

THE TRIPLE HELIX ASSOCIATION MAGAZINE

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Hélice

VOLUME 6 ISSUE 2 JUNE 2017



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

ARTICLES/ESSAYS 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,
Contact: devringoktepe@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 web links to any related activity.
Contact: devringoktepe@gmail.com and sheila.forbes@strath.ac.uk.

Deadlines for submissions to be included in related quarterly issue:

28 May 2017 for June 2017 issue.
29 August 2017 for September 2017 issue
28 November 2017 for the December 2017 issue
28 February 2018 for March 2018 issue

EDITORIAL

Dear Hélice Friends

A warm welcome to the Summer 2017 issue of Hélice.

Our 15th Triple Helix International Conference to be held in September this year will be held in Daegu, South Korea. The conference is jointly organized by the ASIALICS and the Triple Helix Association (THA). Participants will have the possibility of seeing the fast developing innovative side of Korea. The conference organisers promise a very rich and interesting research programme, with exciting keynote presentation as well as thought-provoking political debates enriched with industrial perspectives. For more information on the event, please visit the conference website: www.triplehelix-korea.org.

We are pleased to present interesting scientific papers authored from South Korea, including this year's Conference Theme Paper: *The Fourth Industrial Revolution and the Triple Helix* by So Young Kim, and *Collaborations of Triple Helices in South Korea: A Case Study* by Kyujin Jung.

In our President's Corner, Henry Etzkowitz challenges Hélice readers with a daring article about the future policies and strategies of Europe for innovation and entrepreneurship.

In addition, we have *2IEU + 4IR, The 21st Century 'Entrepreneurial University' and the 4th Industrial Revolution* by Scott Billadeau, and Justin Axelberg presents an overview of the *Third Global Entrepreneurship University Metrics (GEUM) Workshop* which was held on 10-11 June 2017 at Stanford University, Palo Alto, CA. For those of you interested in participating in the GEUM project, we encourage you to join the follow-up workshop which will be organised in London, the global university metrics capital, in Spring 2018. The main objective of the Workshop is to further develop the operationalising and the weighting of the draft GEUM instrument.

In the paper *Business Transformation through Triple Helix: Challenges of the Eco-System*, Rahmat Ullah and his colleagues present key issues and outcomes of the International Business Conference and Exhibition (IBCE) organized for the first time in Pakistan by University of Management and Technology (UMT), Lahore, on

November 7-8, 2016. In a follow-up paper, *Building Trust to Exercise Triple Helix in Higher Education*, the authors present the key outcomes of the ORIC Workshop at the Annual Innovation Summit 2017 held in the University of the Punjab, Lahore. For information about innovation and Triple Helix activities in the South East Asia region, we encourage you get in touch with Mr Rahmat Ullah, the Secretary General of SATHA.

We have also selected a number of interesting publications for your information. In particular, we congratulate the Journal Of Management Dynamics, In the Knowledge Economy Managing the Triple Helix Vol 5, No 1 (2017) and all contributing authors for preparing the first issue of the journal.

The Triple Helix Journal is continuing its successful path and is publishing interesting articles. Should you have any questions, feel free to contact Christiane Gebhardt and Anne Rocha Perazzo (Managing Editor)

Our book review editor, Branca Terra (brancaterra@gmail.com) welcomes you for your interest and submitting book reviews.

We also have a number of interesting and ongoing activities of Triple Helix Association, Thematic Research Groups, Chapters, Regional Correspondents, we as well presenting 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 in Hélice. 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 look forward to hearing from you.

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June 2017

CALL FOR CONTRIBUTIONS

Hélice, distributed to scholars, practitioners, policy-makers, and public administrators, in academic and industrial organizations, and research establishments, has an audience of around 3.000 readers worldwide. This makes Hélice just the place to publish your latest research ideas and recent work. We also welcome news items related to up-coming international conferences or events; call for papers; project reports; job postings; and any other relevant activity that you or your organization is organizing, or has recently organized, and want to tell our readers about. To be included, the deadline for submission is **28 August 2017** (autumn issue) and **28 November 2017** (winter issue)

For further information please feel free to contact Devrim Göktepe-Hultén, Editor in Chief (devrimgoktepe@gmail.com) or Sheila Forbes, Managing Editor (sheila.forbes@strath.ac.uk).

2017 15th
TRIPLE HELIX
International Conference
세계 산·학·관 협력총회
The Fourth Industrial Revolution, Design Thinking, and the Triple Helix
14-16 September 2017
EXCO, Daegu, Korea
UNIVERSITY
INDUSTRY
GOVERNMENT

This year the 15th Triple Helix International Conference is held with the theme of the Fourth Industrial Revolution, Design Thinking and the Triple Helix, in the City of Daegu, South Korea.

Introduced in the 2016 Davos Forum, the Fourth Industrial Revolution is now increasingly dominating the discourse and policymaking on technological innovation, as several notable technologies are emerging at the cyber-physical systems blurring techno-human interfaces. Typified by such technologies as artificial intelligence, robotics, IoT, and virtual/augmented reality, the set of revolutionary changes subsumed under the title of the Fourth Industrial Revolution is likely to challenge many existing institutions, policies, and practices including tripartite relations of universities, industries and governments.

One of the key challenges is to reform education and training institutions and policies, for which design thinking would play a critical role through creativity problem-solving processes.

This year's conference program is comprised of thematic roundtables revisiting the Triple Helix institutions in the age of the Fourth Industrial Revolution and special sessions presenting notable cases and methodological innovations in the studies of the Triple Helix as well as regular sessions.

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KEYNOTE SPEAKERS



Dr. Myung-Ja KIM

President
Korea Federation of Science and
Technology Associations (KOFST)



Dr. Sang Hyuk SON

President
Daegu Gyeongbuk Institute of
Science and Technology (DGIST)



Dr. Christiane Gebhardt

Strategic Advisor of the Triple
Helix Association
Vice-President at the Malik Institute



Dr. Henry Etzkowithz

President
Triple Helix Association

SPECIAL SESSIONS

Global Entrepreneurial University Metrics Initiative (GEUM)

The Global Entrepreneurial University Metrics Initiative (GEUM) is a research project that aims to develop a set of metrics to evaluate the entrepreneurial university. In spite the current rankings and metrics that only consider the teaching and research dimension, GEUM incorporates the entrepreneurial activities conduct by universities to promote economic and social development.

The Global Entrepreneurial University Metrics initiative (GEUM) is an international Working Group initiated by the International Triple Helix Institute (ITHI), CWTS Leiden University and Psychology in the Public Interest Program, North Carolina State University, under the umbrella of Triple Helix Association. The initiative began with 7 country teams from Brazil, China, Finland, Austria, Netherlands, Russia and USA.

In this session we have opportunity to discuss the project development in different countries and interact with their researchers if you would like to participate in the project.

USA: Dr Chunyan Zhou, Director of the International Triple Helix Institute, USA

Russia: Dr. Liana Kobzeva, Tomsk State University, Russia

Brazil: Prof. Mariza Almeida, Rio State University, Brazil

Government Role in Triple Helix in Asian Countries

Chair: Jarunee Wonglimpiyarat, Tamassat University, Thailand

This session we will discuss the development of university-industry-government in different Asian countries and their impact on the economic development.

Participants:

Jarunee Wonglimpiyarat, Tamassat University, Thailand

Yuzhuo Cai, University of Tampere, Finland

Rahmat Ullah, Institute of Research Promotion, Pakistan

Amir F. Manurung, National Graduate Institute for Policy Studies, Japan

Trilicious Game for Industry 4.0

Chair: Prof. Mariza Almeida, Rio State University, Brazil

Trilicious is a serious game to create an innovative solution to a complex problem through well-defined university-industry-government interactions. It is a activity that connects fun, collaborative thinking and Triple Helix concepts to propose solutions to various problems. session We will apply the game to solve difficult problems related to Industry 4.0 based on university-industry-government interactions using the Knowledge, Innovation, Consensus and "AHA" game' cards.

The game was designed by Luke Hohmann an internationally recognized expert and serious games designer, Founder and CEO of The Innovation Games® Company specifically to Triple Helix IX Conference (2011) when the participants were invited to play for the first time.

Triple Helix Actors, Governance and the Region : Triple Helix actors in the regional development ecosystem: enhanced governance and value co-creation

Chair: Liana Kobzeva, National Research Tomsk State University, Tomsk, Russia

We are witnessing an institutional transformation of the triple helix actors due to numerous economic and societal challenges driven by most up-to-date innovation. Smart, sustainable and inclusive growth can be achieved through innovations at global, national, regional and local levels with a greater focus on the regional dimension. We examine how the Triple Helix institutions are adapting themselves to the new challenges and search for the new types of interaction between TH stakeholders at regional level and practical implementation of evidence-driven policy-making decisions on the rise of the 4th industrial revolution - for the engagement of universities and other stakeholders in regional social and economic development; for the mobilisation of clusters, science parks and other regional concentrations of capabilities in economic development projects; and for the establishment of new governance models for sustainable triple helix interactions.

Key Points:

- (a) What kind of policy and mechanisms do we need to design in order to encourage and enable triple helix partners for an ongoing and dynamic value co-creation within regions and territories?
- (b) What kind of activities and cooperation between triple helix actors through networks and clusters are the most beneficial for the regions in the era of the Fourth Industrial Revolution?
- (c) What are the projects, policies, programs and initiatives in the era of the Fourth Industrial Revolution which (1) make financial resources and investments more accessible for the triple helix actors in the region; (2) encourage mobility of professionals and talents, attract and retain them in the region; (3) stimulate university-business cooperation and co-creation including both high-tech, knowledge-intensive, innovation and socially-oriented companies?
- (d) How can the university evolution and transformation currently contribute to the regional smart, sustainable and inclusive growth?
- (e) Which university roles and functions in regional innovation systems are the most efficient for triggering societal development?
- (f) What are the university interactions mechanisms with other stakeholders/actors within the regional dimension to

better serve the needs of the regions and territories? How to create, sustain and strengthen them?

- (g) How the government support can reinforce and made it possible for the region to become a world innovation hub, attracting and circulating talent and technology, internationally?

Roundtable 1 : Innovation and Design Thinking in the Age of the Fourth Industrial Revolution

This roundtable discusses how design thinking can be applied to exploit and expand the opportunities generated by new frontiers of technology in the age of the Fourth Industrial Revolution with the focus on pilot programs and projects aimed at technological and social innovations around the world. Led by Prof. Dongjoo Song (Yeungnam University), key architect of several engineering projects, the roundtable will offer opportunities to explore new ways to imagine and implement innovative ideas for tackling hard problems and improving sociotechnical governance.

Roundtable 2 : Fourth Industrial Revolution and the Future of the University

With the blurring techno-human boundaries and increasing replacement of mental labor by artificial intelligence and robotics, the emerging technologies driving the Fourth Industrial Revolution is posing new challenges to the roles of the university. Organized by KAIST, Asia's top S&T-centered university, this roundtable invites domestic and international experts to reflect on the nature of these challenges and the efforts of S&T-centered universities to rethink and redesign their traditional dual missions of education and research.

2017 Triple Helix Conference Special Issue Session : Measuring Triple Helix Synergies and Innovations using Scientometric, Technometric, Informetric, Webometric, and Altmetric Data

The Triple Helix of university-industry-government relations is an internationally recognized model for understanding cross-sphere entrepreneurship and the changing dynamics of universities (especially the advent of entrepreneurial universities), innovation and socio-economic development. The contemporary era of knowledge economy demands further enhancement of the Triple Helix of university-industry-government relations within Innovation Systems at various dimensions, such as National Innovation Systems and Sectoral Innovation Systems. Among various actors, universities, industries, and governmental agencies can be considered as the three most crucial ones which are becoming increasingly interconnected in innovative activities, which lead to the formation of the Triple Helix relations. Therefore, the Triple Helix of university-industry-

government relations has naturally become the de facto core subsystem of an innovation system. This session provides two presentations discussing one of the questions related themes of the Triple Helix Special Issue provided :

- How Triple Helix model can help solve social, economic and even political problems at various levels in case studies? What kind of indicators should be adopted for measuring Triple Helix synergies?
- How to measure Triple Helix synergies in countries/ territories' innovation system?
- What are the important concerns in measuring Triple Helix Synergies and Innovations through Scientometric, Technometric, Informetric, Webometric, and Altmetric Data?
- How have Open Data been applied to facilitate Triple Helix synergies or innovations?
- What are the identified barriers to facilitate Triple Helix synergies or innovations?
- What are the ways to strengthen and improve the communicative relationships among entities of Triple Helix to maximize the synergies?
- How can information flow of institutions of Triple Helix be measured to assess the effectiveness of collaboration?
- What are the ways to measure the effectiveness of data exchange between cross-sector institutions?
- How can cross-sector collaboration be measured?
- What are the best ways to share ongoing Triple Helix projects and successful cases in a global scale to collectively enhance Triple Helix agenda?

Presenters: Dr. Leo Kim, Brandon Moore (Assistant Vice President IT Architect at Nationstar Mortgage LLC, U.S.)

Topic: Proposing an innovative way to facilitate Triple Helix synergies, Applying industry standard design patterns to open data APIs

Corporate Reputation and Innovation Perception: Are Innovating Companies Gaining Enough Attention they Deserve?

Chair: Jang Hyun Kim (Sungkyunkwan University)

Corporate reputation reflects a company's actual performance but it also constitutes a significant part of the perception of performance. This session incorporates diverse approaches to corporate reputation in terms of diffusion of innovation theory, corporate social responsibility, symbolic interactions, and dialogic communications. Ultimately, as an important resource of corporation, reputation should be grown so that the corporate endeavor for innovation should be properly acknowledged. This session should be an interesting venue in relation to corporate reputation and innovation efforts.

Online to Offline (O2O) Industry and Innovation

Chair: Daeho Lee (Sungkyunkwan University)

O2O is an emerging industry sector which links traditional offline stores to online shopping. This new trend sparks an old debate of whether industrial restructuring as labeled as 'industrial 4.0' is an essential revolution in global economy. This session features articles on analytical approaches to diverse O2O services, comparing different groups of companies in terms of efficiency using meta-frontier analysis, and future prospect of O2O as a form of corporate/ industrial/provincial/national/global innovation.

The Real World Examples of Innovation Education

Chair: TBA (DGIST)

DGIST and many Korean research universities and institutions have achieved considerable number of successful cases in terms of innovation education. Using management of technology (MoT) framework, this session introduces Korean, Asian, and global examples of innovation education. This session will be an interesting forum of exchanging experiences of innovation education.

