People's Liberation Army (人民解放军)* as soon as they took charge of the urban area. Then, *Shanghai Military Control Commission (上海军事管制委员会),* the predecessor of the *People's Government of Shanghai (上海人民政府)*, cut off all connections between the power station and its supervised company in America, leading to a freezing of the diplomatic relationship between the United States and Red China.

Where the socialistic transformation began, the electric power industry of Shanghai maintained the biggest electric plant in charge of the CPC government. As a result of political belief, preaching to the communities of the working class, the *Public Utility Bureau of Shanghai (上海市公用局)* helped private electric power firms recover electrical production and control coal consumption by calling on the support of adept technicians from the old regime. For instance, the *Zhabei Water and Power Company (闸北水电公司)*, the biggest private electric power enterprise in Shanghai whose average electric transmission line loss rate was about 20%, even reaching 30% at most in 1930s pre-war, had dropped the figure to 8% by 1952. [5]

The voice from the top community in 1951, indicated that Shanghai, which owned the greatest industrial base and technical advantage in China, was not the state's choice to invest for industrial construction, thus the local governor needed to utilize more private resources to reorganize the electric power system of Shanghai.[6] This generated a strategic motivation that Shanghai, the biggest city based on private economy in China, had to experience negotiations started by the CPC government with the aim of gradually transforming private ownership to socialistic state ownership by a transitive manner of Joint State-Private Partnership in electric power moving towards state-owned industry.

The transformation was the nationalization of private productive assets as well as a remolding towards political belief and self-cognition of the role of the labourer. Initially, the proposal that state capital would join private enterprise was mentioned discreetly, in case of a radical tendency to nationalization. Following declarations about socialistic transformation in public and meetings with capitalists, the private electric power companies successively applied for Joint State-Private Partnership in spite of their diverse intentions, to ease the financial shortage. But there was an exception, the *Huashang Power Company (华商电力公司)* decided to stay out of this change. Their board of directors meeting witnessed a fierce struggle on the private right and benefit under Joint State-Private Partnership and confidence on the stability of political situation.

The importance of the electric power system to urban society and industrial production drove the CPC government to lead the Joint State-Private Partnership that mainly went through liquidation and reevaluation on private properties, and negotiations on the shareholding ratio of state ownership and the interest rate of private ownership. As the capital-combined structure established gradually in the electric power industry, the electric power bureau obtained the practical control right of the electric power system in Shanghai. According to contracts offered by state partners, private partners could not keep the status of decision makers and users of the land, building, vehicle, and facilities, but would gain the fixed interest or rental only.

After early intervention, government had coordinated that all private power companies unify different electric prices based on dissimilarity of operation cost and profit setting by founding a compensation fund pool in 1950. The administrative authority took over the electric power resources from private enterprises to build an integrated electric system by state logic that illustrated the efficiency national construction had over the cost benefits of private economy. This not only laid the foundation for industrialization, but also showed the dynamic mechanism of the formation of socialistic state-owned industries.

Government Ruling and Evolution of Shanghai University of Electric Power[7]

The University established the *Shanghai Electrical School (上海电业学校, 1951.10-1952.10)*. According to the intention of the *National Electric Power Industry Conference (全国电力会议),* ie, "Adapt to

[5] "zhonggong shanghaishi gongyongju fendangzu guanyu zhabeishuidiangongsi xingzhi de diaocha yanjiu ji muqian ying caiqu shenme taidu de baogao" 中共上海市公用局分党组关于闸北水电公司性质的调查研究及目前应采取什么态度的报告 (Report about Shanghai Public Utility Bureau sub-party group's investigation and attitude on capital essential of Zhabei Water and Power Company), 23 November 1951, Record Number: B169-1-32, Shanghai Municipal Archive, Shanghai.

[6] "yijiuwuyi nian qi yue shisi ri li fuzhuren guanyu shanghai dianli gongzuo jige wenti de zhishi jilu" 1951年7月14日李副主任关于上海电力工 作几个问题的指示记录 (Record about vice director Li's indication on Shanghai electricity on 14 July 1951), 1951, Record Number: A38-2-277, Shanghai Municipal Archive, Shanghai.

[7] Data in this section draws from the official website of Shanghai University of Electric Power. on June 10, 2015.

electrical industry development, train cadres for it", the *Ministry of Fuel Industry (中央燃料工业部)* instructed Shanghai Electric Power Corporation to prepare to construct Shanghai Electrical School in early 1951. On August 25, Shanghai Municipal Government decided to move 320 students to the School, from the Shanghai Municipal Construction Engineering cadres training class and Shanghai middle school engineering class. Shanghai Electric Power Corporation chose more than twenty managers, faculties, and staff for the newborn school. Most of them had industrial experience, for example, one of the first faculty members, Professor Lianfu Pan, had been Vice Director and Chief Engineer of the Yangshupu Power Plant. This ensured the School's tradition of actively combining teaching and industrial practice. From time to time the students were taken to the power plant construction sites.

In June 1952, in order to learn educational experiences from the former Soviet Union, *East-China Industry Ministry (华东工业部)* decided to establish a secondary electric power industrial school on the ground of the Shanghai Electrical School. *East-China Region Colleges Adjustment Committee (华东区院系 调整委员会)* merged the Shanghai Municipal Industrial School to the Shanghai Electrical School, forming a new *Shanghai School of Electric Power Industry (上海电力工业学校, 1952.10-1953.10)*. It was limited to enroll children of the employees who were working for the Shanghai electric power industry and municipal workers in post led by the Eastern-China Industry Ministry, with three years of schooling.

The school duplicated the former Soviet Union in teaching at the beginning. In November 1953, it was led by the *Ministry of Fuel Industry* and renamed the *Shanghai Power School (上海动力学校, 1953.10-1959.8)*, which was affiliated to the *Ministry of Electric Power (电力部)* in 1955.09-1958.02, and the *Ministry of Water Resources and Electric Power (水利电力部)* in 1958.02-1959.08. The School was renamed the *Shanghai College of Electric Power*, still belonging to the *Ministry of Water Resources and Electric Power.* In May and July 1960, to expand the School, *the East-China Electric Power Authority (华东电管局)* merged the School with the Shanghai Amateur Power Engineering College and *the* part-time Shanghai Electric Power Industrial College, creating the *Shanghai Technical College of Electric Power Industry (上海电力工业专科学校,1960.8-1985.1)*.

During the Cultural Revolution (1966-1976), the College was at a standstill. Since 1977, it has been in a new development stage. In 1979, the *Ministry of Water Resources and Electric Power (水利电力部)* made a decision to lead the College together with the Shanghai Municipal Government. They jointly worked for Shanghai higher education development in electric power. In such a dual leadership, the Ministry played the main role in administration, which was good for the upgrading of the School. It was upgraded to *Shanghai University of Electric Power (上海电力学院, 1985.1-)*. Li Peng, the Vice Premier and Minister of the *National Education Commission (国家教育委员会)*, established the board for the School. Referring to the leadership, the Ministry of Electric Power decided to jointly administer the Shanghai University of Electric Power with *East-China Electric Power Group (华东电力集团);* the latter dominated from 1995. Nowadays, the Central Government and the Shanghai Municipal Government jointly manage the University; however, Shanghai Municipal works as the major administrator, rather than the Central Government. It has a mission to serve regional/local development. Its Science Park, a collaborative project between the University and Yangpu District of Shanghai City, has been approved as one of the "National University Science Parks". Based on the tradition of serving for industrial improvement, the University is moving towards a Chinese-style entrepreneurial model. (Zhou and Peng, 2008; Etzkowitz and Zhou, 2008; Zhou, 2014).

Conclusions and Policy Implications

Electric power industry development is strongly affected by political power and follows a state logic, which views electric power as a critical national resource that requires state management and control, forming the "State Electric Power". The policies and decisions of the government drove the electric power industry going forward, which is an epitome for the process of industrialization. The plans launched by the government have markedly accelerated the industrialization process, upon the national strategy of foundational industry development.

Three factors, ie, the State (represented by the Party and Government) administration, the state logic of electric power industrial development as well as EHEIs, work together as an independent and internal-connective system, which constitutes the dynamic mechanism of the Triple Helix to develop in the electric power industry. Reviewing Shanghai electric power industry development, we can find the advantages of a Statist Triple Helix; that is, a strong driving force from the government. This study provides experiences for policymaking of other developing countries. It raises the issue: whether state logic is necessary in industry improvement; whether strong political power is an advantage in the development.

The Statist model emphasizes the coordinating role of government. Strong and weak roles for government and industry are the defining characteristic of statist regimes. Change in statist societies is impelled by the need to speed up the innovation system by introducing new sources of initiative. Bureaucratic coordination concentrates initiative at the top, and tends to suppress ideas that arise from below.

An overlapping Triple Helix introduces a dynamic element by having three spheres interacting through indirect relations from one sphere going through another as well as through direct relations. This can be seen as an American-style indirect industrial policy, an action on the part of government to influence and improve the level of industry by working with universities to reach industry. Going through one sphere to reach another is the first step toward moving the institutional sphere closer by a change in government policy (Etzkowitz, 2008).

University and industry in China, as Triple Helix actors, are driven or controlled by government. The present problem with this model is that government does not have an innovation mission

directly, nor a limit on ownership of the enterprises that it creates (Etzkowitz, et al, 2007). As the ownership changes and the reform gets deeper, a transition to overlapping the Triple Helix (Figure 2) is expected.

How can the science/innovation policy assist the evolution to an interactive Triple Helix, how can overdoing it towards a laissez faire model be avoided, and what is the government's optimal role and contribution to innovation and development? These will be important topics in the future.