Master Class on Triple Helix

Presenters: Prof. Henry Etzkowitz, President Triple Helix Association; Dr Chunyan Zhou, Director of the International Triple Helix Institute.

Topics: Triple Helix general conception; Entrepreneurial university in the Triple Helix; Triple Helix model in regional innovation; Innovation space of the Triple Helix.

Other special sessions in progress: Science Parks and Incubators; University-Industry Partnerships; Knowledge and Technology Transfer; National Innovation Systems and Models; Entrepreneurial Universities - coordinated by Dr Emanuela Todeva

Triple Helix Working Papers and Mentoring System

The session is chaired by Yuzhuo Cai (University of Tampere, Finland) and is open to all THC participants

In this session we discuss with participants about how Triple Helix Working Papers can be a platform to support researchers to share their early research ideas and consolidate them into rigid studies.

This sessions goes about the issues as shown below:

How to write a good scholarly paper?; Why publish at the Triple Helix Working Paper; What papers can be published as Triple Helix Working Papers; What support for authors; Who are the mentors?; and Why become mentors?

2017 Triple Helix International Conference Theme Paper

The Fourth Industrial Revolution and the Triple Helix

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DEFINING AND DELINEATING THE FOURTH INDUSTRIAL REVOLUTION

Since the World Economic Forum (WEF) reputed for its global agenda-setting capabilities introduced the term, the Fourth Industrial Revolution, in its 2016 summit in Davos, it has become a new buzzword capturing recent technological breakthroughs heralding social transformations in every corner of socioeconomic life.

In the words of Klaus Schwab, key architect of the Forum, the core of the Fourth Industrial Revolution lies in technologies blurring the boundaries of the physical, biological, and digital spheres, as best exemplified by artificial intelligence, virtual/augmented realities, the Internet of Things (IoT), autonomous vehicles, and drones (Schwab, 2016).

While it is apparently straightforward to call an assemblage of these emerging technologies the Fourth Industrial Revolution, there are uncertainties and ambiguities in defining and delineating the scope of this transformation at least in three aspects.

Firstly, technical experts as well as historians of science and technology may well doubt that this is really the 'fourth' industrial revolution. According to the WEF's formulation, the current transformation is distinctly the fourth, as the previous industrial revolutions took place based on very different technological systems (mechanical production driven by water and steam power for the first industrial revolution, mass production driven by electrical energy for the second industrial revolution, and automation driven by electronic and IT system). In the views of the advocates of the novelty of the Fourth Industrial Revolution, what is truly new about the fourth, is the integration of cyber-physical-biological system enabled by the above-listed technologies.

Table 1: Twelve Emerging Technologies of the Fourth Industrial Revolution (WEF 2017a)

| | | | |
|---|---|--------------------------------------|---|
| Artificial intelligence and robotics | Development of machines that can substitute for humans, increasingly in tasks associated with thinking, multitasking, and fine motor skills | New computing technologies | New architectures for computing hardware, such as quantum computing, biological computing or neural network processing, as well as innovative expansion of current computing technologies |
| Virtual and augmented realities | Next step interfaces between humans and computers, involving immersive environments, holographic readouts and digitally produced overlays | 3D Printing | Advances in additive manufacturing, using a widening range of materials and methods; innovations include 3D bioprinting of organic tissues |
| Ubiquitous linked sensors | Also known as the "Internet of Things" (IoT); the use of networked sensors to remotely connect, track, and manage products, systems, and grids | Advanced materials and nanomaterials | Creation of new materials and nanostructure for the development of beneficial material properties, such as thermoelectric efficiency, shape retention and new functionality |
| Blockchain and distributed ledger | Distributed ledger technology based on cryptographic systems that manage, verify and publicly record transaction data: the basis of "cryptocurrencies" | Geo-engineering | Technological intervention in planetary systems, typically to mitigate effects of climate change by removing carbon dioxide or managing solar radiation |
| Biotechnologies | Innovations in genetic engineering, sequencing and therapeutics, as well as biological-computational interfaces and synthetic biology | Neuro-technologies | Smart drugs, neuroimaging, and bioelectronic interfaces that allow for reading, communicating, and influencing brain activities |
| Energy capture, storage, and transmission | Breakthroughs in battery and fuel cell efficiency; renewable energy through solar, wind, and tidal technologies; energy distribution through smart grid | Space technologies | Developments allowing for greater access to and exploration of space, including microsattellites, advanced telescopes, reusable rockets and integrated rocket-jet engines. |

Yet, these technologies driving the Fourth Industrial Revolution are critically viewed as the extension of the previous revolution marked by digital technology. In particular, Jeremy Rifkin, the author of *The Third Industrial Revolution* (Rifkin 2011), refutes the WEF's claim by pointing out that the velocity, scope, and systems impact characterizing Schwab's Fourth Industrial Revolution have in fact been the hallmarks of the digital technologies underpinning the Third Industrial Revolution. Both Schwab and he recognize the vast potentials of digital technologies to fundamentally transform the way political, economic and social life is organized around the world, yet the point of disagreement lies, claims Rifkin, is that the Third Industrial Revolution is yet to reach its full potentials and thus too early to be declared to be done (Rifkin 2016).

Another critical view on whether the Fourth Industrial Revolution is indeed the 'fourth' is based on Kondratieff wave theory. Kondratieff waves refer to the long-term fluctuations of 40~60 years beginning with technological innovations and sustained over extended periods of economic prosperity before sudden or prolonged slowdown. One of the widely circulated market trend analyses as shown in Figure 1 posits five such waves with the sixth one characterizing current technological and economic changes (Allianz, 2010).

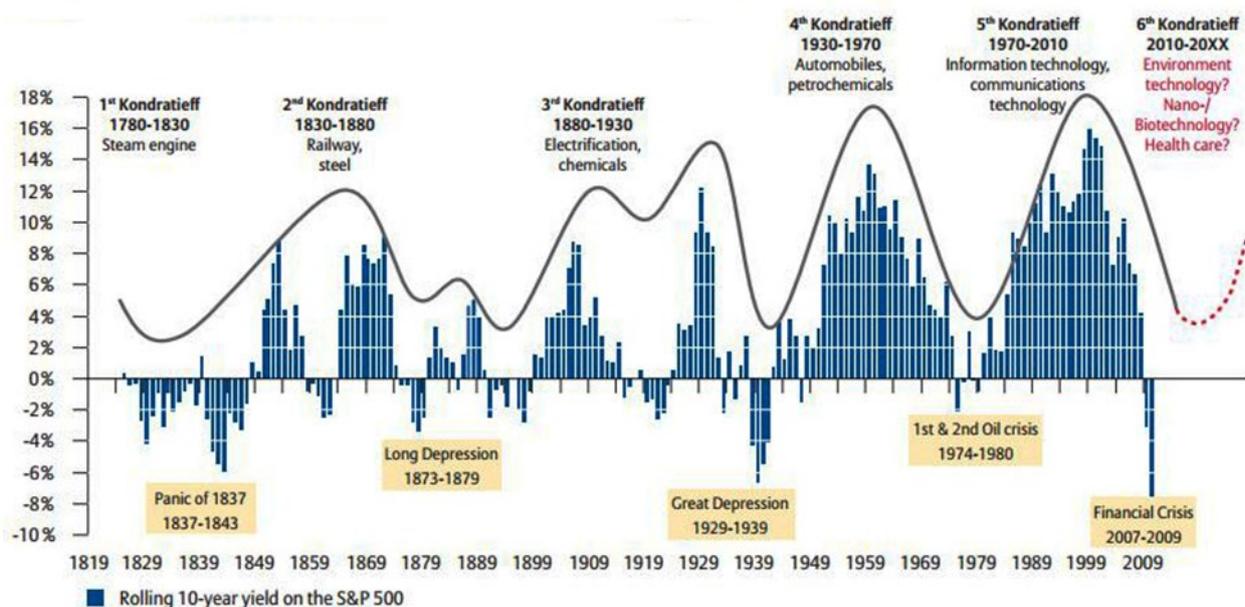


Figure 1: Kondratieff Cycles (Allianz 2010)

Secondly, many observers of the recent technological developments associated with the Fourth Industrial Revolution commonly comment that it is more than the 'industrial' transformation. To a large extent, this observation seems trivial, for no previous industrial revolution has been just an 'industrial' revolution. Since Arnold Tonybee first coined the term to describe Britain's machine-based economy retrospectively (Tonybee 1884), technological innovations associated with an industrial revolution have always involved social, economic and cultural transformations.

In particular, the question about whether the Fourth Industrial Revolution is more than the 'industrial' revolution is linked to the origin of the term, Industry 4.0. Industry 4.0, also called smart industry or smart manufacturing, is a German project launched in

2011 to automate manufacturing production based on digital platforms (GTAI, 2014). While it is generally understood to encompass such phenomena as real-time supply chain, data-driven demand prediction, self-optimizing systems, and connected factories, its meaning has been expanded with each company having its own definition. As many features of Industry 4.0 represent the developments linking cyber-physical systems, the Fourth Industrial Revolution in a narrow definition can be interchangeable with Industry 4.0.

Thirdly, there is a question whether the Fourth Industrial Revolution is truly 'revolutionary'. Advocates of the Fourth Industrial Revolution claim that it is so, as the changes it brings about are exponential disrupting almost every industry in every country enabling new capabilities for people and machines and ultimately leading to the transformation of entire systems of production, management and governance.

In the past human history, all real revolutions - whether political or technological - have only come to be called a revolution posthumously. Then, naming the ground-breaking technologies linked to the Fourth Industrial Revolution and their associated changes as a revolution cannot be a mere attempt to describe what

is happening now. Rather, it is close to a prescription in the sense of setting a global agenda. And even such effort is viewed to have a dubious effect, as one of the immediate book reviews upon the release of Schwab's book (Thornhill, 2016) criticizes the book as inflight reading that is hard to reach broader audience.

In short, the apparent arrival of the Fourth Industrial Revolution is debated and disputed over the precise definition and scope of its impacts. Yet at least in South Korea it has emerged as a powerful keyword setting the tone of policymaking of the new administration let alone science, technology and innovation (STI) policy.

THE FOURTH INDUSTRIAL REVOLUTION IN THE SOUTH KOREAN CONTEXT

Just two months after the 2016 Davos Forum, the AlphaGo match was held in the downtown Seoul, South Korea. Widely televised, the match was proposed by Google DeepMind, the new British start-up company acquired by Google, to challenge humans in the board game of Go. AlphaGo, the artificial intelligence (AI) based computer program developed by DeepMind, won over Lee Sedol, world Go champion with the highest rank (9 dan) in a five-game match.

The match result sent a shockwave to people watching the match, for the prediction before the match was predominantly against AlphaGo. Since the Go game requires more than simple calculation, many conjectured that even an AI program would not be able to penetrate the strategic logic and insight that could only be accumulated over many years of practice.

The match had all the more impact in this country, for South Korea has been well recognized as a global IT leader. The government immediately responded with the announcement of the 2 billion dollar R&D project. Named as the National Strategic Project, the initiative primarily targeted the technologies closely linked to the Fourth Industrial Revolution such as AI, self-driving cars, and virtual/augmented realities (VR/AR).

The sudden focus of the national R&D on the Fourth Industrial Revolution technologies became more intensified over the presidential election in the spring of 2017. As revealed in a simple comparison of the frequencies of the search term between the world and South Korea using Google Trends in Figure 2, South Koreans' keen interest in the Fourth Industrial Revolution is very much evident in the continuing rise of searches in the spring of 2017. While the worldwide search shows the peak in the very week of the 2016 Davos Forum subduing in the following weeks, the search of the term in South Korea has risen much more as time went by.

What was notable in this intense pre-election debate was that it went beyond a simple identification of future strategic areas or fields that the government has to promote for the Fourth Industrial Revolution. The debate touched upon the role of the government vs the private sector in meeting the system-wide challenges from the Fourth Industrial Revolution as well as various issues of national R&D governance that have long been discussed in the nation's R&D community.

Indeed, when the Korea Federation of S&T Societies, the largest organization encompassing S&T associations in South Korea polled scientists and engineers in June 2017, more than a quarter of the respondents pointed out the reform of education and R&D system as the highest priority in meeting the challenges from the Fourth Industrial Revolution (KOFST, 2017). In this survey of 2,350 researchers in various fields of S&T, the responses prioritizing the development of individual technologies driving the Fourth Industrial Revolution such as AI or IoT were in fact fewer than those prioritizing more governance or system-related aspects, i.e. the reform of education and R&D system as shown in Figure 3.

More specifically, the respondents viewed creativity as the most important feature of educational reform (29%), followed by interdisciplinary education (19%) and basic science education (18%). As to R&D reform, they answered the streamlining of redundant legal and institutional measures for S&T (26%) and the abolition of ineffective regulations for technology transfer (25%) as the most urgent tasks in meeting the challenges of the Fourth Industrial Revolution. These survey results naturally lead us to revisit the Triple Helix model in relation to the discourse on governance and policymaking for the Fourth Industrial Revolution.

CHALLENGES OF THE FOURTH INDUSTRIAL REVOLUTION TO THE TRIPLE HELIX

Amid plenty of discussion on emerging technologies driving the Fourth Industrial Revolution, the World Economic Forum created an expert group last year to initiate and promote participatory

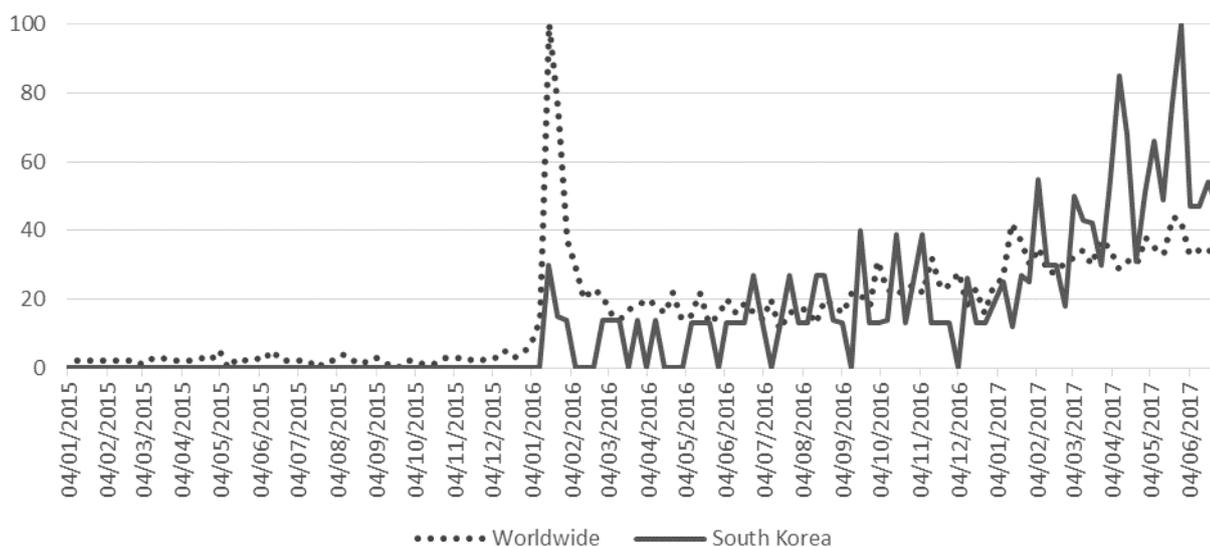


Figure 2 : Keyword Search on the Fourth Industrial Revolution (World vs South Korea)

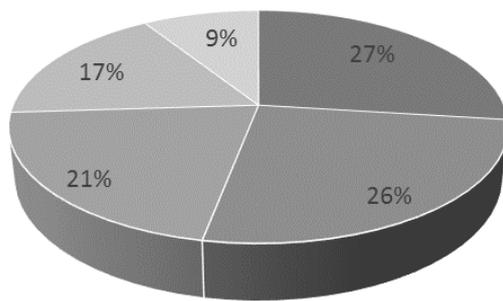


Figure 3 : Priority in Promoting the Fourth Industrial Revolution (KOFST, 2017)

- Reform of Education & R&D System
- Internet of Things
- Artificial Intelligence
- Digitalization of Manufacturing
- Autonomous Vehicles

deliberation of the values embedded in the Fourth Industrial Revolution as well as potential risks and hazards of those technologies. Called the *Global Future Council on Technology, Values and Policy*, this group, together with other more technology-oriented councils, are developing policy approaches and options to shape the future of the Fourth Industrial Revolution. So far four key principles have been laid out through multiple rounds of brainstorming discussions (WEF, 2017b).

One is to focus on systems, not technologies. This is effectively a call to avoid technological determinism viewing technology development as natural or inevitable. The second principle is to have technologies empower people, not determine the fate of people unilaterally. The third principle is to think and develop technologies by design, not by default, meaning that much more care and attention needs to be given in order to avoid coming up with technological default blind to various sectors and segments of the society. The last is to consider value as a feature of technology development, not a bug to fix, which is to acknowledge that technologies are inherently value-laden rather than value-neutral.

These principles, together with the aforementioned survey results on the Fourth Industrial Revolution of South Korean researchers, directly call us to re-think the roles of the university, government, and industries that form the Triple Helix of the innovation ecosystem and re-imagine their interfaces in the governance of emerging technologies.

First of all, unlike many existing technologies developed with clear performance goals in mind, most technologies underpinning or driving the Fourth Industrial Revolution are being developed without clear end-results in view. This implies that the specific paths of technological development for the Fourth Industrial Revolution are much more likely to depend on how various actors of the innovation eco-system, especially those three main tripartite actors (university-industry-government), perceive the utility and risk of emerging technologies and structure the discussions of alternative futures of those technologies.

Secondly, the increasing demand on creativity and inter- (or trans-) disciplinary in education and R&D in the face of the Fourth Industrial Revolution suggests that the traditional dual missions of universities - teaching and research - need to be upgraded in the

directions of allowing much more room for experiments and learning by doing. In this regard, the rise of design thinking in engineering education is of particular note, as the central pillar of design thinking lies in the ability to identify problems and to remain open-minded to every possibility. As a human-centered approach to innovation to integrate the needs of people and the possibilities of technology, design thinking involves creating choices and shifting through analysis and synthesis that would inevitably necessitate interdisciplinary communication (Brown 2009).

Finally, the indeterminate and uncertain nature of new technologies associated with the Fourth Industrial Revolution would make the Triple Helix institutions and agents all the more important and pertinent, as the interactions within the Triple Helix would go beyond strategizing opportunities from technological innovations. That said, institutions and agents within the Triple Helix networks should pivot around social imaginations of future technologies as well as the sociotechnical governance structure for the of new frontiers opened up with the Fourth Industrial Revolution.

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Collaborations of Triple Helices in South Korea: A Case Study

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Local governments in South Korea are suffering from a decreasing number of jobs, which in turn, results in people moving to other cities. Even Seoul, the capital city of South Korea, is trying to promote metropolitan economy, and one of its key foci is to promote the collaboration among university-government-industry sectors.

On a national level, according to Sohn and Kenney (2008), South Korea's sources of technology in the 1980s were mostly based on companies purchasing licenses from Japan and the United States; and then, producing these products in mass production rather than developing their own technologies. Since then, there has been a marked increase in the number of research and development (R&D) activities among small and medium-sized enterprises (SMEs). For example, in the mid-1990s, more than two thirds of the R&D centers were operated by SMEs (Kim *et al*, 2008). By the late 1990s, there was an increase in the number of patents filed by Korean firms in the US Patent and Trademark Office (Sohn and Kenney, 2008). According to Lilischkis and Gmbh (2011), in INNO-Grips Policy Brief, the average R&D intensity of SMEs increased from 1.37 percent to 2.85 percent between 2000 and 2007.

Part of the success of the Korean's industrial reform can be explained by the national government's aggressive industrial policy approach. In 1999, the government enacted the 'Industrial Development Law,' which provided industrial infrastructure as well as financial resources and support to industrial parks outside the Seoul Metropolitan area. Also, during the same period, the national government focused on building infrastructure (e.g. equipment, research facilities, grants) and human development (training, skilled personnel) (Kim *et al*, 2008). In 1995, in order to promote R&D collaboration between SMEs, research institutes, and universities, the Ministry of Science and Technology and the Ministry of Industry and Resource established the Technology Innovation Center (TIC) and the Regional R&D Center (RRC). The 'R&D Capability Enhancement Project' enacted in 2008 introduced strategies for the formation of industrial-university-institute networks. In December 2012, the national government revised the 'Industrial Placement and Factory Construction Act' and introduced the 'Industrial Cluster Development and Factory Establishment Act' setting up a five-year plan for industrial agglomeration enhancement.

However, existing studies suggest the national government's efforts to encourage collaboration between public agencies and firms have had a limited impact on innovative R&D activities. Sohn and Kenney (2008) argued the technological transfer in South Korea has been based on technology acquisition and absorption rather than technological innovation. A study conducted by Sung *et al* (2003) among 118 venture companies reported the tangible benefits were limited to low cost spaces and access to global networks for information sharing. Their findings highlight that most companies

participating in government-sponsored initiatives generally believe their success was due to their own organizational capacities and good business strategies rather than the government's financial incentives, marketing, and technical support. The findings also suggest public initiatives are of limited value in product innovation, especially on venture capital science parks and industrial incubators.

Moreover, despite the national government's efforts, the costs of collaboration often prevent SMEs from collaborating in R&D activities. Most small companies in South Korea lack qualified personnel with necessary management skills. Fresh graduates and skilled workers preferred to work for *Chaebol* companies rather than SMEs because of employment security (Sohn and Kenney, 2008). Sohn and Kenney (2008) argued that the policies of the national government have historically been discriminatory toward SMEs affecting their management capacities. Most financial institutions and venture capital companies preferred to provide funds to large companies rather than SMEs. They tended to finance existing firms with better management capacity rather than start-up companies (Kenney, Han, and Tanaka, 2004). While R&D collaboration between industry and university-research institutes (URI) is becoming an important source of innovation and technology transfer (Sohn and Kenney, 2008), the concern is also related to industrial relocation, where large companies have shifted their manufacturing plants to other parts of South East Asia and China.

Prior studies also suggest that SMEs in South Korea are generally reluctant to engage in R&D collaboration with University-Research Institutes. A study of 372 firms found that about 54 percent of responding firms in South Korea never collaborated with universities (Park, Um, Lee, and Hwang, 2000). Sohn and Kenney (2007, p994) noted that Korean universities respond 'only slowly to changing conditions.' Despite reforms that have been introduced in the Korean higher education system and an increase in the number of professors in science and engineering, the interaction between universities and industry has been limited to informal linkages and short term contracts. The centrally planned approach of the Ministry of Education has also influenced much of the incentives for professors to be entrepreneurial in getting research dollars and innovative in conducting their research. For instance, senior professors are generally reluctant to conduct cutting edge research because of their heavy teaching load and committee responsibilities. The industry has low expectations that universities would generate tangible research results (Sohn and Kenney, 2008). Although the national government has enacted legislation for universities to transfer technology to industry (i.e. Special Entrepreneurial Act in 1998), industry generally perceived the role of universities as production of fresh graduates rather than commercialization of scientific knowledge and new products.

The role of public agencies matters in providing information to potential collaborators regarding the capacity of SMEs. From the institutional collective action (ICA) framework, despite the problems associated with collective action dilemmas, public agencies can align SMEs' incentives with an objective to increase efficiency, create conditions necessary for developing reputation, and commitment to protect firms interests (Feiock, 2013). In the context of South Korea, having government-certified R&D facilities has been promoted by the Small and Medium Business Agency (SMBA) and the Korean Agency for Technology and Standards in order for SMEs to document their credibility in conducting R&D activities. To qualify for the R&D facility certificate, SMEs must at least have five full-time R&D employees with graduate degrees in the fields of natural sciences, engineering, or medical science (SMBA, 2012). The credibility of SMEs can be enhanced because, with the certified R&D facility, they must submit annual R&D activity reports including number of qualified professional employees, investments, and performance. There are other advantages to have an R&D facility certified by the Korean Industrial Technology Association such as financial backup from financial institutions, government funding, recognition of industrial standards and reputation. SMBA also encouraged SMEs to certify their R&D facility as specified by the Basic Research Promotion and Technology Development Support Act (2011).

It is worth examining whether a government certified R&D facility has an effect on the motivation of SMEs to collaborate with public research institutes and universities, in particular the roles of government certified research facility in understanding the ability of SMEs to internalize knowledge, develop infrastructure, and explore external sources of innovation in various stages of product development. Moreover, if R&D activities in URI are contained within a geographical space, the flow of new ideas between URI and firms can be better promoted through formalized university-industrial relations. That is, the flow of new ideas across different industrial sectors can contribute to the commercialization of products. The next section reviews the theoretical framework for explaining the motivation of SMEs to engage in R&D collaboration with URI.

To examine factors explaining the likelihood of SMEs to collaborate with URI in R&D activities, we used data that were collected in the Seoul Metropolitan area by the Seoul Institute. The metropolitan government has made considerable efforts to encourage R&D activities among SMEs. For example, the Seoul Metropolitan government introduced an initiative called 'Open Innovation System' in 2009 with an aim to encourage the creation of knowledge ecosystems that would change the industrial behaviour of SMEs. The initiative aims to sustain urban economic growth, provide firms with new opportunities for product developments, and technology commercialization. There have also been other initiatives, which include industrial clusters in specialized agencies for SMEs and incubators. According to Jung *et al.* (2010), regional techno centers established by provincial governments generally focus on promoting R&D collaboration by using joint research grants for start-up SMEs and URI networking programs. The industrial policy was based on the belief that, without financial assistance and practical policy guidance, the region could not build its own R&D capacities. By pooling skilled labors and resources together, the regional approach to R&D can narrow the R&D gap between SMEs and large conglomerates (Seoul Institute, 2010).

Results suggested several implications for both policy and theory. First, in South Korea, SMEs having government-certified R&D facilities explain their likelihood to engage in R&D collaboration with URIs. The difference embedded in organizational culture, especially between the private companies and URIs may be lessened by public agency regulatory processes and incentive programs, which, in turn mitigates the collective action dilemmas such as distrust, commitment problems, and unequal powers among potential collaborators. The facilities employing scientists and engineers with experience and skills also signal SMEs' research capacity. Because SMEs with a certified R&D facility can contribute to a productive exchange with URIs, they also can gain experience, confidence, and commitment to making long term cooperative venture decisions.

Second, the role of organizational size as measured by the level of R&D investment in R&D activities explains the collaborative behaviour of the SMEs in the sample. The results confirm the empirical findings of other studies. A relatively larger SME tends to invest heavily in R&D activities, which means it has the capacity to absorb knowledge developed by URI (Cohen *et al.*, 2002; Fontana *et al.*, 2006). A larger SME also has the experience, standard operating procedures, and ability to deal with a university administration and effecting agreements with URIs on R&D projects. We also found that SMEs in the chemical industry tend to have a higher propensity to establish R&D collaboration with URIs compared to SMEs in the IT sector.

Third, in terms of the perceived importance of R&D activities there are marked differences between SMEs collaborating with URI and those that do not. The differences are found in the areas of R&D needs related to acquisition of information, basic research, pilot testing of products, and product manufacturing. The differences in the perceived importance of R&D activities highlight the extent to which managers from the public and private sectors can organize and manage their innovative activities selectively across sectoral boundaries. If R&D activities matter but vary depending on various stages of product development, then the administrative support, infrastructure, and the ability of public agencies to coordinate information and provide avenues for multiple actors to work together also become crucial.

While our findings broaden the understanding on the scope of management decisions adopted by SMEs, the study has several limitations. We only examined 336 SME in the Seoul Metropolitan area, making generalizations to other regions of the country limited. Another concern is related to the endogeneity of explanatory variables in the model. While our model assumes that SMEs collaborate with URI in R&D can be explained by the presence of certified research facilities, the effect could also be explained by SMEs strategic decisions. That is, the choice on research facility certification was not made randomly, but based on the expectations that the decision could be explained by R&D collaboration with URI. We also have not examined the advantages of being in close proximity to others with a similar industrial-base. This is particularly important for SMEs to gain access to basic infrastructure as well as specialized research centers, technology transfer agencies, universities, and laboratory facilities.

Note. This article is a modified version of Kyujin Jung and Simon Andrew (2014), 'Building R&D collaboration between university-research institutes and small medium-sized enterprises', *International Journal of Social Economics*, 41(12), 1174-1193.

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PRESIDENT'S CORNER

Fast Forward: Europe's Innovation and Entrepreneurship Future

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The following draft Hélice "President's Corner" was found in the papers of the first President of the Triple Helix Association, dated 27 June 2040, deposited in the Association's Archives, at its headquarters in the Acadamei Lincei, Rome.