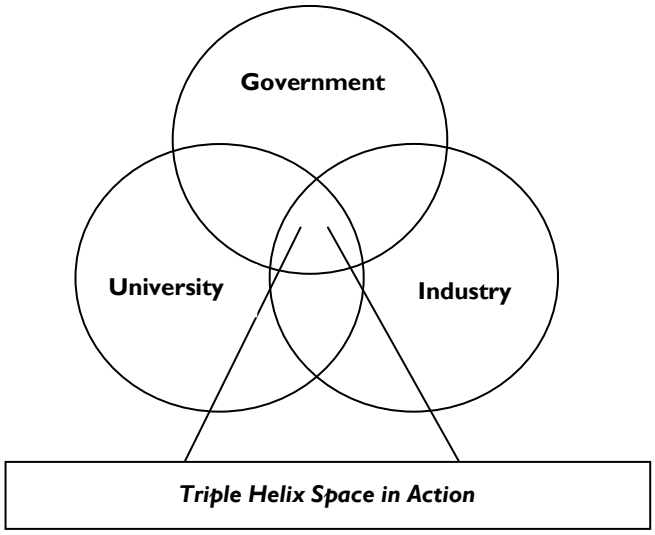

Figure 2 Interactive Triple Helix

Future investigation will focus on whether State logic needs to be abandoned in some "national strategy fields", and whether the private sectors should be developed to share the state strategic resources. Put differently, should a public-private pathway be taken in these fields? In addition, as China's Triple Helix evolves into an ideal model, what changes will happen to the industry and university spheres?

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Exploring the Co-evolution between Technical Innovation and Technology Standardization in the Mobile Communications Industry

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Abstract

Technology standard and technical innovation are the core factors affecting advances of mobile communication competition individually and collectively. By reviewing the past forty years of evolution of technology standard and technical innovation, this paper explores the co-evolution mechanisms between technology standard and technical innovation. Based on the analysis, this paper firstly proposes that technology standardization tends to concentrate, while the modes of technical innovation switch from standalone closed innovation to systemic synergetic innovation. Secondly, the paper explores the co-evolution mechanism and effects between technology standardization and technical innovation. Thirdly, the paper argues that it is the synergetic innovation that plays the very important role that balances the value creation of technical innovation and value sharing of technology standardization. The conclusions of this paper have important practical implications for nurturing the synergetic mechanism of technical innovation ecosystem of mobile communication industry.

1. Introduction

China has witnessed a very rapid growth of its mobile communication industry over the last two decades, since the first mobile operator China Unicon was founded in 1994 (Xia, 2012). Two meaningful institutional changes in the telecommunication sector which included the twice restructuring of the telecom operators around 2000 and 2008, were all mainly for the benefit of mobile communication and made some far-reaching influences on the development of the mobile communication (Xia, 2011). By the end of June 2014, mobile phone subscribers reached 1.26 billion; meanwhile, penetration rate reached 92.6 phones for every 100

people (MIIT, 2014). With the continuing expansion of mobile communication networks, the majority of the mobile communication standards from 1G systems to 4G systems, have been operating within China whatever the success or failure of the results. As a consequence, several actors and organizations have made great progress, contributing to the construction of an ecological system of mobile communication. For instance, three network operators have nurtured their powerful operation capabilities; network equipment manufacturers such as Huawei and ZTD, have been enormously successful, while other MNC's have faced devastating failures. Content/application providers such as Baidu and Tencent etc have achieved great successes too; and service providers such as China Unionpay and Alibaba, handset manufacturers like Huawei, Millet, Lenovo and ZTE, have all benefitted from growth.

While the ecological system of mobile communication has become more and more diversified; questions have to be asked about the unsatisfactory performance of the homegrown TD-SCDMA standards in such a good market environment, for example China Mobile invested a lot but failed to withdraw their investment. Why could China fail to enjoy the fruits from the success of the homegrown TD-SCDMA? This raises the issue - is the innovation more important than standardization, and what is the co-evolution mechanism between technology standardization and technical innovation?

In order to explore these questions, this paper firstly generalizes the past forty years of evolution of the successive generations of standards in the mobile communication industry; secondly, the paper reviews the corresponding evolutionary process of the technical innovations mechanism and the ensuing results which accompanied the standardization processes of mobile systems; and thirdly, the paper explores the co-evolution mechanism between technology standard and technical innovation.

The contributions of this paper are as follows:

- It provides a historical review on successive processes of standardization in mobile communication from the earliest beginnings, and identifies, in a global perspective that the model of standardization shifted from performance-based de facto standards to design-based de jure technology standards between the 2G and 3G mobile communication system accompanied by the emergence of 3GPP and 3GPP2.

- Based on comparison of the functions of technical innovation and technology standardization, this paper elicits that the major force for technical innovation was oriented towards value creation, and the main dynamics of technology standardization was focused on integration for value sharing.

- According to the analysis of mutual effects and the co-evolution mechanism between technology standardization and technical innovation, this paper finds that the synergetic innovation mechanism plays a decisive role in promoting the performance of technology standardization and technical innovation in mobile communications industry rather than standardization.

2. Literature Review

2.1 Innovation impact on standardization

In most cases, technology innovation functions as market dynamics to determine a de facto standard. According to the U-A dynamic model, alternative technologies compete intensely until the dominant version gains sufficient market share to become the single standard (Utterback, 1994; Tassey, 2000). Market control by one firm can truncate this competitive process. Such control is particularly effective in cases of increasing returns and can quickly force acceptance of the monopolist's proprietary technology element as the standard (Tassey, 2000). So for a de jure standard, the literature normally recognizes that standardization is a down-stream phase of innovation rather than a basis of technology innovation. So, technology standards only serve as the references for technology innovation (Jiang et al, 2012).

2.2 Standardization impact on innovation

Standardization affects the R&D, production, and market penetration stages of economic activity, and therefore has a significant collective effect on innovation, productivity, and market structure (Tassey, 2000). However, these effects can be both positive and negative.

Standards play an important positive role in promoting and driving innovation. The use of standards triggers innovation because technology providers can reduce their costs to serve customers by applying or providing innovative technologies. Standards can codify information of a particular technology, disseminate new knowledge, facilitate interoperability between new products and services, and provide a platform for further innovation (Jiang et al, 2012; Friedrich J, 2011). In addition, standardization plays an important role in synchronizing disjointed technical innovations in a systemic innovation; this then leads to the design and proto-type manufacture of viable products that attract the attention of business people for serious consideration of their introduction into the market (Kano, 2000).

However, standardization can increase efficiency within a technology life cycle, but it also can prolong existing life cycles to an excessive degree by inhibiting investment in the technological innovation that creates the next cycle (Tassey, 2000). So, a two-tiered approach in mobile communications, which defined successive generations of standards and only specified the interface specifications between sub-systems, was introduced in order to alleviate negative effects of standardization on technical innovations (Kano, 2000).

3. Research Design

3.1 Research architecture

Since the days of Schumpeter (1950), technology and technical innovations have played an important role in the study of economics, industrial organizations, and development (Dosi, Teece and Chytry, 1998; Chandler et al, 1998; Kano, 2000). However, the literature is still seriously lacking in further research focusing on innovation in mobile communication. Standards are regarded as a

tool for regulation and technical interconnection in the telecommunication industry (Kano, 2000, Jiang et al, 2012), but the papers are seriously short of exploring the relationship between innovation and standardization in mobile communications (Jiang et al, 2012).

Hence, this paper reviews the evolution of the successive generations of standards in the mobile communication industry in section 4, and further reviewed the corresponding evolutionary process of the technical innovations in section 5. A systemic thinking was applied to combine the viewpoints of both innovation and standardization, in order to explore the co-evolutions mechanism between technology standard and technical innovation in section 6.

A case study method (Eisenhardt, 1989; Yin, 1989; Gao and Liu, 2012) was used to study this complex process, focusing on identifying the key factors and underlying mechanisms. Specifically, the study tried to answer the following questions: what are the key functions that technical innovation and technology standardization played during the evolution of mobile communication? What factor impact on the co-evolution process?

3.2 Research method

Data were collected for case analysis mainly by means of searching in literature and interviewing people who are familiar with the development of mobile communications. There are two aspects to be considered: (a) one of the authors started his career in 1986 as a telecommunication senior engineer engaged on technical projects on various telecommunication systems. For example, Ericsson's AXE-10 Programmed Exchange System in China Telecom for thirteen years, GSM mobile network in China Unicom for three years, IP broadband backbones network in China Netcom for four years. Hence, the advantage of author's career was of benefit in interviewing relevant experts of communication technologies and officials in government agencies, and (b) two authors have studied together on collaborative innovation during the doctoral period since 2006, and have fostered a good capacity to capture the key points at interviews.

Interviews took place between 2010 and 2014. People interviewed were from many organizations and government agencies, including multinational firms such as Siemens, Ericsson, Alcatel-Lucent, Qualcomm, LG, and Samsung; key domestic equipment firms such as Datang, ZTE, Huawei, and Potevio; mobile carriers such as China Mobile, China Telecom, and China Unicom; content/application providers such as Baidu and Tencent; service providers such as China Unionpay and Alibaba; Handset makers such as Huawei, ZTE, and Lenovo, Millet; IC suppliers such as T3G, Spread Spectrum Communications, CCSA, CYIT; TD-SCDMA Industry Alliance, TD-SCDMA Technology Forum; and government agencies such as MIIT, the Ministry of Science and Technology (MOST), and the National Development and Reform Commission(NDRC).

Following the grounded theory development principles, data analysis was conducted simultaneously with data collection (Glaser and Strauss, 1967; Strauss and Corbin, 2008). According, Gao and Liu (2012), commentaries were written on each interview and whenever a new theoretical concept emerged. To assure validity, the theoretical sampling principle and data saturation principle were followed. Patterns were also searched for by comparing across events to look for different interpretations of those events by the key players.

4. Co-evolution Mechanism between Standardization and Innovation

4.1 Evolution of standardization

Since the first mobile phone set of the 1G System was put into service in 1973(Chen, 2013), systemic innovations in mobile communications have been recognized as successive generations, each of which required a new standard (Antonelli, 1998). From the viewpoint of standardization, a systemic innovation requires an overall framework and a set of interface specifications among component subsystems. But the emergence of mobile phone equipment has been regarded as a component or sub-system of the total fixed telephone system rather than as stand-alone system in the mid-1970s.

The **first generation (1G) mobile system** which supplied public cellular mobile communication services as a system rather than sub-system, were standardized around the 1980s. Since there was no predecessor to follow, the type of innovation of the 1G system obviously was a systemic innovation that set up of a new standard architecture.

The 1G system was mainly launched by monopoly operators of fixed telecommunication networks, or through close cooperation between operators and manufactures. For example, the NTT Mobile System which was developed originally by the biggest Japanese telecommunication corporation, NTT, and first operated in 1979; Nordic Mobile Telephony (NMT) was launched in 1981, and Total Access Communication System (TACS) was launched in 1985 in Europe; Advanced Mobile Phone System (AMPS) was developed independently by AT&T and put into use around the USA in 1983. Besides that, the 1G was all regional standards, because the mobile phones at that time were too big to carry across the Atlantic or the Pacific Oceans.

The **second-generation (2G) digital system** was standardized in early 1990s, including two main streams (Kano,1999): firstly, the personal communication system (PCS), such as the Digital Enhanced Cordless Telecommunications (DECT) of Europe was standardized in 1993, the Personal Handy phone System (PHS) of Japan also in 1993, and as many as seven standards in USA in 1990s. Secondly, the cellular mobile systems, such as the Global System for Mobile Communication (GSM) of Europe was developed in 1992, the Personal Digital Cellular (PDC) of Japan in 1993, and the ANSI-136 (based on TDMA technology) and ANSI-95 (based on CDMA technology, dubbed as CDMA one) of USA, standardized in 1993 and 1995 respectively. In this paper the authors pay more attention to the cellular mobile system rather than the personal communication system (PCS) in order to focus on the research target.

The 2G standard was also a regional standard based on a global viewpoint, because this was not approved officially by the ITU (International Telecommunications Union). However, from the

regional viewpoint of Europe, the GSM standard was regional de jure standard within Europe, which was officially approved by ETSI. Due to the double opportunities in the monopolized market in Europe and competitive market outside Europe on one side, and increasing the efficiency of economic activities by improving products' compatibility and interoperability on the other side, the GSM standard gained more competitive advantage in the market than other competitors, and began to be established as a prototype of world class standards.

The **third-generation (3G) multimedia system** included two main streams: International Mobile Telecommunication-2000 (IMT-2000) and wiMAX. In this paper the authors ignore the wiMAX in order to focus on the research target. Three main technical standards were covered by IMT-2000 and were officially standardized in year 2000. The GSM evolved 3G system standard (dubbed as WCDMA), was developed by an industry forum called the 3GPP (3rd Generation Partnership Project); and ANSI-95 evolved 3G standards (dubbed as CDMA2000) by the 3GPP2. While Japan decided not to evolve its 2G system which was called PDC. The Chinese became a new member of the 3G family with the homegrown TD-SCDMA standard instead.

The 3G standard was a global standard, which was officially approved by the ITU and licensed by governments around the world as regulation policies. The procedures and modes of standardization changed greatly from 3G, which left the cut-throat competition behind the standard and paid more attention to the technical design-based proposals.

The **fourth generation (3G) LTE system** was dominated by the 3GPP (3rd Generation Partnership Project). LTE Release 8 was frozen in December 2008, and this had been the basis for the first wave of LTE equipment. The 3GPP officially began research work from R8 in 2004, and has released five versions of standards about LTE up till now, such as R8, R9, R10, R11, and R12. The standard version of R10 was completed in March 2011 and is called LTE-Advanced system (Sun et al, 2013). The two versions of the LTE family, such as FDD-LTE (WCDMA evolved 4G system standard), and TD-LTE (TD-SCDMA evolved 4G system), are very similar.

In fact, they differ only in the physical layer and, as a result, the version implemented is transparent to the higher layers. This means that UEs are able to support both TD-LTE and FDD-LTE with one chipset with only minor modifications required. All major chipset vendors, such as ST-Ericsson, Altair, Semiconductor, and Qualcomm, have already released chipsets that support both LTE flavors. UEs based on those chipsets are available from Sony Ericsson, Huawei, Samsung, Nokia, and others (Ascom, 2012). The architecture of distributing the intelligence amongst the base-stations in LTE provides a chance for the same base station to be shared by different operators.

By generalizing the successive generations of standardization in mobile communication, three trends can be highlighted:

- The number of standards from 1G to 4G was gradually deceased while reaching the peak number of more than ten standards for 2G systems, three versions in the IMT-2000 family, and two versions to only one LTE family. The trend is clear that the form of standards is integrated, based on the viewpoint of quantity of standards.

- The differences between the standards became smaller. For 3G standards of the IMT-2000 family, there was little difference among the three standard versions due to backward compatibility with different 2G systems; and for 4G standards of LTE family, there were only small differences in the physical layer of user terminals. It is obvious that the content of standards is getting integrated based on the viewpoint of differences between the standards.

- The model of standardization has shifted between 2G and 3G systems. According to the preceding classification of the standards as four types, the standards for 1/2G systems are regional performance-based de facto standards, which mainly determined by market dynamic, the standards for 3/4G systems are global design-based de jure standards, which mainly determined by a consensus of various combinations of vertical and horizontal consortia and accepted by governments finally. Understanding the transition of standardization models can clarify the pattern of market competition after the deployment of the 4G standard to reshape new market advantages.

4.2 Evolution of innovation mechanism

Since the first mobile phone set of the 1G System was put into service in 1973, the global market place and the information and telecommunication technologies have gone through tremendous changes. The traditional approach of self-reliance or self-sufficiency for global competition became a virtually impossible goal. Even the global leaders in their respective industries found it necessary to find collaborative partners to design an innovative value chain, combining their own core competencies with those of other world-class firms (Tapsott, 2006). Hence, the models of innovation mechanism in the mobile communication industry have varied rapidly from closed innovation to open innovation at the firm's level, and from stand-alone innovation to synergetic innovation based on the innovation system viewpoint. Hence, this paper is based on the perception of industry innovation system level to divided innovations into stand-alone closed innovation and systemic synergetic innovation, in order to explore the evolution of innovation mechanism in mobile communication industry.

By generalizing the evolution process of the innovation mechanism in mobile communication, the following trends can be highlighted:

- The systemic synergetic innovation was pulled by the market dynamic forces. There was a need for compatible mobile communication system so that mobile phones could be used around the world. In 1/2G systems, because users could more easily cross national borders in Europe, regional standardization within Europe was considered more necessary than other countries. As a result, the closed collaborative innovation mode was first operated in Europe. After mobile phones had become so small as to be carried in a pocket, many people travelling around the world suffered from incompatible 2G standards adopted by different countries. Therefore, the motivation of users to use the same mobile phone and the same mobile phone number around the world became the

dynamics of synergetic innovations under on a global basis (Kano, 2000).

- The innovation mechanism was dominated by the international standard organizations such as 3GPP and 3GPP2 since the introduction of the 3G system. The 3GPP and 3GPP2 played a very important role as focal organizations in the ecosystem of innovation to achieve synergies between actors and organizations in the mobile communications industry around the world, such as government, network operators, network equipment manufacturers, handset manufacturers, universities, etc to carry out systemic synergetic innovation for value creation.

- The balance between the integration of the mobile communications system and diversification of users terminals is realized by the a two-tiered approach in mobile communications, which defined successive generations of standards and specified the interface specifications between sub -systems in order to alleviate negative effects of standardization on technical innovations (Kano, 2000).

4.3 Balancing value creation and value sharing by synergetic mechanism

There are two complementary forces promoting the co-evolution of the mobile communication, ie, the technical innovation force and the technology standardization. The force of the technical innovation which dominates market factors promotes value creation for the diversity of the mobile system and auxiliary equipment, while the force of the technology standardization which dominated by regulation factors, guarantee integrated disjointed innovation for value sharing.

In the previous literature, the government should play the role to coordinate with both the technical innovation force and the technology standardization in search of balance. Such as, relevant government departments should be keen to discover and absorb the value of innovations, and release it for technology standard at the right time, to ensure the space for industrial technology innovation and the reasonable restriction on industry development, but the problem is how can it be certain that the government would make the correct decisions?

However, the synergetic innovation mechanism, dominated by 3GPP and 3GPP2 as focal actors in the mobile communication ecosystem, plays an important role. The function of the synergetic innovation mechanism, like a resonance between the wave of technical innovation force and the wave of technology standardization, balance the synchronization between them to ensure the diversity and integration of the mobile communication system.