The Europe of Innovation and Entrepreneurship (EIA), begun in 2020, and focused on macroscopic collaborative projects, drawing upon resources across the Union. Founded in order to replicate the AIRBUS success, EIA targeted advanced, emerging areas of civil innovation, relatively neglected by the US, Russia and China. 'Picking Winners' became the name of the game. Laissez faire development models that had long been abandoned by the US, had become increasingly popular in Europe. However, they were finally eschewed in the light of awareness that they were not followed in the US, despite perseverance on the ideological level, perhaps to confuse competitors. A European innovation methodology was arrived at through an iterative consensus development process, utilizing a design thinking approach, conducted at local, regional, and cross-national levels. Innovation targets were selected through a bi-level competition, with an initial stage of expert selection followed by a final selection made by popular vote. Resources on the scale of the agricultural subsidies were committed according to regional GNP levels, with extra input into the process, with higher returns possible, through committing a higher than mandated level of contribution. Most funds derived from long-term European Innovation bond issues premised on enhanced returns to economy and society to cover the investment in knowledge-based innovation (Etzkowitz and Etzkowitz, 2017).

The European Civilian Advanced Research Projects Agency (CARPA) founded in 2022, following a pilot begun in 2018, was established to manage the process. CARPA followed the model of drawing in academic and industrial visionaries for discrete 5-10 year tenures, but with double the US ARPA budget. In retrospect, organizational models derived from the AIRBUS, various EU framework programmes, the Boston and Silicon Valley Triple Helix conurbations stimulated by military and health related research were credited with influencing the development of EIA. The US post-Sputnik DARPA, credited with the Internet, GPS and

autonomous vehicle, and California Institute for Regenerative Medicine, three billion dollar bond issue for stem cell research, were also influential (Etzkowitz and Rickne, 2016). The follow-on Europa initiative, created a common playing field for Europe-wide investment in start-ups, superseding local regulatory regimes with a common innovation and entrepreneurship infrastructure. The socio-economic success engendered by this regime, made it possible to create new global enterprises. Their appearance gave Europe the confidence to create a federal political union, with sufficient defense capabilities, superseding, the former NATO alliance.

This strategy had earlier been advocated by former Belgian Prime Minister Guy Verhofstadt in 'Europe's Last Chance', a plea for culmination of the European project. Viewed as hopelessly utopian at the time of its initial appearance in 2017, this ovular volume was eventually recognized as prescient, even prophetic two decades hence. In contrast to the US experience of political unification preceding economic growth; economic efflorescence was the base for European political unification. Not surprisingly, the 1950's European Coal and Steel Community was identified as the source of an economy first; polity second approach, a distinctively non-linear European sequence. Nevertheless, it represented a significant departure from Verhofstadt's expectation of the universality of US political development experience in an otherwise perspicacious book. The Brussels NATO headquarters, repurposed as the first in a series of MIT/Stanford like entrepreneurial universities, was named Aho/Verhofstadt University (AVU) after the two visionary European innovation leaders.

The first in a series of new entrepreneurial university foundations, across Europe, AVU was based upon an idea that had earlier been mooted by former Finnish Prime Minister Esko Aho, but only

partially realized until the greater ambition of a Europe of Innovation and Entrepreneurship took hold.

By 2030, several European regions had achieved the dynamism of Silicon Valley and Boston, characterized by multiple interacting entrepreneurial universities with interdisciplinary foci built on a massive linear research funding base, with lateral Triple Helix interactions generating an interface strategy. An assisted linear model of innovation support structures had been created within and among universities and regions. A comparative article on the Chalmers, Stanford, and Porto Allegre Innovation systems, inspired the widespread development of experimental university development models, including incubators and accelerators as elements of a variegated innovation support structure within academic complexes. Start-ups were encouraged to birth in academic labs, moving them in due course of their growth to adjacent science parks. This policy followed the example set by the Pontifical Catholic University Rio Grande del Sul in its realization of the Brazilian Innovation Law of 2004, itself highly influenced by previous French legislation.

A series of distributed Triple Helix regions, including Hadrian's Valley, Northeast England and Scotland, Sophia Antipolis, France and Barcelona, Catalonia; Greater Copenhagen, Sweden and Denmark, source firms on the scale of the former Apple-Google-Facebook conglomerate, created in the wake of the great earthquake that led to Silicon Valley's great migration and re-consolidation in San Diego, relatively insulated from the San Andreas fault line. Silicon Valley's greatest risk, ordinarily suppressed from consciousness inexorably took its toll. Only the precise timing was unknown in advance, a result that was guaranteed by severe budget cuts to earthquake detection technology development during the first Trump Administration. This depletion had not yet been fully rectified, after the fact in the Michelle Obama administration. The former Valley of Hearts Delight, in its late nineteenth to mid twentieth century fruit orchard era, and Silicon Valley, in its mid twentieth to early twenty-first century hardware/software era received a National Monument designation. In its late era, the South Bay was recognized as a West Coast counterpart to the Lowell Massachusetts Historic Park with its nineteenth century looms.

Surviving iconic structures like the Apple Cupertino 'spaceship campus' and the Google San Jose headquarters, caught in mid-construction, received historic site designations. Silicon Valley, like Route 128, turned out to be a relatively temporary phenomena due to fundamental flaws in their conception and execution. Boston, however, recovered its edge, with a rising phalanx of universities and a biotechnology complex closely linked to academia, learning from the mini-computer era to continually infuse its industrial base with new ideas and technologies. Silicon Valley's escalating imbalance between employment growth and housing opportunities, economic and social priorities, if not addressed by macroscopic strategies, may prove to be the Valley's undoing even if an earthquake fault line does not wreak total havoc on human and natural environments.

The belated gradual upgrading of European Innovation ambitions, held back by skeptical S&T policy experts, was pushed forward by popular recognition, instantiated in socio-political eruptions like

President Emanuel Macron's 'En March!' movement that swept France in 2017. Within a year, citizens impatient with imposed austerity, upped the ante from modest goals of revising labor market regulations to facilitate entrepreneurship. A macroscopic European scale of investment in innovation and entrepreneurship, superseded a previous modest project. So called 'smart specialization' was seen as inadequate to be more than an adjunct strategy to achieve Europe's future as global innovation and entrepreneurship, as well as cultural hub. A higher innovation target was set of making large-scale focused investments in emerging areas combined with similar investments in infusing advanced technologies into older areas. This initial initiative inspired other Europeans fed up with paying for banking misadventures, to take the future into their own hands.

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21EU + 4IR The 21st Century 'Entrepreneurial University' and the 4th Industrial Revolution

An Essay by Scott Billadeau © 2017

The future of work is changing faster than my Facebook feed. Only a generation ago, most people worked for long stretches of time in one place doing one thing. Each of my parents for example worked their entire life for one corporation and one government agency respectively. The word *career* comes from a Latin word for "wheeled vehicle" which the French and Italians used in the mid-sixteenth century to denote a racecourse, essentially referring to horse and chariot racing. Thus our modern use of 'career' is quite apropos in more ways than one. While the twentieth century is peppered with long careers and specialists spending their working lives focused on one discipline, the twenty-first century is already shaping up to encompass something quite different. It is now considered typical for a professional to have four or five different careers during their working life, and what lies ahead, are professionals working four or five jobs at the same time. In fact, this is already occurring - so in that sense, the future is now. Starting next year in 2018, the majority of college freshmen will have been born in the twenty-first century. While profound societal changes are quickly disrupting traditional careers and work lives, the higher educational system is lagging behind. The value of 'higher ed' is being questioned more than ever. Indeed, a paradigm shift must occur in post-secondary education as to the value creation within each individual, their prospective employer (if not self-employed), and society as a whole. Academic institutions will need to become 'entrepreneurial universities' in order to compete while embracing the fourth Industrial Revolution now emerging.

Some 250 years after the first 'Industrial Revolution', an entirely new kind of revolution is emerging. This time it's not just machines, but 'thinking' machines. And in theory, machines that can and will replace human beings with a level of complexity and sophistication heretofore not experienced. In the first half of the twentieth century, a 'calculator' was a person who performed mathematical calculations. In the second half, no one ever thought to call a person a calculator. I grew up with Atari, the Commodore 64, and the Apple II. It was truly marvelous what those machines could do especially in the context of their time. However, they only did exactly what someone instructed them to do, and not a single thing more. This budding era we now live in beacons a world where computers and robots can learn how to make themselves considerably more advanced than its human programmer first bestowed. It's called 'machine learning', and along with 'deep learning' it has deep implications as to who we can be when we grow up.

While it seems that I have forgotten more than I've retained, every moment of my life has molded my mind into the person I am today. I don't think the way you do, and you don't think the way I do. That should be celebrated. What should also be celebrated is

how artificial intelligence can help us both think differently, better, and more insightfully. As with everything else in the universe, it's a matter of striking the right balance. I'm going to hypothesize, however, that the balance between the digital brain and the human mind is far different than the A.I. Kool-Aid everyone seems to be drinking out of Silicon Valley right now - the 4IR is just another set of tools to enhance our human experience.

Goethe and Alexander Humboldt were perhaps the last people on earth to 'know everything', or at least everything worth knowing at the time. While there is plenty to debate about that statement, the point is that around the time of the early-to-mid 1800s, there was just too much for any one person to know regardless of how staggeringly high their IQ might be. For around two centuries now, we have become a civilization of specialists - with fewer and fewer people possessing enough knowledge to connect the dots between various forms and categories of knowledge. There are very few medical researchers who communicate with one another let alone the possibility that advancements in game theory might help solve the perplexing challenge of pancreatic cancer. Don't get me wrong, we need specialists in every field to develop and further advance deep knowledge about their subject matter. While this has created a vast number of silos, it has also created great opportunity for cognitive synthesis. I believe the renowned biologist E O Wilson has stated this best;

"We are drowning in information, while starving for wisdom. The world will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely."

From the inception of human civilization through 2003, approximately 5 Exabytes of information had been created. Of course that is only an astonishing amount of information if you know what an Exabyte is.

- 1,000 Bytes is a Kilobyte
- 1,000 Kilobytes is a Megabyte
- 1,000 Megabytes is a Gigabyte
- 1,000 Gigabytes is a Terabyte (1 TB can store up to 3 million books, 50 TB could store every book in the entire world),
- 1,000 Terabytes is a Petabyte,
- 1,000 Petabytes is an Exabyte

As previously mentioned, approximately 5 Exabytes of information was generated over the course of millennia - and by 2013, an average of 5 Exabytes of information and content was being created on the internet each day!

It is currently estimated that there is more than a Zettabyte of information online.

1,000 Exabytes is a Zettabyte.

In decimal form, Zetta (Z) is a prefix denoting a factor of 10^{21} or a 1 followed by 21 zeros;

1,000,000,000,000,000,000,000

That is a number exceeding the estimated grains of sand on planet Earth.

The point here, is that there is a staggering amount of information in the world, but we only want and need the information that is relevant to us - and we need help like never before. As mentioned earlier, the 4IR is a genuine revolution in respect to machines thinking with us and for us. Theoretically, this could lead to a Techno-Human Singularity in which machines surpass overall human intellect, attain some level of consciousness (or faux consciousness), and even take over as the new superior 'race'. I do not believe, however, as many futurists have predicted, that a 'techno-human singularity' will occur in our lifetime or lead to a jobless society any time soon - if ever. If anything, our advancing world is largely understaffed for what lies ahead. And one of the big questions at this penultimate nexus of man vs machine, is how to prepare and educate people to not only work alongside artificial intelligence and work inside virtual reality, but to co-create the next evolution of society with digital brains and human minds on the same team.

The 4th Industrial Revolution encapsulates IoT (the 'Internet of Things'), 3D Printing, A.I. 3.0 and 'Deep Learning', Robotics, Virtual Reality, Quantum Computing, Nanotechnology and BioTech to a point that it will no longer just be man vs machine, but machine inside man. While this might be a frightening concept for some, I think it should be welcomed as the additional tool it is for humankind. The 4IR will continue our evolution from *algorithmic work* (a step by step process from a known starting point to a known end point) to *heuristic work* (which is primarily creative work with both start points and end points left up to human imagination). As we evolve our education system to be more aligned with our twenty-first century reality (and *virtuality* for that matter), we will need to resolve not only the ethics and morality of the 4IR, but what should continue to be learned concepts and facts relevant to a human who no longer needs everything in their brain in order to use their mind. With that said, it is indeed difficult to imagine thinking and creating without the vast quantity of information and quality of experiences that seemingly, only the human brain can simultaneously retain and synthesize into meaningful and comprehensible thought. Learning, discovery, experimentation, and creativity are most certainly key ingredients in a meaningful and purposeful life.

Nonetheless, we should celebrate how artificial intelligence can help us all think differently, better, and more insightfully - and become digital team members. This should lead to a higher educational experience that includes critical thinking, digital fluency, research and discovery, creativity, problem solving and interdisciplinary team engagement (both human and virtually human) not only within the framework of each departmental

program, but within the majority of all courses taught. It is time to advance our education system to align with our advancing world. We must lean into this inevitable future of co-creation and co-discovery mindful of its implications and what it will mean to be an educated human.

The concept of the 'university' is considered by some to be the greatest invention of the last millennium. After evolving from a purely academic endeavor with the emphasis on the dissemination of knowledge, the University of Berlin and Johns Hopkins University in the United States paved the way for research-driven teaching and experimentation, with inestimable value provided to students, faculty, entire industries, and for that matter, entire countries. While there is substantial overlap in respect to inception, academic institutions have begun to play a role as economic engines within their regional economic ecosystem. In order for this to fully materialize and manifest, a genuine collaboration between university, industry, and government, known in academic circles as the Triple Helix concept, must become a synergistic flow of cooperation and coordination. As an outcrop of the Triple Helix is the transformation of academic institutions into 'Entrepreneurial Universities'. As a member of GEUM (Global Entrepreneurial University Metrics), which convened most recently at Stanford University earlier this year, we developed a working definition of an *entrepreneurial university*:

An innovative academic institution that transforms knowledge, discovery and invention into sustainable economic and social development.

No one ever says "Go maintain the world!" The sweeping notion we all have is, "Let's change the world for the better". If executed to its full potential, this will help solve one of the most significant and seemingly impenetrable problems in modern society - the enormous and continually expanding income gap. It's not that everyone needs to become an entrepreneur, or even a solo-preneur, but everyone should become more *entrepreneurial* - not just to ensure value for themselves, but to provide value to those they work for and with. While an entrepreneur typically risks capital in order to form a new entity with separate teams and goals, being entrepreneurial is viewing the status quo as inferior and unacceptable, taking initiative, and using creativity and innovation to figure out a better course of action. In this sense, we need higher education to transform into entrepreneurial universities so that all graduates can employ resourcefulness, discernment, digital fluency, creativity and interdisciplinary team engagement with an ethical and moral compass for assessing what is right, wrong, and best.