5. Discussion and Conclusion

5.1 Discussion

Both technical innovation for value creation and technology standardization for value sharing are very important in the advances of mobile communications. However, the synergetic mechanism is more significant for balancing the value creation and value in a vivid industrial innovation system. The lack of synergetic mechanism in an innovation ecosystem to ensure synergetic innovation, no standard that has gained the first mover advantage can survive from the intense market competitions. TD-SCDMA was based mainly on technologies from Datang who proposed individually in 1998, and was accepted as one of the three international standards by the ITU in 2000 and 3GPP in 2001. The first mover advantages from the 3G standard are tremendous, but until China Mobile officially adopted TD-SCDMA in January 2009, the synergetic innovation ecosystem for homegrown TD-SCDMA had not been established due to a number of reasons, such as the network operators hesitated to operate, network equipment manufacturer Huawei was reluctant to join in at the beginning, most handset manufacturers worried about their investment, and even the attitude of the government was uncertain for a very long time (Gao and Liu, 2012). As a result, the operators of TD-SCDMA such as China Mobile are still searching for a next-generation technology that will overcome the limitations of TD-SCDMA, such as limited/expensive handsets available only in the domestic market, or multiple mode handsets needed for global roaming (Ascom, 2012). So, work on establishing the synergetic innovation ecosystem for 4G TD-LTE, should be the key to the catch-up strategy for the China mobile communications industry.

5.2 Conclusion

By reviewing both the successive generations of standards and the corresponding evolutionary process of the technical innovations in the mobile communications industry from the earliest beginning, the paper reviews the corresponding evolutionary process of the technical innovations comprehensively, and then explores the co-evolutions mechanism between technology standard and technical innovation.

The contributions of this paper are as follows: elicits that the major force of technical innovation was oriented towards value creation and the main dynamics of technology standardization was focused on integration for value sharing. The synergetic innovation mechanism played a decisive role of promoting the performance of technology standardization and technical innovation in mobile communications industry, rather than standardization only.

The conclusions of this paper have important practical implications. For example, the government should realize that the success of the 4G standards and market requires a competent innovation ecosystem encompassing participants in various roles to realize the synergy. In addition, the related businesses should reshape their collaborative innovation strategies based on their network position and should develop new synergistic innovation-based competitive advantages instead of adhering to the paths that were successful in the past.

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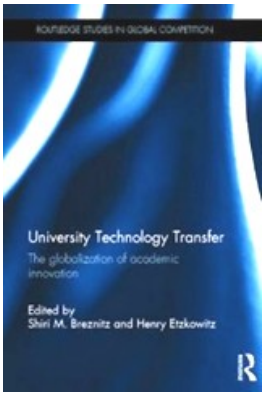

UNIVERSITY TECHNOLOGY TRANSFER: THE GLOBALIZATION OF ACADEMIC INNOVATION

Edited by **Shiri M Breznitz**, **Henry Etzkowitz**
Publisher: Routledge, 2015

This book, which includes articles by leading practitioners and researchers from the THA community, analyses the crucial role of Universities in the generation of knowledge and innovation by means of critical cases as well as country reports. Universities have become essential players in the generation of knowledge and innovation. Through the commercialization of technology, they have developed the ability to influence regional economic growth. By examining different commercialization models this book analyses technology transfer at universities as part of a national and regional system. It provides insight as to why certain models work better than others, and reaffirms that technology transfer programs must be linked to their regional and commercial environments.

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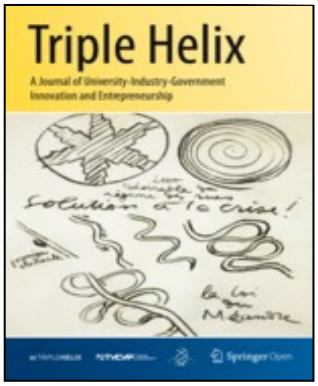

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Regional Statistics 5(1) (2015), 25–43.

BOOK REVIEW

FACTORY MAN

By BETH MACY

Little, Brown and Company, NY, 2014, 213 pages
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ISBN 978-0-316-23156-5 (eBook)

Reviewer: *Michelle Baker*
President, Baker Inventions LLC

In June the US Congress passed one of the most fiercely contested bills of the decade, relinquishing its right to amend the final terms negotiated by the President for the *Trans-Pacific Partnership* (TPP) trade agreement. The vote split the Democratic Party. Senators allied with labor and environmental groups refused to back President Obama's appeal for "Fast Track" authority. They were defeated. Now that negotiators have settled on terms, the TPP will come before legislative bodies of the signatory nations for approval. In the US Congress the choice will be "yes" or "no"; there will be no tinkering with provisions. The contents of the bill, widely proclaimed as the most important trade agreement since GATT in 1947, still have not been released to the public. In the US an informed electorate was once considered the keystone of democracy. But let's not weep nostalgic, at least we have WikiLeaks.

Beth Macy's book, "Factory Man: How One Furniture Maker Battled Offshoring, Stayed Local - And Helped Save an American Town," published in 2014, offers a puzzling prelude to the trade agreement. To what end could this new agreement be aimed? Macy shows trade between the US and Pacific Rim countries had already been accelerating since the mid-1980s. The only apparent obstacle to trade in furniture was imposed by the United States

itself, and then only as a limited, ineffectual curb on trade with China. And why did China, the sole nation to have furniture industry duties imposed on it by the US, choose not to be included in the TPP?

Scores of interviews and original source material went into the making of "Factory Man." Academics and professionals in technology policy might find Beth Macy's narration long-winded and short on theoretical perspective but few would criticize her research. Her journalistic treatment of globalization's rout of US furniture manufacturing in southern Virginia and North Carolina over the last fifteen years is thorough and wide-ranging. And this book, directed to a general audience, provides a rich trove of descriptive material in a fast-moving, deceptively easy-to-read style. I say "deceptively" because important details, of which there are many, are easily overlooked when anecdotes about hunting dogs and family squabbles occupy long stretches. Some will find these interludes entertaining. For the rest, keep watch for the meat scattered throughout this stew.

THA readers will find a chronology detailing the reaction of business and government when a well-established, mature industry was challenged by global competition. It includes a regional cluster and global mega-corps that create their own "value-chains." And, if you want a case study on how to manipulate a baroque and poorly designed government trade policy, look no further. The final third of the book describes how law firms were enriched in a battle between firms that benefited from inexpensive imports and those fighting to maintain US-based factories. When the US government ruled to assess anti-dumping duties on Chinese manufacturers in 2004, those duties were distributed to US firms despite the fact that the World Trade Organization (WTO) had, in 2002, ruled the practice illegal and those businesses closed their US factories. Was it simply an oversight that led the industry to lay the charge of "dumping" only on Chinese manufacturers while leaving an open field for the rapidly expanding, lower-cost furniture manufacturing based in Vietnam and Malaysia? Was US trade policy intended to protect domestic manufacturing or to transition the industry to retail operations reliant on foreign manufacturing? Were there any clear goals for US trade policy or was it a captain less ship ruthlessly plundered by pirates?

Between 2000 and 2015 more than 250,000, nearly half, of the jobs in US furniture factories disappeared as a result of hundreds of factory closings. Most of these jobs were in a region, approximately 200 miles square, containing the oft-studied, century-old industrial cluster centered on the High Point Furniture Market in north-central North Carolina. The region experienced lasting double-digit unemployment and all the human misfortune that accompanies joblessness: increases in drug abuse, crime, family breakups, declines in mental and physical health, and the deterioration of property and infrastructure

The most important catalysts to globalization of the furniture industry were advances in containerization. Huge standardized shipping containers could be moved directly from ships to trains to trucks. These freight transport efficiencies, developed after World War II, greatly improved during the Vietnam War, and enhanced recently with investments in port infrastructure and computerized logistics meant that even bulky goods could, by the 1990's, be shipped great distances economically. Today it is estimated that a single sofa can be reliably shipped from China to the northeastern US for approximately $130.

> *…. the number one export at the Virginia Port Authority was logs and lumber. The number one import? That very same wood making its way back across the ocean to Virginia as dressers, tables, and chairs …. (p. 393)*

Between 2002 and 2012 the share of furniture production by middle/low income countries grew from 25% to 59%. In low income countries such as Poland, China, and Vietnam, huge new factories with state-of-the-art plant and equipment have been financed by investments from US, Taiwan, Germany, and Sweden. The scale and advanced technology of these operations add productivity advantages to the already low labor costs. And, the same processes transforming the industry in the US are affecting high-wage EU countries such as Italy, Germany, and Sweden. China has displaced the US with the largest share of worldwide furniture production. Poland has risen to seventh place behind Germany, Italy, India, and Japan (1).

Those with a truly global perspective might laud trade that brings new prosperity to low-wage countries. In China, manufacturing wage increases of 12% per year since at least 2001 have created a new consumer class and encouraged producers to move to elsewhere in East Asia. In 2002 a typical Chinese manufacturing worker received $4.80 for eight hours of work. Today a factory worker makes an average of $27.50 a day in China, $8.60 in Indonesia and $6.80 in Vietnam. Increases in the standard of living in these countries creates large and desirable "emerging markets", to be stoked and fed by global corporations that move production to the least cost locale and tailor products to sell anywhere there is consumer spending power. Such corporations often consist only of executive offices with logistical expertise, design teams, and regional marketing operations. Ethnic and cultural particularities are no longer obstacles where today's science of marketing is concerned.

Not every nation has opened its doors to trade. In Brazil and India growing domestic markets create rich opportunities for local furniture manufacturers. Unlike the typical expansion of furniture manufacturing in low-wage countries that is based on exports to Europe and the US, in these two nations it is the strength of their own "emerging markets" that drives industry growth. Both countries protect their local furniture industry with high import tariffs. As a result, without significant exports, they have doubled furniture production in the period from 2002 to 2012 to become fifth and ninth worldwide. (1) And though Macy's book focuses entirely on the US furniture industry, one cannot help but notice how tariffs have succeeded in enabling rapid growth in Brazil and India whereas mismanaged tariff policy in the US has been completely ineffective to slow the closing of factories and decimation of domestic manufacturing.

Macy's book follows two firms - Bassett Furniture and Vaughan-Bassett - both founded as entrepreneurial ventures of J D Bassett at the turn of the century. J D grew his businesses by creating cheap copies of other furniture maker's designs and acquiring nearby manufacturers. By 1938, with sales in the millions, J D took his furniture enterprises public as Bassett Furniture, Inc. Jump to 1983.

J D Bassett has been dead for seventeen years. The furniture empire he built is now more than forty factories strong with sales of over $300 million a year. JB's grandson, John Bassett III (JBIII), the hero of Macy's book, has been pushed aside by his sister's husband, Robert Spilman, the same Spilman who also is busy expanding ports as Chairman of the Virginia Port Authority.

Tired of working for Spilman, JBIII quit his job at Bassett Furniture and bought a troubled company that had been founded by his wife's grandfather and former J D partner, Bunyan Vaughan. Yes, it's a tangled web of business and family, family and business. THA readers may find the family saga trite and overly detailed but it sets the stage for a fascinating comparison of two alternative responses to the competition from Asia. Thus Macy casts off to follow her second firm, Vaughan-Bassett, and, half way through the book, launches the real beginning of her story. One tantalizing tangle left unexamined: presumably JBIII inherited a large chuck of Bassett Furniture stock from his father and/or grandfather; did he sell it all when he left to purchase Vaughan-Bassett or does the story play out while Macy's dragon-slayer quietly pockets rich dividends from his offshoring, so-called rival run by Spilman?

When JBIII bought it, Vaughan-Bassett consisted of two factories - one in Galax, Virginia and one in Elkin, North Carolina - and 1500 workers. By 1988, five years later, after acquiring a third factory in South Carolina, sales had more than tripled to $79 million. In 1998 he added a fourth in Atkins, Virginia. Then pressure from low cost competitors buying from China began to impact business. Worse, large retailers, formerly clients, began to order directly from Chinese manufacturers.

The fact that retailers were beginning to cut out US wholesalers didn't escape brother-in-law Spilman. In 1999 Bassett Furniture Inc sold furniture through J C Penny with a retail value of $1 billion. Over the next three years, despite re-engineering to reduce costs, J C Penny phased out nearly the entire Bassett line of furniture, replacing it with products bought directly from Chinese manufacturers. Spilman had already been busily closing down its manufacturing operations in the US. Now he put Bassett in direct competition with the retailers, purchasing retail outlets to create a chain of Bassett Furniture Stores that would sell furniture made by Asian manufacturers. In 1985 Bassett had fifty-seven factories in fifteen states. By 2000 it only had fourteen factories left. Today it has two.

JBIII, determined to keep his US factories in operation, tried every variety of fix as his business slipped. He hit up suppliers for cost reductions; he cut rates for sales commissions; he came up with prizes and contests to motivate workers; he instituted new processes for faster delivery; he launched an ad campaign emphasizing service and delivery times; he started new lines of furniture and made "knock-offs" of higher-end furniture; he lobbied the Virginia governor and the Environmental Protection Agency to roll-back regulations; and he bought a non-union, particle board furniture plant in South Carolina where wages were lower. He also invested in the most advanced technology. Between 2006 and 2012, JBIII "spent nearly $40 million on high-tech German and Italian routers and state-of-the-art kilns - a capital investment rate that was double his competitors". Nothing worked. After closing down one of his four plants in 2002, JBIII decided to go to the US government for help. He organized a coalition and, in 2003, petitioned the US International Trade Commission (ITC) and Department of Commerce to impose tariff duties on Chinese furniture manufacturers that were, they declared, "dumping products" into the US market at prices below the cost of production.

Tariffs would force up prices and, under the 1971 Byrd Amendment, monies raised by the tariffs would be distributed to firms that claimed harm from dumping. Brother-in-law Spilman's firm signed on to JBIII's group. So did other large firms that were ramping up imports as they closed down US factories by the score. Strangely, China was the only country cited in JBIII's petition to the US government. This left plenty of cheap sources in Vietnam, Malaysia, and Russia. Even so, not everyone in the industry wanted to see tariffs imposed on China. Large retailers like JC Penny formed their own organization and hired scores of lawyers to fight China tariffs. The middle third of Macy's book describes the battle that split the industry.

The ITC ended up ruling for JBIII's group and assessed tariff duties that ranged up to 216% on individual Chinese manufacturers. No matter that by distributing duties it would be rewarding the very companies that were shifting production offshore. In the years 2004-2011 there were hundreds of millions of dollars in duties. Vaughan-Bassett received more than $21 million. At the same time it closed two of its remaining three plants. Bassett Industries and Stanley Furniture received $7 million and $80 million as they closed nearly all of their US plants. The number of people making bedroom furniture in 2010 was less than half of what it was pre-tariffs. Imports from Malaysia and Vietnam were tripling and then doubling again.

The story gets sordid in the last quarter of the book. The way individual manufacturer's duties were assessed launched an annual fete of payoffs to Washington, DC law firm, King and Spaulding. King and Spalding, working for JBIII's coalition, compiled the list of Chinese firms presented each year to the Department of Commerce for investigation. Manufacturers who were not on the list might not have duties assessed at all. Every manufacturer wanted to stay off that list and they were willing to pay to be removed. The exact amount of each "settlement fee" was negotiated with King and Spaulding attorney, Joseph Dorn. Dorn's list-keeping amounted to a form of extortion. It was only exposed in 2010 after the Guang-Dong Furniture Association filed a brief with the ITC.

The Byrd Amendment was repealed in 2005 by the US Congress after the EU, then Canada, and finally, Japan, announced that they would begin collecting duties on selected goods imported from the US. These retaliatory actions were authorized by the WTO in a 2002 ruling that the more than $1.25 billion of tariff duties that had been distributed to US companies was illegal.

Beth Macy's sympathies are with the unemployed workers and communities brought down by factory closures. And yet, the antithetical case of Bassett Furniture Inc might be seen as an object lesson for how to adapt a business to opportunities created by globalization. Today the company is run by Spilman's son, Robert Spilman, Jr. The two factories that remain create custom upholstered furniture for thirty-day guaranteed delivery.

Customers enter one of Bassett's ninety-four retail outlets to work with designers to create furniture from patterns. Bassett Furniture has managed to compete with retailers like JC Penny, stay profitable, and steadily grow sales from 2010 through 2014.

By making JBIII into a hero, Macy's story gains dramatic urgency. It's possible that the man had a pure heart and a courageous spirit. But as a hero he's no Atlas. Even granting him the best intentions - and the murky status of his stock holdings in Bassett Furniture give one pause - his campaign has done little to save factory worker jobs. The $21 million Vaughan-Bassett received from tariffs didn't keep JBIII from firing more than half of the 1600 workers in his three factories. Macy cites estimates that each factory job saved cost $800,000 in duty money. The law firms received over $60 million in fees. But as for Vaughan-Bassett's hometown, Galax, Virginia, in 2014 over 40% qualified for food stamps and more than 25% lived in poverty.

Some of the questions raised by Macy's book are well known but take on new force as natural barriers to both trade and the scale of firms fall away. How much support should be given to displaced workers, bankrupted investors, and impoverished communities? Should government help a selected handful of firms and aid their transformation into titans capable of competing with like-sized behemoths from other nations? Is there any meaning to national affiliations for a firm like IKEA that employs 13,000 people in ten nations and operates 353 retail stores in 46 more? What is the role of tariffs? What about protecting competitive advantages from intellectual property? Can local environmental and safety regulations be enforced on foreign producers or are they always a one-sided crimp on the competitive position of domestic businesses?

About those health and safety regulations: a sinister provision of the TPP allows corporations to sue in secretive international courts for damages from actions that threaten profits. Naomi Klein has already documented how WTO rules were used to shut down a program for solar energy in Ontario, Canada. (2) Given what Macy has described of the less-than-admirable workings of the legal establishment in the US, one shudders at the vision of a closed-door fledgling tribunal that will bypass national judiciaries and beat down local laws with TPP-like trade bill provisions. Will "free trade" be a harbinger of world government or a veil beneath which avaricious forces lurk?

Citations

1. **Renda, Andrea, et al.** *The EU Furniture Market Situation and A Possible Furniture Products Initiative.* Brussels: European Commission, DG Enterprise and Industry, 2014.
2. **Klein, Naomi.** The price of free trade is unchecked climate change. *Globe and Mail.* September 12, 2014, currently available online: http://theleap.thischangeseverything.org/the-price-of-free-trade-is-unchecked-climate-change/.

WEBINAR SERIES : 2015-2016

DELIVERED

DEVELOPING INNOVATION ECOSYSTEMS

Thursday 24 September 2015

The September 2015 webinar was delivered by **PROFESSOR LUIZ MÁRCIO SPINOSA**, and **PROFESSOR CELSON PANTOJA LIMA.**

PROFESSOR LUIZ MÁRCIO SPINOSA is Dr ès Sci Innovation Ecosystems at the Pontifical Catholic University of Parana, Polytechnic School (Full Professor), Postgraduate Program in Urban Management (Researcher), International MBA in Innovation Management (Coordinator).