More than less, the days of working for corporations your whole life are over. It is more likely that you will be part of eating the lunch of a large corporation by being entrepreneurial, agile, and co-creating at the speed of thought. Resourcefulness, discernment, digital fluency, creativity and interdisciplinary team engagement will be the cornerstones of the twenty-first century professional. The more academia shifts towards being teachers, guides, and mentors of these capabilities, the more relevant a college degree will become. The emphasis must be on amplifying the whole person and accentuating the unique abilities of the human mind. Everything else will be accessible from your smart phone.

Third Global Entrepreneurship University Metrics (GEUM)

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On 10-11 June 2017 at Stanford University, Palo Alto, CA, the Third Global Entrepreneurship University Metrics (GEUM) Workshop took place.

The GEUM initiative, launched during the Leiden Workshop in June 2015, has been enhanced each year through international research/working groups, and this year's annual workshop focused on the initial proposal to **promote the development of new metrics, including entrepreneurship, gender and diversity, and the furtherance of the public interest in University ranking systems.**

This year, an international delegation of scholars from four different continents (North and Latin America, Europe, Asia) convened to present the results of ongoing research projects and to discuss future development of the GEUM metrics, including the launch of a White Paper.

With the majority of metric definitions resolved at the previous workshop held in Silicon Valley on 3-5 June 2016, the III GEUM brought a wide variety of projects already in data collection phase, hence much of the discussion of the workshop was focused on the social utility and presentation of metrics.

The event kicked off with a report by Justin Axelberg, University of San Paulo, on the grassroots Brazilian Entrepreneurial Universities Ranking launched in November, and considered to be the first Entrepreneurial Universities Index in the country based on six axes and fourteen indicators. Then Professor Richard Zare, Stanford University, presented a compelling argument against the overuse of rigid metrics producing undesirable results, something which sparked lively debate. There seemed to be an irresolvable tension in which metrics are essential in modern higher education in order to judge performance externally, but can constrain and distort academic behavior when used improperly.

Professor Sue Rosser, Former Provost, San Francisco State University, brought a fascinating discussion to the table on the issue of diversity and gender-based metrics as a vital component of the entrepreneurial university, pointing to the fact that despite higher female participation in many areas of academia, they are still notably excluded from many areas of innovation and startup activity. There was broad agreement in the room that gender representativity metrics should be incorporated into the project, and a number of the local projects are seeking to incorporate them.

Later, Lena Leonchuk, North Carolina State, presented a detailed analysis of the ways in which current rankings work, as well as, a comparison between those rankings, how they are composed, and which percentage of metrics are related with innovation and entrepreneurship.

On the Saturday afternoon, Professor Mariza Almeida, Universidade Federal do Estado do Rio de Janeiro – UNIRIO, ran the Trilicious Triple Helix board game as a way of resolving the issue of how we could maximize the impact of the project's findings. The game, developed by Innovation Games, is designed to offer a collaborative approach to complex problem solving. The participants were divided into four groups, and solutions

were diverse and a general agreement was reached that one solution alone would not be enough for GEUM.

On Sunday, Scott Billadeau, Founder and CEO of Liquid Planet and Co-Founder of HATCH Experience, presented his Hatch project, based in rural Montana, which seeks to unite artists, entrepreneurs, scientists, and academics to hold intensive problem solving sessions free from the distractions participants face in their ordinary lives. As an organically formed approach, it highlighted the importance of creating interface spaces between different spheres in order to create innovative solutions to problems.

This was followed by national updates from the seven participating countries: Austria, Brazil, China, Finland, Russia, United States and UK.

Anne Kovalainen and Seppo Poutanen, Turku University, presented their work in the SWiPE platform (Smart Work in Platform Economy), a research project that focuses on the renewal and transformation of work in the platform economy in Finland.

This was followed by Mariza Almeida and Artur Vilas Boas who presented the Brazil chapter's widespread quantitative efforts, now moving into the data analysis phase



with detailed data collected from more than seventeen Brazilian Universities. In São Paulo, Artur Vilas Boas presented an approach to measuring the university's impact on the ecosystem by cross referencing social security numbers of graduates with business filings at the state chamber of commerce, building a map of economic activity.

Georg Furlinger at AIT presented Austria's approach to measuring the value of human capital in ecosystems, comparing European ecosystem cultures with those found in the US.

From the UK, Emanula Todeva and Federica Rossi presented their research proposal into developing metrics for multi-disciplinarity which is awaiting research funding.

Alice Zhou from the International Triple Helix Institute, presented the US initiative's large variety of metrics, with perhaps the most ambitious range of data to collect of all projects thus far.

Liana Kobzeva, Tomsk State University, presented a fascinating overview of the evolution of Russian HE, and the clear need for better ways to measure entrepreneurial universities.

Hiroshi Saito, Chiba University, presented an initiative in Japan to identify superstar researchers, who are both highly cited and entrepreneurially active in order to create positive role models.

Besides this, other research projects are being developed in parallel with GEUM, for

example, the master project focused on key performance indicators for TTOs presented by Sara Aragão and Erin Young's work in analyzing multidisciplinary research teams for innovation.

The final afternoon of the event was marked by intense discussion on the future direction of the project, how to present finalized metrics, how to give weight and importance to each, as well as mentoring developing proposals. Discussions are still ongoing as the project continues to open out and incorporate more perspectives and experiences. Our challenges include building a common system of indicators to assess the entrepreneurial university development, while also including specific types of metrics for different environments.

The international co-operation under the GEUM initiative is now focused on the need for a variety of paper formats going to academic journals, industry channels as well as working papers.

The GEUM White Paper, organized by Henry Etzkowitz and Alexander Bikklov as a collaborative paper from the whole group is now being split into three different formats, each with different working teams. The papers include an academic summary with a brief of all the initiatives developed around the world supported by this issue to enhance the working process and the importance of the project results and a **GEUM special issue for the Triple Helix Journal**, organized by Henry Etzkowitz, Loet Leydesdorff, Erin Lorelei Young and Justin Axelberg as Editors, with a twofold focus

on the analysis of national/regional GEUM project results and the analysis of GEUM themes and methodologies.

As an important next step, a **follow up workshop** will be organized in London, the global university metrics capital, in Spring 2018. The main objective is further developing, operationalizing and weighting the draft GEUM instrument, which includes best practice, methods and metrics that should help university management to define measurable objectives, develop and allocate resources, create strategy, monitor results, and facilitate decision-making. At the same time, the system could provide features to attract financial resources, human resources, and improve relationships with stakeholders.

Business Transformation through Triple Helix: Challenges of the Eco-System

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BUSINESS TRANSFORMATION

Business transformation is a requirement of every business. It helps to align the business with new strategies aiming to bring innovation. Business suffers without the essence of innovation. In turn, business gets default and shut down. Innovative culture can best save them from these downfalls, thus leading to the economic and social transformation of the country. Business transformation has a direct positive effect on the economic and social transformation of any society and country. This phenomenon has been experienced in the developed world a few decades ago, and recently in the emerging markets of Asia (Fritsch and Mueller, 2004; Van Stel, Carree and Thurik, 2005). Business transformation requires the growth of the innovation eco-system shared by academia, industry, and government called the Triple Helix growth model (Leydesdorff and Etzkowitz, 1998).

Businesses are live organisms which thrive based on culture and environment. Business transformation means having a fit alignment with the strengths of the country and ability to exploit emerging

opportunities. This makes industries survive, and grow in a new and changed environment. Mr Imtiaz Rastgar is a business tycoon in Pakistan and was one of the speakers at the International Business Conference and Exhibition (IBCE). He said *"The industry of Pakistan is not oriented for the transformation process according to changes in the demand market. Therefore, it becomes the role of Government to facilitate education and awareness for industry about emerging market scenario"*.

ROLE OF THE TRIPLE HELIX IN BUSINESS TRANSFORMATION

Academia can play a role in generating new ideas for industries that get transformed and create new value products. A strong linkage needs to be developed between academia and industry. Institutions of higher learning are known as seeds for new ideas that feed the socioeconomic growth. Business comes between the birth of new innovative ideas and the socioeconomic development final impact. Business transforms these newly born ideas into products and services and create new value. In the process of this transformation they get a great experience of self-transformation. The new products and services help business kill their growing irrelevant offerings. The business shift to new products and services, build new capability of delivering value and train human resource accordingly. We are observing IBM transforming from a purely software company, to a data management and data science company (Walker, 2007). Amazon is known for cloud services, and Microsoft is rebranding itself as a mobile company (T Ograph and Morgens, 2008).

Dr Emanuela Todeva, Director, Business Clusters, Networks and Economic Development (BCNED), presented a keynote lecture on Triple Helix and the innovation ecosystem. She said, *"Pakistan is not competing with innovation indices of the global market. Various components of the competitiveness index also reflect poor performance of the Pakistan S&T sector. Pakistan needs to start Triple Helix collaboration to build on other parameters and catch up with the world"*.



Speakers at the International Business Conference and Exhibition (IBCE)

Industry works as a catalyst to convert academic research into great products and services, and normally has a product life cycle and a business life cycle. Today's flourishing value offering has to be an obsolete value offering tomorrow. This leads to a simple conclusion that businesses need to always be in search of new ideas followed by new strategies (Anderson and Zeithaml, 1984). The birthplace of new ideas is academia. The industry maintaining close collaboration with academia has a higher chance of transformation along the business life cycle. Industry can ensure a supply line of new improvements in current products and also destructive ideas and technologies coming from university labs.

Government plays a vital role in the process of business transformation originated by academic research and caused by forces of change. The transformation needs a conducive environment. Bottlenecks in the environment seriously discourage business transformation and lead to less competitiveness of the business. In the less competitive environment business loose the value of existing products and seldom get new product to match the competitive world.

The state provides a conducive environment, drives all the stakeholders of transformation and offers interventions to support the collaborative working of the Triple Helix as in the case of the French business transformation (Schmidt, 1996). Government is the recipient of the fruits of business transformation in terms of taxes, economic activities, employment and other benefits of business growth. It needs to act proactively to help businesses transform and respond to new business challenges and market needs. According to Evans (1997) "The character of the business community can be reshaped by state policy".

The serious problem in countries like Pakistan is to focus on one sector with high expectations from it to drive the entire process of transformation. This approach does not yield the desired results of business transformation in total and for the long run. The policy directives and practical interventions must address the problems and capacity of three helixes for real business transformation followed by economic and social transformation (Etzkowitz and Leydesdorff, 1995). The government needs to play a major role by giving policies for building more interactions between the academic sector and the industrial sector in order to promote economic growth for a healthy and sustainable innovative eco-system.

CHALLENGES OF THE ECO SYSTEM IN PAKISTAN

The ECO system of the Triple Helix leads to business transformation and economic progress. The process starts from the policies of government towards academia. The government devising policies can encourage academia to liaison with industry, assess industry needs, and supply new and relevant ideas in the form of technologies. Government has to devise policies for industry to become the recipient of local knowledge and technologies, and needs to offer incentives and rewards to inspire industry to cooperate with academia and invest in research along with state.

Mr Abid H K Shirwani, President, South Asia Triple Helix Association (SATHA) said, "We are deriving S&T sector revival for the last ten years. SATHA is now playing an active role in policy advocacy

for science, technology and innovation in Pakistan and soon will spread its efforts in South Asia".

In Pakistan, policies related to science, economics and technologies are not given due attention. The partial efforts of academia and industry to collaborate without a conducive and driving environment always leads to a failure and widen the trust gap between two. The absence of a serious policy framework makes their efforts useless. The government of Pakistan has to come up with conducive policies and good incentives to ensure business transformation through the Triple Helix model.

ACKNOWLEDGEMENT

This paper is based on notes taken from the invited speakers' experiences and their speeches presented in IBCE from all around the world. IBCE is the first International Business Conference and Exhibition organized for the first time in Pakistan by University of Management and Technology (UMT), Lahore, Pakistan, on November 7-8, 2016. IBCE was a learning initiative taken by UMT with a technology expo.

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Note: This is a smart version of a full length article

Building Trust to Exercise Triple Helix in Higher Education

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The Triple Helix concept advocates for knowledge economy co-developed by academia, industry and public sector. The trust factor plays the role of catalyst in the relationship of the three. The literature also terms it as confidence building measures. In a developing country like Pakistan, the absence of the trust factor negatively impacts the spillover effects of higher education. Some earlier failures also add fuel to this trust deficit.

HIGHER EDUCATION OF PAKISTAN

Higher education of Pakistan has grown exponentially during the last decade. The Higher Education Commission played an instrumental role in setting up new universities, laboratories, and training PhDs with a good quality of paper publication. Pakistan is competing with BRICS countries now in the citation of research papers.

The next challenge for higher education in Pakistan is to be responsive to local relevant needs. Academia has to ensure its spillover effect by contributing largely to social and economic development. It has to respond to challenges of relevancy of curriculum, need based research, and transfer of technology for economic impact (Lin, 2004).

TRUST DEFICIT IN HIGHER EDUCATION

A number of factors cause trust deficit in higher education. The trust deficit is of two types - internal and external. The internal trust deficit is between the institutions of higher education. This deficit causes the duplication of academic resources and lack of resource sharing. The scientists do not share expertise and seldom collaborate for joint projects of technology development. The departments in the institutions of higher education seriously lack a culture of collaboration and sharing (Bok 2009, p222). This trust deficit marginalizes the academic capacity to serve external stakeholders.

The second trust deficit is between academia and external stakeholders. A number of factors cause this deficit, for example, a

difference in priorities, timely delivery, over commitment, lack of funding and lack understanding of each other's. The most critical component that widens the trust gap is the wrong planning of each other's role in the process of technology development and transfer.

Mr Abrar Ahmed representing the industry and local chamber of commerce said, *the technology process needs to start from confidence building measures between the Triple Helix as academia, industry and Government. Resources, competency and will is quite high. The disconnection between three players is actually making innovation halt*.



CONFIDENCE BUILDING MEASURES IN HIGHER EDUCATION

There are certain measures to gradually build internal and external trust. The first measure is strong leadership in the office of research, innovation, and commercialization (ORIC). The top team of ORICs needs to be dynamic, outreaching, have good communicators and people of relationship. Such an ORIC team inspires trust through their interactive and friendly behavior. Key performance indicators of ORICs (KPIs) should include outreach, contract research, external funding and technology delivered to industry and society. The ORIC team needs to be full-time, dedicated and supported by infrastructure, financial and communication resources.

Professor Dr Akram Shaikh representing the Government from Pakistan Science Foundation (PSF) and Pakistan Scientific and Technological Information Center (PASTIC) said, *Extensive mobilization is needed to connect three players as the Institute of Research Promotion (IRP) and PASTIC did in the past. We all three need to take small steps first to build confidence and then initiate large R&D projects*”.

Policy measures provide an enabling environment for both scientists and industry to work. Scientists always question why they should solve industries problems, whereas they are judged annually for teaching and publication. Scientists lose interest in the start or mid of the projects which causes failure and serious trust deficit. Once a scientist loses trust, it is difficult to rebound it again (Bok, 2009). Policy related to the requirement, appraisal and incentives must incorporate high weight for problem-solving research. This policy also drives the trust of the external stakeholders, and they believe in the strong technology-oriented mechanics of the institutions.

Faculty and students exposure to industry and society's problems also highly affects trust with the external stakeholders. The faculty having high exposure and a good understanding of local problems speak the relevant language and inspire trust.

In academia, students are used as research workers through their thesis and research works. The poor quality of students working leads to trust deficit. The academic system of thesis conduct and supervisory process must ensure good quality and rigorous research output from the students.

Mr Abid Shirwani, President South Asia Triple Helix Association (SATHA) said, *We need such Triple Helix meetings more frequently to exchange ideas and possibilities of working together. Triple Helix networking is a pre-requisite to innovation led economic growth and we all must pay attention to boost our networking.*

The magnitude of the project also determines its ultimate destiny. The high-tech projects have a higher likelihood of failure and cause the trust gap to widen. Academia must start with short, doable and efficiency improvement related projects. The success rate in smart

projects will lead to good trust and high value projects. The smart projects are also more likely to be delivered on time.

Ownership of the projects through the internal system guarantees trust development. Academia must have an internal department body to review the progress of industry projects, and be responsible for taking measures in case of low performance. Industry seldom trusts a second time if their given projects are carelessly treated with no timely report, required support, dedicated time, and significant attention to the projects deliverables.

CONCLUSION

The academic knowledge spill over and contribution through technology transfer is the outcome of a process which starts from trust building. The ignorance of the foundation of trust causes the building of research collaboration to collapse. We suggest that academia in developing countries like Pakistan begin from confidence building measures and build a knowledge economy and innovation culture on it.

ACKNOWLEDGMENT

The paper is based on inputs taken from an ORIC workshop at the Annual Innovation Summit 2017 held in the University of the Punjab, Lahore, Pakistan. The workshop was attended by over twenty directors ORICs, S&T heads and industry persons. The title of the workshop was "Trust building of ORICs with internal and external stakeholders. Thanks to Muqaddas Tariq for taking notes.

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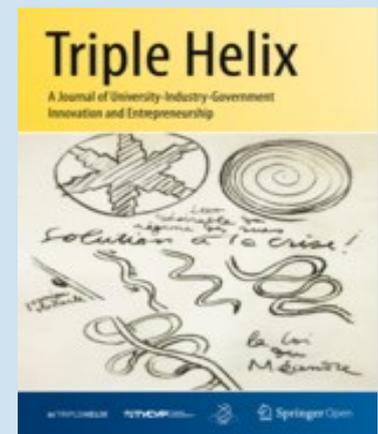
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JOURNAL OF MANAGEMENT DYNAMICS IN THE KNOWLEDGE ECONOMY MANAGING THE TRIPLE HELIX VOL 5, NO 1 (2017)

Congratulations to the authors in our first publication, a special issue in the journal Management Dynamics in the Knowledge Economy (MDKE). Among the highlights are papers from the XIV Triple Helix Conference held in Heidelberg, Germany, in 2016.

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INNOVATION INCOMMENSURABILITY AND THE SCIENCE PARK

DOI: 10.1111/radm.12266, April 2017

Henry Etzkowitz
Chunyan Zhou

The gap between science park aspiration and accomplishment is conceptualized as 'innovation incommensurability,' the persisting dilemma of a physical structure oriented innovation mechanism. A typology of science park impetuses and growth—analyzing critical elements, goals/ends and paths/means - suggests an appropriate balance between 'exogenous' and 'endogenous' innovation strategies in various regional circumstances. Alternative strategies of science park development are a 'strategic research site' to evaluate the roles of a university-industry-government triple helix in developing the science park model. Innovation incommensurability can be overcome by a longer-term endogenous strategy combined with significant public investment. Ambitious science park projects, which were either early failures or later lost support, may succeed once a triple helix base is built to achieve an innovation eco-system.

<http://onlinelibrary.wiley.com/doi/10.1111/radm.12266/abstract>

THE MEASUREMENT OF SYNERGY IN INNOVATION SYSTEMS: REDUNDANCY GENERATION IN A TRIPLE HELIX OF UNIVERSITY-INDUSTRY-GOVERNMENT RELATIONS

SWPS 2017-08, SPRU Working Paper Series,
Eds T Ciarli and D Rotolo (March 2017)

Loet Leydesdorff
Henry Etzkowitz
Inga Ivanova
Martin S Meyer

The Triple Helix of university-industry-government relations can first be considered as an institutional network. However, the correlations in the patterns of relations provide another topology: that of a vector space. Meanings are provided from positions in this latter topology. Meanings can be shared, and sharing can generate redundancy; increasing redundancy provides new options and reduces uncertainty. This evolutionary dynamics feeds back on the institutional networks which develop historically. Meaning is provided from the perspective of hindsight and with reference to other options; codes of communication open horizons of meaning. The codes operate as selection mechanisms and reinforce the perspectives of hindsight so that rationalized expectations can be entertained in a knowledge base. The knowledge base evolves in terms of providing new options by making distinctions possible. The vertical differentiation in inter-human communications operates upon the horizontal differentiation in TH relations and vice versa. The trade-off between the evolutionary generation of redundancy and the historical variation providing uncertainty can be measured as negative and positive information, respectively. Reducing uncertainty improves the innovative climate, and the generation of new options (redundancy) is crucial for innovation systems. In a number of studies of national systems of innovation (e.g. Sweden, Germany, Spain, China), this TH synergy indicator has been used to analyze regions and sectors in which uncertainty was significantly reduced. The quality of innovation systems can thus be quantified at different geographical scales and in terms of sectors such as high- and medium-tech manufacturing or knowledge-intensive services.

https://papers.ssrn.com/sol3/papers.cfm?abstract_sid=2937647

WORKING PAPER SERIES

New Chair and Co-Chair Appointed

We are pleased to welcome Professor Yuzhuo Cai as Chair, and Dr Rhiannon Pugh as Co-Chair of the Working Paper Series (WPS).

Yuzhuo Cai is a Senior Lecturer and Adjunct Professor at the Higher Education Group (HEG), School of Management, University of Tampere, Finland, and was the acting professor of HEG during August 2013-July 2014. He is currently a guest professor at the Institute of International and Comparative Education, Beijing Normal University, China. His main teaching and research areas are organisation theory, higher education administration, transformation of universities in innovation systems, and internationalisation of higher education, with extensive publications in the fields.

Rhiannon Pugh is a research fellow in economic geography at the Department of Social and Economic Geography at Uppsala University, Sweden. Previously she worked at Lancaster University and the University of Wales in the UK, and completed her PhD at Cardiff University School of Planning and Geography. Her research focused on the governance of regional economic development, such as innovation and economic development policy, and the role of universities as regional drivers. Her PhD examined twenty years

of innovation policy in Wales and reflected on the applicability of key theories of regional innovation in a weaker region setting. She is especially interested in “less-favored” regions such as the post-industrial, weaker, and peripheral.

The WPS mission is to accelerate the development of papers in order to achieve publication standards, by mentoring and/or engaging the Triple Helix community in a scholarly discussions and intellectual exchanges during a short period of time.

If you are a THA member and would like to be assisted by experienced mentors in fine-tuning your paper and render it compliant scientific journals' quality standards, take advantage of our WPS and submit your work to info@triplehelixassociation.org.

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TALKS SERIES

The TH Talks Series aims at inspiring and engaging our Association and extended network by offering them **ten minute video-recorded interviews** with our THA Champions. The Talks Series is open to all **THA members who would like to be interviewed to present their TH practices, achievements, and success cases** to our international community.

If you want to showcase your experience and be a Triple Helix Champion, TH Talks is the place for you! Please email *Lucas Coelho (right)*, Chair of TH Talks (lucascoelho@nextainnovation.com) your short presentation and the experience you intend to present, and he will schedule an interview.



All available interviews with our champions are available at www.triplehelixassociation.org/th-talks-series:

- **Professor Henry Etzkowitz**, explaining the origin of the Triple Helix model
- **Professor Yuzhuo Cai**, explaining the meaning of the Entrepreneurial University concept
- **Dr Holly Wells**, presenting the critical role of analytics for innovation management
- **Mrs Tatiana Schofield**, discussing on the impact of open innovation on University and the new roles it can play
- **Professor Panayiotis Ketikidis** discussing about the main blockers in Academia-Industry cooperation
- **Camilo Montanez**, presenting his Triple Helix cooperation experience in Colombia
- **Anastaisa Yarygina**, sharing insights from her professional experience in Hyundai on how open Innovation and 4.0 Industry touch the Automotive Industry
- **Charisse Reyes**, presenting the Singapore Case Study of Entrepreneurial University

THEMATIC RESEARCH GROUPS (TRGs)

Triple Helix Actors, Governance and the Region (THARG)

CALL for MEMBERS



If you would like to join this Thematic Research Group in its collaboration activities, please email a request to both Irina Pavlova (iapav@mail.ru) and Mrs Maria Laura Fornaci (mlaura.fornaci@triplehelixassociation.org).

We invite all THA members and other interested scholars and practitioners to join this new Thematic research group on TH Actors, Governance and the Region.

Our group aims to accelerate in research, publications and training of Triple Helix actors, enabling them to develop enhanced multi-stakeholder governance mechanisms for value co-creation and regional development.

The mission of this professional group is to become a leading resource for knowledge and advice for evidence-driven policy-making decisions at regional level and for their practical implementation; for the engagement of universities and other stakeholders in regional social and economic development; for the mobilisation of clusters, science parks and other regional concentrations of capabilities in economic development projects; and for the establishment of new governance models for sustainable triple helix interactions.

AGENDA AND VISION

We are witnessing an institutional transformation of the Triple Helix actors due to numerous economic and societal challenges. Smart, sustainable and inclusive growth can be achieved through innovations at global, national, regional and local levels with a greater focus on the regional dimension. According to the European Guide for Connecting Universities to Regional Growth:

- Regions are seen as important sites for

innovation because of the opportunities they provide for interaction between businesses, public authorities and civil societies

- Universities and other higher education institutions have a key role to play in knowledge creation and its translation into innovative products and public and private services, a process that can engage the creative arts and social sciences as well as scientists and technologists
- Activities may vary across regions according to the priorities and rules implemented by the managing authorities.
- The key agenda for today is how to enable public authorities to promote the active engagement of universities and other higher education institutions in regional innovation strategies for smart specialisation, in cooperation with research centres, businesses and other partners in the civil society. It is also important for academic and economic partners to explore the benefits they can expect from working together for regional development.

To facilitate the knowledge and innovation creation and translation processes, a range of mechanisms are available including: advice and services to SMEs, placement of graduates in businesses, incubating spin-offs in science and technology parks, facilitating networks in business clusters and meeting the skills needs of the local labour market.

The rise of entrepreneurial universities implies the necessity of regional governments of use the potential of such institutions to the fullest extent. The university third mission, which is fully

articulated and integrated into official policy agenda, enhances a more responsible university role to meet current societal challenges. Despite the increasing role of entrepreneurial universities (Etzkowitz, 2008), the third generation universities (Wissema, 2009) and the globalisation of knowledge production, their operational role is within the region. Regional innovation and socioeconomic strategies have to incorporate in the official documents the responsibility of the triple helix actors to cooperate in the creation of public goods. At the same time, the authorities are tasked to design the policy framework, offer a platform for a dialogue within the consensus space (Etzkowitz and Ranga, 2010). At the VIII Triple Helix Conference in Madrid, a new set of cooperation mechanisms were proposed for the Triple Helix actors' engagement in the regional development with the focus on the universities as the locus of talents, knowledge, technologies, ideas.

Among the research questions that this group aims to address are:

- What kind of policy and mechanisms do we need to design in order to encourage and enable triple helix partners for an ongoing and dynamic value co-creation within regions and territories?
- What kind of activities and cooperation between triple helix actors through networks and clusters are the most beneficial for the regions?
- What are the projects, policies, programs and initiatives which (1) make financial resources and

- investments more accessible for the triple helix actors in the region; (2) encourage mobility of professionals and talents, attract and retain them in the region; (3) stimulate university-business cooperation and cocreation including both high-tech, knowledge-intensive, innovation and socially-oriented companies? •
- How can the university evolution and transformation currently contribute to the regional smart, sustainable and inclusive growth?
 - Which university roles and functions in regional innovation systems are the most efficient for triggering societal development?
 - What are the university interactions mechanisms with other stakeholders/actors within the regional dimension to better serve the needs of the regions and territories? How to create, sustain and strengthen them?
 - What kind of conditions are necessary for university and business participation in regional governance?
 - What are the case-specific and region-specific university models which manifest contribution to regional sustainable development?
 - What are the patterns of interaction with other triple helix actors in these models?
 - What kind of performance indicators of university engagement in regional development processes can we use in order to adequately monitor and assess this process?
 - How to enhance the role of Academics – undertaking assessment and also paying attention to the policy development process?

- What and who are the role models, regional champions and cornerstones in the regions and territories?
- What are the factors which contribute to or hinder the successful triple helix actors co-creation within the regional dimension?
- How to improve the triple helix actors and specifically university engagement in economic and social activities in the regions and territories?
- How to generate synergies and coherence of action by the triple helix actors?
- What should be the programmes and training for the development of other triple helix actors in the region?
- How the government support can reinforce and made it possible for the region to become a world innovation hub, attracting and circulating talent and technology, internationally?

WHO SHOULD JOIN?