PROFESSOR CELSON PANTOJA LIMA is a Visiting Scholar at the Industrial Performance Center, Massachusetts Institute of Technology, Professor at Federal University of Wester Parà, Amazon Region, Brazil. Celson is a visiting researcher at the MIT IPC, working on a research project involving IPC expertise and the Brazilian industry. The main focus of the project is to study and assess innovation matters in the Brazilian industry - from supply chains, regional ecosystems, and roles to be played by all stakeholders involved in these scenarios. Additionally, Celson has been involved in the organization of international conferences, such as CIB 2010 (W78), CIB 2009 and 2007 (W102), ECPPM 2006, CE 2006, CE 2003, PRO-VE 2006, PRO-VE'99. He has published more than ninety papers for journals, conferences, and book chapters.

During the Webinar the Brazilian innovation eco-system was presented and analyzed thought the identification of specific factors affecting the development of a supportive innovation ecosystem. Some specific recommendations were discussed in order to review the present Brazilian public policies.

The recommendations aim at fostering a culture for innovation and building an innovation ecosystem in Brazil.

A video-recording of the Webinar is freely available to THA member at www.triplehelixassociation.org/webinar-series.

UPCOMING

EVALUATION OF ENTREPRENEURIAL UNIVERSITIES: A MACRO AND MICRO PERSPECTIVE

Wednesday 25 November 2015 @ 18:00 CET (TBC)

SPEAKERS

DR ANDREA-ROSALINDE HOFER
Economist, OECD Skills for Entrepreneurship
OECD
(Organisation for Economic Co-operation and Development)

PROFESSOR DR KLAUS SAILER
Professor for Entrepreneurship
Munich University of Applied Sciences
CEO, Strascheg Center for Entrepreneurship

More information on the webinar content will be available at: www.triplehelixassociation.org/webinar-series

REGISTRATION FEE: **50€**

- which includes access to the webinar and annual THA **regular individual membership.** If you are interested in the THA webinar series, the annual THA **regular organizational membership** (200€) includes free access to all six titles.

THA members can join the webinar free of charge

To register please email: mlaura.fornaci@triplehelixassociation.org

THEMATIC RESEARCH GROUPS NEWS

KNOWLEDGE AND TECHNOLOGY TRANSFER TRG: ACTIVITIES IN 2015

In May 2015, a webinar was held on the Critical Success Factors in University-Industry Collaboration with Dr Bob Smailes from Gunn and Twynmore, and Ashley Stevens D Phil from Focus IP Group. This presentation focused on academic-industry research collaboration, particularly consortia. Two different but highly successful consortia were discussed to illustrate what can be achieved.

The webinar also introduced a new collaboration model that goes a step further by giving access directly to institution's research results even at a prepublication phase. The risks and benefit of such a model were discussed.

ENTREPRENEURIAL UNIVERSITIES TRG AT THE CONEEECT INTERNATIONAL SYMPOSIUM

Professor Yuzhuo Cai, the convener of the THA Thematic Research Group on Entrepreneurial Universities presented the THA and its work at the first Coneeect International Symposium on Entrepreneurship.

The first **Coneeect International Symposium "*Next Step into the future of Entrepreneurship Education*"** took place on September 10-11, 2015, in Berlin. Organised by the Coneeect partner ptj, it was a great success. It was an excellent opportunity for all Coneeect partners, faculty, and alumni to meet and share their experiences with colleagues from across the globe. In the presence of the European Commission (Simone Baldassari and Peter Baur), the OECD (Jonathan Potter), the European University Association (Rita Morais), Efer (János Vecsenyi) as well as the project consortium, and 130 enthusiastic participants, three successful project years were presented, and the symposium has seen the launch of the Coneeect Handbook 1.0, publishing innovative practical examples as well as the Coneeect Compendium, i.e. interactive video clips of entrepreneurship education.

University-Industry Partnership TRG will implement EU funded Project on Virtual Incubation

We are pleased to announce that the UIP-TRG recently acquired an ERASMUS+ Funded Project, *Network of Multidisciplinary Ideation and Business Model Creation (NetMIB)*, which involves key THA member institutions from Italy, Greece, Hungary, Finland, Spain and USA. This two-year effort will enable the UIC-TRG to perform proper co-creation with potential stakeholders and expand its network of members.

The consortium which will be implementing the project is led by the Simonyi Business and Economic Development Center of the University of Pecs (HU), and is composed of five THA members: SEERC (GR), ESPAITEC (ES), Tampere University (FI), Fondazione Rosselli (IT), North Carolina University (USA), with the THA supporting the dissemination activities as associated partner.

The project aims to set up a virtual incubation programme by internationally connecting the HEIs action learning curriculum in the area of idea and business model generation, to support the implementation of products and services that will serve regional, country specific, or international needs, for all members of the knowledge triangle.

The direct target group for the project is universities that strive to achieve stronger Triple Helix relations and economic impact in their regions. The NetMIB will equip HEIs with a cutting edge, action learning teaching methodology and a toolkit that will allow them to establish their own Triple Helix model within their region, and also to connect to a vibrant, high quality network of entrepreneurial HEIs.

The indirect beneficiaries of the NetMIB project are: (1) students with marketable business ideas studying at the participating HEIs irrespective of their disciplinary area; (2) business students, who join the development of the business idea proposed by a fellow student to establish a validated business model; (3) faculty members, who participate in the incubation of student ideas as mentors or lecturers; and (4) business professionals, SME owners, nonprofits, public employees, who get involved in the development process as speakers, mentors, or judges, of the projects and receive new, creative impulses from the idea, or from the ideation process.

The NETMib project will commence at the end of 2015.

Further information:
NETMib Project leader - Zsolt Bedo,
zsoltbedo@ktk.pte.hu
Director of Simonyi Business and Economic Development Center of the University of Pecs

Chapter News

Chapter of Greece

Business and Innovation Network Annual Event, November 2015, Porto

Professor Panayiotis Ketikidis, President of the THA Chapter of Greece, will be presenting the keynote speech entitled "Triple Helix Interactions as a Tool for Innovation and Entrepreneurship" at the BIN@PORTO 2015 Conference. The event will take place from 2-4 November 2015 in Porto, Portugal. The aim of the event is to develop a sustainable international network of partners from across industry, academia, investment, incubation, business development and economic development agencies, to support the sharing of good practice and knowledge and to promote open innovation.

http://web.fe.up.pt/~binporto2015/index.php?option=com_k2&view=item&layout=item&id=235&Itemid=57

Chapter of South Asia

SATHA Call for International Speakers

The SATHA Chapter is organizing the Fifth Invention to Innovation Summit, Annual Technology Event of 500+ Technologies and 1000+ Innovators. The event will take place in four Pakistan regions and will be hosted by local Universities.

In conjunction with the event, the SATHA has launched a call for Pakistan projects from scientists and students to develop technologies demanded by industry. To consult the call, please visit: www.irp.edu.pk/projects/.

The summit is held in November, January, March and May each year in Pakistan. The SATHA Chapter is **calling for speakers**, either professors with practical exposure or practitioners with academic exposure, for the topics R&D, trade policy, IPRs and payback of innovations. Speakers will be given the full coverage of the travel and subsistence costs. Interested candidates should send their CV to: rahmat@irp.edu.pk and mlaura.fornaci@triplehelixassociation.org.

News from the Americas

FRAMERICAS

2015-2020 Core Program
Monitoring Progress in Deployment of Science Technology and Innovation for Sustainable Development
UN SDG 17

I. FRAMEWORK

FRAmericas is an independent, non-for-profit charitable organization 501.c.3, devoted to applying the latest knowledge and technology achievements to improve living conditions and enhance income generation among low-income groups. In pursuing its objectives, FRAmericas partners with other private and public organizations where each partner's capabilities can result in faster and more solid results.

FRAmericas, an ECOSOC Consultative Status organization, follows closely the workings of the UN Open Working Group for the development of Sustainable Development Goals, with a particular focus on Goal 17 "**Strengthen the means of implementation and revitalize the global partnership for sustainable development".** FRAmericas considers progress in achieving MDG and SDG the greatest and most significant challenge the world must pursue, and thus is committed to supporting such processes in any way and by any means it can.

In undertaking the proposed monitoring role, FRAmericas follows the UN Sustainable Development Knowledge Platform guidelines (https://sustainabledevelopment.un.org/sdgsproposal):

- *The implementation of sustainable development goals will depend on a global partnership for sustainable development with the active engagement of governments, as well as civil society, the private sector, and the United Nations system. A robust mechanism of implementation review will be essential for the success of the SDGs. The General Assembly, the ECOSOC system and the High Level Political Forum will play a key role in this regard. (#14)*
- *In order to monitor the implementation of the SDGs, it will be important to improve the availability of and access to data and statistics disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts to support the support the monitoring of the implementation of the SDGs. There is a need to take urgent steps to improve the quality, coverage and availability of disaggregated data to ensure that no one is left behind. (#17).*

II. PROPOSAL

FRAmericas proposes to work on behalf of the UN to monitor progress in the implementation of SDG17 in the area of "technology" and its applications to further development objectives, and to report on world-wide achievements towards the fulfillment of agreed targets. In order to do this, FRAmericas will: (i) develop baseline data for selected target indicator (see Scope, below); (ii) construct a data base to collect, verify and register activities undertaken by governmental and non-governmental organizations world-wide that respond to the selected target indicators; (iii) create an open platform to which registered organizations can access and contribute their inputs to the monitoring process; and (iv) report periodically on tendencies, progress and perceived obstacles to the attainment of the targets selected.

FRAmericas will conduct promotional and dissemination events and use social media to further the reach of this monitoring activity and enlarge the cache of registered organizations participating in its open platform.