We welcome individuals and teams who would be willing to participate in such a project, who can share experiences and solidify knowledge in the academia and society. Our work falls within the dual scope of academic-driven as well as practice-oriented scholarly work. The group, especially, welcomes professional, academics and practitioners with the following knowledge, expertise and/or experience in:

- working with tertiary education establishments and organizations, all-level governments, business, clusters, regional associations, etc.;
- monitoring and assessing the university performance and its impact for regions and territories;
- designing and building regional collaboration channels and mechanisms to initiate, sustain and spur university regional engagement through interaction with businesses and clusters.

The group will enhance discussion, debate and cross-fertilization on the above listed topics by mean of special events, workshops and webinars; and will foster theoretical developments and practical achievements by mean of research and implementation projects.

References and Publications on the topic:

- Etzkowitz, H. (2008). *The triple helix: university-industry-government innovation in action*. Routledge.
- Etzkowitz, H and Ranga, M. (2010, October). *A Triple Helix System for knowledge-based regional development: From “Spheres” to “Spaces”*. In VIII Triple Helix Conference, Madrid, October.
- European Union (2011), *Connecting Universities to Regional Growth: A Practical Guide*. URL: http://ec.europa.eu/regional_policy/sources/docgener/presenta/universities2011/universities2011_en.pdf.
- Wissema, J G. (2009). *Towards the third generation university: Managing the university in transition*. Edward Elgar Publishing.

II University Cities Forum – Leveraging University Vitality for Urban and Regional Development

November 30 - December 2 2017

National Research Tomsk State University, Tomsk, Siberia, Russia



This track is organized as one of the events of the THA thematic research group Triple Helix Actors, Governance and the Region: www.triplehelixassociation.org/th-thematic-research-groups/triple-helix-actors-governance-and-the-region

Join a unique and lively event. Learn more through high-potential expert discussions, public interviews, author presentations, cross-disciplinary workshops and collaborative foresight sessions. Contribute to build advanced models, action plans, and projects to leverage academic and creative vitality and spur innovations and economic growth.

Our special track 'University in the new urban economy' will address the university's role in the development of a new economy in a city or a region. The track participants will include experts in the field of urban and technological development, cluster policy experts, representatives of universities, municipal and regional authorities, and representatives of business. The track event will engage in the discussion on how the university contributes to the development of the new urban economy as well as the best initiatives and practices of the university city transformation. Key issues for discussion enhance the following topics:

- how to build university-industry-government cooperation on urban development;
- how to transform the campus of the university into a place of attraction for companies and a new type of urban environment;
- how to create a consensus space for developing and implementing joint initiatives of universities, business and government;
- how to jointly manage the transformation of the urban economy.

The track events will be held in the format of workshops and panel discussions and will enhance the interactions of the triple helix actors in the course of unfolding a new urban economy. The framework for discussing cases, practices, mechanisms and tools to transform the campus of a smart city into a new economy could be:

- clusterization and localization of the economy;
- agents and leaders of the new economy transformation;
- triple helix actors partnerships for a new economy; institutional transformation of the university and its new role.

For more details about participation in the Forum, you can contact our THA member Liana Kobzeva, the Forum's Head of

CHAPTER NEWS

CHAPTER OF SOUTH ASIA (PAKISTAN) SATHA

SATHA HOLD SECOND INVENTION TO INNOVATION SUMMIT

SATHA, partnered with ORIC University of Balochistan and the Faculty of Management Science, BUITEMS, for the organization of the Second Invention to Innovation Summit, Buy and Sell Technology, Balochistan on 25-26 April 2017. The Summit is the largest annual R&D networking event scheduled in four provinces of Pakistan. It connects academia, industry and Governments for developing a national innovation ecosystem. The Summit includes: the display of innovative ideas and products; keynote speeches from innovation gurus, case studies on successfully commercialized technologies, business plan sessions for investment in new technology, a networking dinner, technology awards, cash awards and Innovation awards.

CHAPTER OF GREECE

THE ROLE OF THE TRIPLE HELIX FOR A RESILIENT THESSALONIKI

The President of the THA Chapter of Greece, Professor Panayiotis Ketikidis, provided advice for the *Resilient Thessaloniki* initiative in terms of drafting the road-map towards a smart and resilient Thessaloniki via inclusive co-creation among the relevant Triple Helix actors. Professor Ketikidis provided advice related to making the Triple Helix infrastructure more cohesive and sustainable in the context of the bottom-up approach (society driven) promoted by the strategy. The role of Triple Helix co-creation towards fostering entrepreneurship and regional competence-led growth is one of the key enablers of a resilient Thessaloniki.

As a city in true transformation, Thessaloniki requires a suitable enhancement of its Triple Helix infrastructure to properly integrate the fast-growing social voice in the already established decision making frameworks of the city and nearby region. This adaptation becomes even more relevant in conjunction with Thessaloniki's efforts towards becoming resilient (i.e. by 2030 as aimed by the aforementioned strategy) by posing the need of crossing organizational boundaries and to some extent, the emergence of new organizational interfaces. For this purpose, society driven growth is indeed the way forward especially for innovative cities where non-tangible assets are key enablers of growth.

The strategy (which can be accessed at http://lghttp.60358.nexcesscdn.net/8046264/images/page/-/100rc/pdfs/Thessaloniki_Resilience_Strategy_PDF.pdf) has at its basis four main pillars: shaping a thriving and sustainable city; co-creating an inclusive city; building of a dynamic urban economy and responsive city; and re-discovering the city's relationship with the sea. These pillars will be implemented (among others) via: smart and environmentally sustainable mobility systems (including waste management), leveraged human capital, entrepreneurship, social cohesion, citizen empowerment, enhanced economic clusters, emphasized the role of local culture and creativity, etc.

This strategically developed plan involved the collaboration of more than forty organizations and 2000 citizens which have at their basis the entire Triple Helix infrastructure of Thessaloniki. For this purpose, the long-term involvement of the THA Chapter of Greece in regional/local ecosystems can have a strong potential to ensure that such strategies lead to market oriented impactful results. The THA Chapter of Greece is very keen to become involved in a resilient Thessaloniki and all efforts required to achieve this mission.

CHAPTER OF RUSSIA

RUSSIAN TH CHAPTER AND TURAN UNIVERSITY TOGETHER FOR THA WEBINAR

Turan University, Kazakhstan, in cooperation with the TH Russian Chapter successfully delivered a Webinar on 15 March 2017 entitled: *Modern development of innovation and entrepreneurial universities in the context of the implementation of the model of the Triple Helix*.

Conducted by Turan University, the purpose of the event was the study and exchange of experience of modern universities of innovation and enterprise type in the implementation of the Triple Helix model, finding ways of adapting the model taking into account national specificities, identifying the role of universities, business, and government in the interaction system.

The moderator and presenter of the webinar was Dr Tatiana Pospelova (right), Executive Director of the Russian representative office of the Triple Helix International Association. Education: PhD (Faculty of Economics of Moscow State University); Master of International Business (International Business School - HULT). The Russian Chapter of the TH Association is based in the Economic Faculty of the Moscow State University, Department of Economics of Innovation, one of the main centers of Russia preparing qualified economists with a broad university education.



The title of Dr Pospelova's talk was *The Role of Modern Universities in the Development of Innovative Territorial Clusters*. The presentation is devoted to the results of a PhD thesis delivered in December 2016. During the presentation, the key role and importance of modern universities in the creation and functioning of clusters was logically justified and disclosed. Logically supplemented by the concept of the Triple Helix model, the possible participation of universities in the structure of clusters. Based on a critical analysis of functioning clusters, typical models of universities classification of innovative regional clusters was carried out and developed as participants of innovative territorial clusters.

NEW THA MEMBERS MARCH 2017 - MAY 2017

We are pleased to welcome and present new THA members joining our Association between March 2017 and May 2017.

The THA membership constituency is growing constantly and can now rely on an international base of more than 160 individuals and organizations, from five continents including university, scientific-research institutes, incubators, science parks, private companies and governmental institutions representatives. We are delighted to see that our network is attracting not only individuals but more and more organizations, eager to fully exploit the learning, networking, and promotional opportunities that THA offers to its affiliates.

We hope to maintain this momentum and see Universities, Research Centers, Innovation intermediaries, Companies and Governmental Institutions joining us as Organizational members to sustain our open access policy, and to share our efforts in building, disseminating and transforming into practical achievements the Triple Helix theories and models.

Consult www.triplehelixassociation.org/wp-content/uploads/2013/08/THA-Organizational-Membership-Levels-and-benefits.pdf for the THA organizational membership levels and the related benefits, and subscribe for membership by completing the form at www.triplehelixassociation.org/membership-request.

Organisational Members



ASTER S Cons. P, A
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Via Gobetti, 101
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Italy 40129
www.aster.it

Contact
Dr Leda Bologni (Head of Unit)
eda.bologni@aster.it

ASTER is the Consortium for innovation and technology transfer of Emilia-Romagna. Its partners are the Emilia-Romagna Regional Government, the six Universities and the National Research Centres located in the region (the National Research Council-CNR, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development-ENEA, the National Institute for Nuclear Physics-INFN), the Regional Union of Chambers of Commerce, working in collaboration with regional Business Associations and Innovation Centres. ASTER works in collaboration with enterprises, universities, research centres and institutions for the development of the innovation ecosystem of the territory.



Turan University
Satpayev Street 16-18, 18 a
Almaty, Almaty 050090
Kazakhstan
www.turan-edu.kz

Contact
Mrs Olga Sudibor (Head of International Office)
o.sudibor@turan-edu.kz

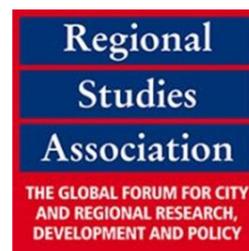
Turan University was founded in 1992 at the dawn of Kazakhstan Independence to be one of the first non-profit educational establishments of higher education. Up to date the university offers twenty educational programs and is in the top five of the Kazakhstani universities in multidisciplinary program profile with a slant on Economics. Recently, Turan University adopted a new academic policy towards innovation and entrepreneurship. Areas of organisational competence and expertise in TH research and practice include: business incubators, research on entrepreneurial spirit of students, entrepreneurial university etc



Turan-Astana University
29 Dukenuly Street
Astana, Aqmola region 010000
Kazakhstan
<http://turana-astana.kz/>

Contact
 Mr Kanat Daubayev
k.daubaev@mail.ru

Turan-Astana University promotes research initiatives, the nurturing of deep thinkers, and the further development of effective professionals who are in demand in the country's labour market. It carries out educational activities in the field of higher education under the state license series AB 0137367, issued by the Republic of Kazakhstan's Ministry of Education and Science in 2010. In the same year, the University received its state certification. The university is a member of the educational corporation 'Turan' with its complete series of studies. These include: i) undergraduate - Baccalaureate; and ii) postgraduate - Masters and PhD Doctorate.



Regional Studies Association
Sussex Innovation Centre
Brighton
East Sussex BN1 9SB
United Kingdom
www.regionalstudies.org

Contact:
 Mrs Sally Hardy
sally.hardy@regionalstudies.org

The Regional Studies Association works with its international membership to facilitate the highest standards of theoretical development, empirical analysis, and policy debate of issues at this sub-national scale, incorporating both the urban and rural and different conceptions of space such as city-regions and interstitial spaces. We are, for example, interested in issues of economic development and growth, conceptions of territory and its governance and in thorny problems of equity and injustice

Individual Members

PROFESSOR MARCELO AMARAL
Universidade Federal Fluminense
Rio de Janeiro
BRAZIL
marceloamaral@id.uff.br

Marcelo Amaral holds a BSc in economics, and MSc and DSc in industrial engineering from Federal University of Rio de Janeiro (UFRJ) and did postdoctoral studies at the University of São Paulo (USP). He was a visiting scholar at North Carolina State University (NCSU), and a visiting researcher at Research Triangle Park in the USA.

Marcelo is a specialist in project management oriented to technology innovation, certified by the International Association of Innovation Professionals. He worked from 1999 and 2006 in organizations like the Electric Energy Research Center (CEPEL), Rio de Janeiro State Federation of Industries (FIRJAN) and Center for Mineral Technology (CETEM). Marcelo was an entrepreneur, as part owner of companies such as CAN Eventos, AMG Research and Project, Rio BMF (Mr Quandt), and iSzabo Consulting. He worked also as a consultant to companies and government agencies in the field of regional development projects. Since 2006, he has been a professor in the Department of Business Management of the Institute of Human and Social

Sciences (ICHS), a unit of Fluminense Federal University (UFF). He is also a professor with CEDERJ, where he teaches several graduate classes, and also a member of the Graduate Program in Management (PPGA), Graduate Program in Public Management (PROFIAP) and Doctoral Program in Administrative Law.

From 2009 to 2010, he worked at the International Institute of Triple Helix in Madrid, Spain, where organized the Eighth Triple Helix Conference. From 2011 to 2014 he was dean of ICHS/UFF. Currently, he is vice-dean and president of the Innovation Forum of AGIR/UFF, a member of the Oversight Board of UFF and Administrative Board of Euclides da Cunha Foundation (FEC). As a researcher, Marcelo has twenty-two years experience as a member and coordinator of research projects funded by FAPERJ, CNPq, CAPES, FAPESP and FINEP. Since 2008, he has headed the Triple Helix Research Group (www.triple-helix.uff.br) and has published more than fifty academic works, including papers in conference annals and journals and books, besides being a reviewer of journals and a member of several scientific and editorial committees.

He is a member of the Honor Committee of the World Complexity Science Academy (WCSA), and the Scientific Panel of the International Society for Professional Innovation (ISPIM). His research themes are in the field of innovation management, specifically on issues like business strategy, entrepreneurship,

project management, industrial property rights, economic development, science, technology and innovation policy, incubators and technological parks, knowledge, and technology transfer and Triple and Quintuple Helix approaches.

Areas of interest in TH research

Management of innovation environments.

SCOTT BILLADEAU

**University of Montana
Missoula**

UNITED STATES of AMERICA

scott@liquidplanet.com

With undergraduate degrees in both business and the arts, including a Master's degree in Music Technology and Composition, Scott served on the music composition faculty at the University of Montana from 1997-2002. He received a regional EMMY nomination for his PBS soundtrack to Silence & Solitude. Scott is also the founder of two companies, Liquid Planet and Planetary Design, and co-founder of HATCH (hatchexperience.org), a non-profit with a focus on mentoring the next generation while inspiring creativity and innovation in all fields.

Areas of interest in TH research

The regional economic impact of an 'entrepreneurial university'.

EVANS TAKYI ANKOMAH-ASARE

**Jiangsu University
(PhD Student, China) and
National Council for Tertiary
Education
(Ghana)
Zhenjiang
China**

e.takyi@ncte.edu.gh



Evans Takyi Ankomah-Asare holds a Masters in Learning in Complex Systems awarded by the University College of Akershus, Norway. He is the holder of a Bachelor's degree in Social Work with Sociology from the University of Ghana. He has participated in Going Global since 2013 (Dubai), and is also a member of INQAHEE. His research interests are in transnational education, internationalisation, access and equity, and pedagogical training.

Areas of interest in TH research

Innovation, complex systems, university performance, modeling and internationalisation

To become a member of the Triple Helix Association, please complete the membership form at www.triplehelixassociation.org/membership-request

THA NEWS

THA Welcomes Applications for Hosting Meetings (2019 onwards)



Want to host one of the next Triple Helix Meetings in your country? The THA can offer a wide array of meetings from small workshops to big events, like the Triple Helix Conference and the Triple Helix TH Summit.

For more information on THA meetings, please consult the *THA Meetings Portfolio Presentation* to select the event which would best fit your agenda, and then check the *Open Call for Proposals* for advice on how to submit your application. Both documents are available at www.triplehelixassociation.org/call-future-conference-proposals

For more information, or to submit your application, please contact Mrs Maria Laura Fornaci, mlaura.fornaci@triplehelixassociation.org, THA Executive Director, and Professor Tariq Durrani, durrani@strath.ac.uk, Chair of the Future Meetings Committee.

PROFESSOR EMILIO RICCI PRESENTS AT AFIDE

Professor Emilio Ricci from the [Universidad Católica del Norte](#), Chile, and THA organizational member, attended the V International Congress on Entrepreneurship (AFIDE) on 17-18 May 2017 in Panama, Central America, where he presented the paper *From the model of the Triple Helix to Social Innovation: Promoting the Welfare of the People* together with a practical case for the application of the Innovation and Development Triple Helix model in the Antofagasta Region in Chile, where emphasis is placed on social innovation and Special Interest Tourism (SIT).

2017 EFMD HIGHER EDUCATION RESEARCH CONFERENCE (HERC)

The 2017 EFMD Higher Education Research Conference (HERC) will take place at the Faculty of Economics and Business of KU Leuven on 23-24 October 2017. The theme of the conference will be: Impact and interdisciplinarity in management education and research.

www.efmd.org/index.php/events/event/331-2017-efmd-higher-education-research-conference .

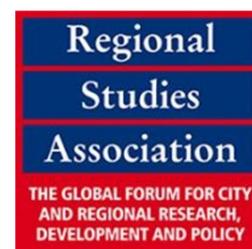


2018 EIT CALL FOR KIC PROPOSALS

Created in 2008, the European Institute of Innovation and Technology (EIT) is a unique EU initiative that spurs innovation and entrepreneurship across Europe with one simple idea: through diversity there is strength.

EIT brings together leading universities, research laboratories and companies to form dynamic pan-European partnerships. Together, these unique partnerships, called Knowledge and Innovation Communities (KICs), develop innovative products and services, start new companies, and train a new generation of entrepreneurs. They bring ideas to market, turn students into entrepreneurs and, most importantly, they innovate. The EIT Community puts entrepreneurs and innovators at the heart of our efforts. Check the new open call proposals for KICs:

- <https://eit.europa.eu/interact/bookshelf/presentation-eits-2018-call-kics-urban-mobility>
- <https://eit.europa.eu/interact/bookshelf/presentation-eits-2018-call-kics-manufacturing>
- <https://eit.europa.eu/collaborate/2018-call-kics/faq>.



REGIONAL STUDIES ASSOCIATION UPCOMING 2017 EVENTS

Regional Polarisation and Unequal Development in CEE: Challenges for Innovative Place-based Policies, 10-13 September, Cluj-Napoca, Romania
www.regionalstudies.org/conferences/conference/rsa-cee-cluj2017

Charting a Career Path: Sharing the Learning and Lessons, 2-3 November, Newcastle, UK
www.regionalstudies.org/conferences/conference/student-and-ec-2017

The Place Dimension of Cities and Regions: Governance, Industrial Development and Sustainability, 16-17 November, London, UK
www.regionalstudies.org/conferences/conference/rsa-winter-2017



**SYNTEGRATION BRAINPORT
NOORD- BRABANT
5-8 APRIL 2017**

Brain Port is a technology region in the province of Noord-Brabant in the Netherlands.

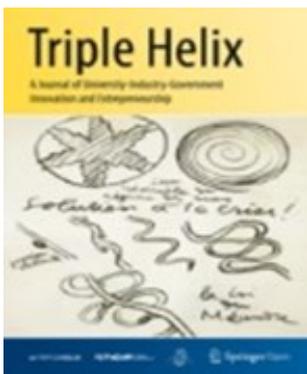
For three days, 5-8 April 2017, researchers and representatives from industry and administration held a meeting to develop solutions for future smart districts.

Researchers Alexander Schmidt and Tom Hawxwell participated to share their experiences from the Morgenstadt: City Insights network. The historical atmosphere on the second day at Helmond Castle in the technology region Brainport, Netherlands. Alexander Rieck from Fraunhofer IAO: Fraunhofer-Institut für Arbeitswirtschaft und Organisation shared his thoughts about smart districts with other researchers and representatives of cities and companies.

The Brainport Smart District and Malik Institute joined their efforts to syntegrate stakeholders for a trendsetting and innovative urban development. Brainport is a leading technology region in Europe, located in the Southeast Netherlands, with Eindhoven at its heart. This top technology region creates solutions for the societal challenges of tomorrow and with the planned Malik Syntegration plans to become "... a lighthouse as the most liveable adaptive residential area in the world"..

The partners in the development of Brainport Smart District are dedicated to the realization of a housing development, mobility and sustainability projects. Remarkably, everyone in the region stays involved, because the project organisation is convinced that the solutions of tomorrow's society require an integrated and innovative approach. What counts is not the opinion of one, but the opinion of all stakeholders. .

PUBLICATION OPPORTUNITIES



Triple Helix: A Journal of University-Industry-Government Innovation and Entrepreneurship (Springer) www.triplehelixjournal.springeropen.com/articles

SPECIAL ISSUE

Innovation Cooperation between Large and Small Firms: Operational Models

Lead Guest Editor
Guest Editor

Dr Annika Steiber, A S Management Insights AB, USA
Assoc Prof Sverker Alänge, Chalmers University of Technology,
Sweden

Paper Submission Deadline : 31 August 2017

Globalization, climate change, technological development, and more create demand for continuous innovation and new operational business models. Large incumbents face tremendous challenges in continuing pursuing, and exploiting their existing business at the same time as they need to explore new areas for the future. This has proven to be hard and history is full of examples where large successful corporations turn into a downward spiral

towards extinction. Small start-ups, on the other hand, excel in pursuing new ideas leading towards new innovation but face limitation when it comes to scaling its business on a global market. There are examples of collaborations initiated by large firms that lead to innovation success, however, many large firms still are looking for ways to develop the ambidextrous dynamic capability that would allow them to become innovative through the

cooperation with small creative firms (Alänge and Steiber, 2017).

This has made the other actors in the *Triple Helix* (Etzkowitz and Leydesdorff, 1995, 1997), government, university, and industry players, try to figure out what their role could be to contribute to the creation of a dynamic between large and small firms. Third party actors, both governmental, university, and privately or

publicly funded intermediaries, they have created space for interaction between large and small firms, such as Science Parks, research institutes, government or privately funded accelerators, TTOs, laboratories and test sites, and specific initiatives such as local/central government funding of collaboration initiatives based on competitive applications by the participating parties, typically also including university participants.

This article collection is centered on operational models initiated by the industry participants themselves, and by other Triple Helix actors. This has been an area where relatively little empirically based research has previously been presented (O'Reilly and Tushman, 2013) but where vital knowledge and experience is being accumulated. Thus, there is a need to present and critically evaluate these operational models for ambidexterity.

This article collection focuses on addressing the following questions:

- Implemented operational models for ambidexterity, preferably described through case studies and from which lessons learned could be drawn. How could these implemented operational models be conceptualized and characterized? Lessons learned over time by the firm applying the specific operational model for ambidexterity? Suggestion on sub questions:
 - * What are the triggers for adoption of the selected operational model and what are the goals and ambition levels for selected empirical cases?
 - * What is the planned duration of activities within the operational model and is the model in itself viewed as a permanent or a temporary instrument?
 - * Is any type of intermediary involved in the operational model? What is the intermediary's role(s)?
 - * Could underlying dynamic capabilities be identified as a prerequisite or result of developing and implementing the new operational model for ambidexterity? (that is could the Dynamic Capabilities concept and the Ambidexterity concept be viewed as complementing concepts?)
- What are the metrics for success used by the firm? Suggestion on general metrics that could be used to analyze the effectiveness of a specific operational model?
- What roles do third party actors (intermediaries) take in facilitating or participating in initiating and accomplishing innovation cooperation between small and large firms?
 - * Can Third Party "Space" serve a vital role in creating innovation cooperation between large and small firms, e.g. science parks, accelerator program, filtering function, and more (Lopez and Vanhaverbeke, 2009), and if so, how is this done and under what circumstances?
 - * Are intermediaries becoming more or less important over time in supporting this kind of new collaboration between large and small firms? (for example some large firms create their own "private" open innovation solutions focused on startups)
- To what extent are university actors vital contributors to innovation processes including both on-going knowledge cooperation and entrepreneurial spin-offs from universities?
 - * Which university actors can be identified – such as students, researchers, IP and liaison offices.
- In selected case study of an operational model for ambidexterity, what is the role of intellectual property - such as patents and licensing? Can IP issues be a hurdle? How have the actors behind the models found workable ways to solve the IP issues?
- We would like to invite you to address these questions or pose your own. An ideal article combines theoretical, empirical and policy elements, although the balance may differ.

Abstract submission

Authors should submit their abstracts directly to the guest editors by 31 August 2017.

Full paper submission

Full papers should be submitted using the submission instructions below by 31 December 2017.

Lead Guest Editor

Dr Annika Steiber
A S Management Insights AB
USA

Guest Editor

Assoc Prof Sverker Alänge
Chalmers University of Technology
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JOURNAL OF TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE (ELSEVIER)

SPECIAL ISSUE

Understanding Smart Cities: Innovation Ecosystems, Technological Advancements, And Societal Challenges

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First Submission date: 15 September 2017

Submission deadline: 15 December 2017

Currently there are more than 140 ongoing Smart Cities projects around the world (Lee et al., 2014). Smart Cities initiatives aim to “provide more efficient services to citizens, to monitor and optimize existing infrastructure, to increase collaboration amongst different economic actors and to encourage innovative business models in both private and public sectors” (Marsal-Llacuna et al, 2015: p618).

In order to achieve these goals, Smart Cities rely on state-of-the-art information technology (fiber optic networks, sensors and connected devices, open data analytics, internet of things, ICT-enabled participatory planning frameworks, etc.) on the one hand (Albino et al, 2015; Stratigea et al, 2015), and on human capital (research universities, knowledge intensive companies and public institutions) on the other hand (Neirotti et al, 2014; Ahvenniemi et al, 2017). Angelidou (2014) calls the former “hard” smart cities strategies (smart buildings, smart energy grids, smart water management, smart mobility) and the latter “soft” strategies (developing human capital through education, culture, social inclusion, social innovation). It is widely assumed that the digital infrastructure of modern cities offers a unique opportunity to facilitate entrepreneurship, creativity and innovation in order to drive local economic growth (Kraus et al, 2014; Grimaldi and Fernandez, 2015). The city of London, for instance, has based its Smart City initiative on four dimensions (Angelidou, 2015): a) technology innovation; b) open data and transparency; c) collaboration and engagement; d) efficiency and resource management. These dimensions echo Lee and co-authors’ (2014) six enablers of Smart City development: urban openness, service innovation, partnership formation, urban proactiveness, infrastructure integration and smart city governance.

According to the neo-evolutionary perspective of the Triple Helix framework, Smart City projects represent a unique innovation opportunity for companies, government agencies, and researchers (Leydesdorff and Deakin, 2011). In this sense, the European Union has established “action clusters” to foster the development of citizen participation, integration of infrastructures and processes,

new business models and better mobility solutions in “sustainable districts” (European Commission, 2016).

Alternative frameworks highlight the “transboundary” nature of Smart City projects. Thus Angelidou (2014) suggests the necessity to go beyond the “hard versus soft” infrastructure dichotomy and to also consider the national versus local implications for smart city projects; the new (green field) versus the existing (brown fields) approaches to urban development; and the economic-sector versus geographic sector approaches. Similarly, Ramaswami and co-authors (2016) suggest thinking about the local infrastructure provision (the smart management of energy, buildings, public spaces, waste and sanitation, food supply, water supply and transportation) as subject to a larger flow of national and global actors and institutions. The performance of these initiatives must be measured in terms of their environmental, economic and social benefits (Ahvenniemi et al, 2017). These initiatives can also be studied from a strategic perspective, as they can spark the emergence of new strategies in the firms and stakeholders involved in designing and executing the Smart City projects (Paroutis et al, 2014).

The Special Issue editors invite papers that examine novel phenomena, employ original methodologies, and offer interesting empirical insights and theoretical contributions related to topic of the Smart Cities. Possible topics include - but are not limited to - the following domains of inquiry:

- Natural resources / energy (smart grids, public lighting, renewable energies, waste management, food and agriculture)
- Transport and mobility (city logistics, people mobility)
- Smart buildings (facility management, services, housing quality)
- Smart living (entertainment, hospitality, pollution control, public safety, healthcare, welfare and social innovation, culture, public spaces)
- Smart working in the smart city (how the services provided by the smart city revolutionize the way we work)
- e-Government (e-democracy, smart procurement,

- transparency)
- Smart health 2.0 / e-health
 - Smart Economy (innovation and entrepreneurship in smart cities, cultural heritage management, digital education and digital divide, human capital management)
 - Business Model Innovation in Smart Cities
 - Sustainable Districts
 - ICT infrastructure and information management in Smart Cities
 - Business-led Urban Development
 - Developing social and relational capital in Smart Cities
 - The socio-technical challenges of the Smart City
 - Attracting and developing high-tech and creative industries
 - Marketing strategies concerning the new services provided by the Smart City
 - The emergence and impact of new strategies in firms involved with Smart City initiatives

Important Dates

First Submission date: 15 September 2017
Submission deadline: 15 December 2017
Acceptance Deadline: 31 July 2018
Expected publication: September 2018

All submissions will go through the journal's standard peer-review process.

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