III. SCOPE OF THE PROPOSED SDG17 MONITORING ROLE

Sustainable Development Goals are accompanied by targets and will be further elaborated through indicators focused on measurable outcomes. For SDG 17, the following targets will be the focus of FRAmericas monitoring:

Technology

- *17.6 enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation, and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, particularly at UN level, and through a global technology facilitation mechanism when agreed*
- *17.7 promote development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed*
- *17.8 fully operationalize the Technology Bank and STI (Science, Technology and Innovation) capacity building mechanism for LDCs by 2017, and enhance the use of enabling technologies in particular ICT*

Multi-stakeholder partnerships

- *17.16 enhance the global partnership for sustainable development complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technologies and financial resources to support the achievement of sustainable development goals in all countries, particularly developing countries*
- *17.17 encourage and promote effective public, public-private, and civil society partnerships, building on the experience and resourcing strategies of partnerships*

Data, monitoring and accountability

- *17.18 by 2020, enhance capacity building support to developing countries, including for LDCs and SIDS, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts*
- *17.19 by 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement GDP, and support statistical capacity building in developing countries.*

IV. ACTION PLAN

FRAmericas proposes to undertake the following activities and timeframe:

1. Linkage to UN Open Working Group for the development of Sustainable Development Goals (May-June 2015)
    a. Meeting with OWG members, on the occasion of ECOSOC assembly May 26-June 3, 2015. Theme: presentation of project; establishment of liaison.

2. Development of open platform (June-July 2015)
    a. Conceptual design and organizational platform
    b. Technical web-based design
    c. Pilot testing
    d. Dissemination campaigns
    e. Registration of user organizations/individuals
    f. Full-fledged operation

3. Consultation to establish baseline (July-September 2015)
    a. Design of baseline data matrix (January 2015 start date)
    b. Requests for data from sector governmental organizations, specialized agencies, individual organizations
    c. Data collection of public sources
    d. Promotion of use of Open Platform to collect data from users
    e. Meeting with Technology Bank and Science, Technology and Innovation Supporting Mechanism Chair Rwanda's Romain Murenzi, currently Executive Director of the World Academy of Sciences in Trieste, Italy. July 2015. Theme: Results of first meeting February 2015.
    f. Report on baseline by end of 2015

4. Operation of open platform and data-bases (October 2015 on)
    a. Design of output formats for open data-bases
    b. Collection of data on projects, activities, results
    c. Generation of outputs from open data formats

5. Generation of output reports (June 2016 on)
    a. First report by June 2016s
    b. Bi-annual reports after June 2016 until December 2020

6. Dissemination events (June 2015 on)
    a. Presentation of results in ECOSOC meetings, others as required

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FRAMERICAS AT THE WORLD INFORMATION SOCIETY (WSIS) +10 INFORMAL INTERACTIVE STAKEHOLDER CONSULTATION

FRAmericas participated in the World Information Society (WSIS) +10 Informal Interactive Stakeholder Consultation, held in the ECOSOC Chamber at United Nations Headquarters in New York City, on 19 October 2015.

The meeting considered the Draft of a Resolution where WSIS position on issues of Digital Divide; ICT for Development; Human Rights; Internet Governance; and Cyberspace is represented.

FRAmericas focused on paragraphs 16, 17 and 18 covering the subject of "ICT for Development" :

Credit: Photo by Veni Markovski on Tweeter

ICT for Development

"16. The spread of ICT and accelerating global interconnectedness has great potential to accelerate progress across the economic, social, and environmental pillars of sustainable development. The Information Society will play a critical enabling role in achieving the 2030 Agenda for Sustainable Development, including the Sustainable Development Goals (SDGs).

"17. We recognize that information and communications technologies have the potential to provide new solutions to development challenges, particularly in the context of globalization, and can foster sustained, inclusive and equitable economic growth and sustainable development, competitiveness, access to information and knowledge, poverty eradication and social inclusion that will help to expedite the integration of all countries, especially developing countries, in particular the least developed countries, into the global economy.

"18. Priority should be given to leveraging the critical role that ICT plays in enabling resource efficiency, particularly of energy and water, as well as sustainable urban development and the evolution of renewable technologies.

FRAmericas' intervention in the meeting pointed out:

- That sufficient evidence exists today to demonstrate that *ICT indeed has accelerated progress* in terms of socio-economic development and ***provided new solutions*** to development challenges. Therefore, the use of the tentative wording "**ICT has the *potential* to** ..." seems outdated. After fifteen to twenty years of experience of efforts in this field, ICT potential should be more than proved.
- Such evidence might not be adequately systematized or be dispersed, thus making it difficult to perform a clear assessment of ICT impact on development challenges.
- In that case, WSIS+10 should include among priority actions listed in par.18 the need to "support efforts to; (i) quantify and analyze the impact of ICT on development challenges; and (ii) analyze the comparative efficiency and effectiveness of alternative project implementers in the use of funding devoted to support ICT for Development, in particular NGO and other Civil Society organizations.

NEW THA MEMBERS
JULY 2015 - SEPTEMBER 2015

We are pleased to welcome new THA members joining our Association during the period July to September 2015!

THA membership is growing constantly and can now rely on an international base of more than 110 individual members and organizations from five continents including university, scientific-research institutes, incubators, science parks, private companies, and governmental institutions.

We are delighted to see that our network is attracting not only individual members, but also organizations which are eager to fully exploit the learning, networking, and promotional opportunities that THA offers to its affiliates.

We hope to maintain this momentum and to encourage more universities, research centers, innovation intermediaries, companies and government institutions joining us to share our efforts in building, disseminating, and transforming into practical achievements the Triple Helix theories and models.

You can subscribe to THA Organizational Membership (200€ annual payment), or THA Individual Membership, by visiting www.triplehelixassociation.org/membership-request.

ORGANISATIONAL MEMBERS

Federazione delle associazioni scientifiche e tecniche
fondata nel 1897

FAST – Federation of Scientific and Technical Associations
Milano, MI 20121
ITALY
Tel: 02.77790309
www.fast.mi.it

Established in 1897, FAST, the Federation of the Scientific and Technical Associations is an independent non-profit making association acknowledged by Decree of the Italian Ministry for Education, University and Scientific Research dated 30 October 1995. It groups the main national scientific associations with around 50,000 members mostly from industry, research, development and technology sector.

The main activities of FAST focus on services to industries, research activities and training. In particular, it aims to: offer high level services to enterprises; facilitate the participation in European research and technological dissemination programmes; plan and implement advanced training and vocational initiatives; probe research and technological development policies; and promote cultural debate, information and scientific dissemination.

Thanks to its national and international relationships, FAST is constantly and directly linked to the whole technical-scientific and industrial environment in Italy, and organises events in co-operation with industrial professional associations.

P T S
FUNDACIÓN

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PTS Granada is an ideal resource for the creation, implementation, and expansion of institutes and companies, which converts knowledge into economic and social development, especially in the pharmaceutical, health sciences, healthcare and food industries

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The University of Tampere (UTA) is a leading university in Finland with round 15,000 enrolled student and 2000 staff. The origins of the University in its forerunner, the Civic College, have endowed it with a singularly clear and extensive mission to serve society. The University of Tampere is Finland's largest provider of higher education in the field of social sciences and the accompanying administrative sciences.

In its teaching and research the University takes a critical approach to phenomena in society. Its experts engage in the societal debate both through their publications and through the mass media; their opinions are sought after and their words carry weight in discussion and decision-making.

The University offers a wide range of research and expert services to both private companies and public bodies. Areas of organisational competence and expertise in Triple Helix research and practice include; the entrepreneurial university, innovation studies, and regional studies.

Individual Members

Ms Débora Moretti

Federal University of Rio de Janeiro
Rio de Janeiro
BRAZIL
mmorettidebora@gmail.com
(TH Chapter Brazil)

Majored in Biomedical Sciences (2009), and obtained her master degree in Biochemistry from Federal University of Rio de Janeiro (2011). Currently start-up executive and manager of Stratego Bio and voluntair as Advisory Board Member Antonio Paes de Carvalho Junior Enterprise (EJ APC). Has experience in the area of basic life sciences (focused, mainly, in the subjects: protein biochemistry, mosquito biology, tyrosine phosphatases and vitelogenesis) and in the areas of administration (business and public) and academy-industry relationship.

Area of interest in TH research:
Innovation ecosystem concept.

Mrs Anastasia Yarygina

Lomonosov Moscow State University
Seoul
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TH Chapter Russia

2013-present: Brand Strategy, Hyundai Motor Company, South Korea, Seoul. 2013 - IRP program at UCLA Anderson Business School. USA, Los Angeles 2012-2013 - Global MBA. Korea University Business School. South Korea, Seoul 2010-2012: Master Degree of Economics and Innovation. Lomonosov Moscow State University. Russia, Moscow 2010 - Jönköping University Business School. Exchange program. Sweden, Jönköping 2009-2012: venture business consulting, MSU Science Park. Russia, Moscow 2006-2010: Bachelor Degree of Economics. Lomonosov Moscow State University. Russia, Moscow.

Areas of interest in TH research:
University-industry-government relationship, multi-cultural aspects in development of innovations processes, the role of universities in national and global economic development. Innovation infrastructure, clusters, innovation ecosystems, universities, collaboration, university-industry-government relationship, South Korea, Triple Helix, globality.

Professor Riccardo Fini

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Riccardo Fini is Associate Professor of Entrepreneurship and Technology Innovation Management, and CIG Marie Curie Fellow at the University of Bologna (UNIBO), and Fellow at Imperial College London. He is serving as Associate Dean and Director of the Master in Entrepreneurship and of the Global MBA (Innovation) at the Bologna Business School. Before joining UNIBO, he researched at Ecole des Mines Paris, Case Western Cleveland, and the University of Bozen. He was also IEF Marie Curie Fellow at Imperial College and Assistant Professor at UNIBO. His research has been published in leading entrepreneurship and innovation journals such as Entrepreneurship Theory and Practice, and Research Policy. He has been invited to contribute to the University of Chicago Handbook on Technology Transfer, and the Palgrave Encyclopedia of Strategic Management, and he has been awarded more than €300.000 of research funds. Dr Fini has given three keynotes on science and public policy in Brisbane, Porto, and Singapore, and was invited to present his research in thirty universities and business schools in Asia, Australia, Europe, and North America. He has also featured in Nature, Times Higher Education, and The New York Times.

Areas of interest in TH research:
Entrepreneurship; technology transfer and scientific productivity.

Camilo Andres Montañez Aldana
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As a young Colombian entrepreneur, I launched my first Startup on 2009 about augmented reality. I am Industrial Engineering from Sabana University in 2012, my first employee was on Maersk Line international shipment company, in a financial area, where I was made credit and collect and make projects. Here, I contributed to increase the collect of the invoice and make a manual for use of financial module on SAP. SAP FRC. I then had the opportunity to be involved in one of the best healthcare companies about the eyes in the world, the Barraquer Clinic, where I found on of the principal motives to intro to THA because Barraquer have a cluster (or helix) of companies inside it from his foundation more than forty years ago. Actually I am the executive secretary of one of these, I work in Escuela Superior de Oftalmologia form 2013 to present. At the same time continue working on my entrepreneurial way with a StartUp based on virtual reality VR with the knowledge and expertise acquire from the last seven years as an entrepreneur.

Areas of interest in TH research:
Triple Helix Systems of innovation, Entrepreneurial University and Integration between three helixes.

Mr Pedro Silva
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TH Chapter Brazil

Majoring in product design at the Federal University of Pernambuco, Brazil, on the perspective of strategic design, management. It develops research on the implementation of the Triple Helix in the wild region of Pernambuco. Second largest center of Brazil's clothing.

Areas of interest in TH research:
Application and implementation of Triple Helix; management, strategic design, innovation

Professor Margherita Balconi
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Margherita Balconi is a full Professor of Applied Economics at the University of Pavia. She graduated in Political Sciences at the University of Pavia (1973) in the area of international economics. In the Eighties she was a visiting scholar at the Sussex European Research Centre, Sussex University (UK) and at the Faculty of Economics and Politics, University of Cambridge (UK). In 1984-1989 she was a consultant of the Italian Parliament on the restructuring of the steel industry, and in 1994 a Member of the Technical Committee of the Ministry of Industry for allocating aids to capacity cuts. In 2006-2009 she was a Member of the Scientific Committee as by Piedmont Regional Law n.4, 2006, Regional system of research and innovation. In 2005-2012 she was University Rector Delegate for Pavia Science Park.

Areas of interest in TH research
Academic patenting, the links between basic research and innovation, patterns of collaboration between universities and industry, the performance of science parks, the performance of university spinoffs.

Dr Cui Liu
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Cui Liu is a lecturer in the Department of Architecture, Zhejiang University, China. She obtained her bachelor of architecture and master of architecture at Tongji University, and her PhD in Spatial Planning and Urban Development at Polytechnic of Milan. Her research interests include the changing role of the universities in the knowledge society and their corresponding spatial transformation. She is also an urban planner registered in the Ministry of Housing and Urban-Rural Development, China, and participates actively in urban design projects.

Areas of interest in TH research:
Role of university in the regional innovation system

Ms Yang Xiaoli
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YANG Xiaoli, is an Associate Professor in the Finance Department of Fujian Jiangxia University. She obtained an MSc in Finance from Xiamen University, and a BA in Economics from Shandong Finance Institute.

Areas of interest in TH research:
International finance, banking operation and management, ecological industry fund, innovative entrepreneurial university

MRS CHARISSE REYES
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I am a doctoral student at the University of Tampere, Finland. My research focuses on entrepreneurial universities, particularly in the Singaporean context. In my study, I am also applying frame analysis as a method to explore the institutionalization of the entrepreneurial university model. This is based on a single case study of a higher education institution in Singapore.

Areas of interest in TH research:
Entrepreneurial universities, national innovation system, regional development

PROFESSOR WEI YAO
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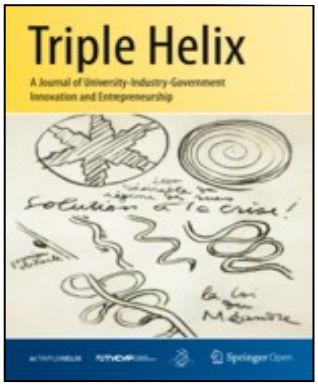
Research Institute of Development Strategy, Zhejiang University, China. Associate professor, assistant to dean. Research interest in university-industry collaboration, entrepreneurial university, and systematic innovation methodology.

Areas of interest in TH research:
Entreprenurial university

THA NEWS



TH JOURNAL LOOKING FOR A FRENCH TRANSLATOR

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The THA is looking for one French translator available to translate a maximum of twenty abstracts over the year from English to French. We offer either a small payment or one year of free THA regular organizational membership. To express your interest and receive more detailed information, please contact Maria Laura Fornaci: mlaura.fornaci@triplehelixassociation.org

LE@D PROJECT STUDENTS' AND EDUCATORS' SURVEY ON E-LEADERSHIP SKILLS

The Le@d3.0 Academy, led by Fondazione ISTUD, is a project that will establish a long lasting knowledge alliance between academy and industry in order to support the development of Soft e-Leadership Skills, much needed in the Digital Age. The project will develop training programmes targeting teachers in Universities, Business Schools, and Corporate Academies, as well as managers and potential managers.

One of the project's goals is to IDENTIFY those e-Leadership Skills that managers, trainers, and students, consider more underdeveloped, and thus requiring priority in future Leadership Development training programmes.

Starting from a e-leadership soft skills taxonomy derived from European and International literature, a set of in-depth interviews (over 25 managers and 30 trainers) has been carried out by partners to finalize the skills' set to focus on. These are the so called "strategic e-leadership skills" (SeLs) and refer not only to transversal, but also to vertical skills, such as for example the ability of identifying and exploiting innovative business opportunities coming from digitalization.

To identify among these skills should be considered as a priority in the development of future Leadership Development training programmes, an extensive survey is being carried out targeted to managers, trainers and students. Please contribute to the survey by answering to an online questionnaire: it is anonymous, and will take about 10-15 minutes, http://efmd.co1.qualtrics.com/jfe/form/SV_b7t5U36YwJSUaG1

Moreover, if you wish to be informed about our project, you can subscribe to the Le@d3.0 quarterly Newsletter: https://docs.google.com/a/triplehelixassociation.org/forms/d/1aJcsAWunG-7AjPvVgN25aAfIJW1JABqc_uG9MT4tunA/viewform?c=0&w=1

CALL FOR PAPERS

NINTH INTERNATIONAL CONFERENCE FOR ENTREPRENEURSHIP, INNOVATION AND REGIONAL DEVELOPMENT [ICEIRD 2016]

23/24 JUNE 2016

CALL FOR PAPERS

In recent years we have witnessed an explosion of the entrepreneurial sector, all over the world. Understanding the complex evolution in this domain requires an interdisciplinary approach, as well as cooperation between academics, researchers, professionals, and public actors. The Ninth edition of the International Conference for Entrepreneurship, Innovation and Regional Development to be held in Bucharest, Romania, aims at creating a network of specialists and stakeholders interested in the latest evolutions in the entrepreneurial sector.

The topics proposed for discussion encompass a wide area from investigating the trends in the field, to identifying effective tactics for sustainable development of entrepreneurial endeavours.

Proposed Tracks

- Challenges and Trends in Contemporary Entrepreneurship
- Strategic Management for SMEs in a Changing Environment
- Business Ethics: Practices, Boundaries and Outcomes
- Networks and Open Innovation
- Triple Helix of University-Industry-Government Relations

Additional tracks submissions are invited. Details on proposal submission are available on the conference website.

Confirmed Keynote Speakers

Constantin Brătianu
Bucharest University of Economic Studies, Romania

Mattias Nordqvist
Jonkoping University, Sweden

Important Dates

Submission of abstracts:	27November 2015
Notification of abstract acceptance:	15 December 2015
Full paper submission:	20 March 2016
Notification of paper acceptance:	10 April 2016
Early bird and author registration:	8 May 2016
Camera-ready paper submission:	8 May 2016
Registration:	5 June 2016

Publishing Opportunities

- Book and e-book with ISBN
- Management Dynamics in the Knowledge Economy (BASE, Cabell's, DOAJ, EBSCO, ERIH Plus, Index Copernicus, NewJour, ProQuest, RePEc and Ulrich's)
- International Journal of Innovation and Regional Development (Academic OneFile, EconLit, Expanded Academic ASAP, Google Scholar, etc.)
- International Journal of Enterprise Network Management (SCOPUS, Academic OneFile, ABS, Business and Company Resource Center, etc.)
- International Journal of Value Chain Management (SCOPUS, Academic OneFile, ABS, Expanded Academic ASAP, etc.)

Networking Opportunities

– social dinner
– workshops
– conference tours

Detailed information on the conference, as well as submission procedures, are available at:

www.iceird2016.com.