



The 18th Triple Helix Conference

Conference proceedings

Future of innovation and Innovation for future

Online conference organised by Tampere University

Sponsors

DIMECC

VISIT
TAMPERE



BRILL



LSR 100
1919 - 2019



sustainability

THE UNIVERSITY OF TAMPERE FOUNDATION



Federation of Finnish
Learned Societies

DEMOLA

Program of the Virtual Triple Helix Conference 2020 –

Future of Innovation and Innovation for Future

Time in Helsinki	activity
	Day 1 – June 15
12.00 - 13.30	Networking in individual video-chats in Brella (additional slots are available in Brella throughout the day)
13.30-14.00	Opening words , chaired by Yuzhuo Cai, Chair of Triple Helix Conference 2020 <ul style="list-style-type: none">• Mari Walls, Tampere University President• Mariza Almeida, Vice President of Triple Helix Association
14.00-14.30	Keynote: Martti Hetemäki, Permanent Secretary, Ministry of Finance of Finland: <i>"Changes affecting innovation policy"</i> , Chaired by Pauli Kuosmanen, Director of Collaboration and Partnerships, Tampere University
14.30 – 15.15	Triple Helix vs. Quadruple and Quintuple Helix Dialogue by Loet Leydesdorff, Elias Carayannis & David Campbell. Moderator: Yuzhuo Cai
	15 min - break (and time for technical check in parallel rooms)
	Parallel sessions
15.30-16.50	Workshop: "EntreTime - training university educators in entrepreneurship " Speakers: Prof. Klaus Sailer and Prof. Mats Westerberg Description: In this workshop you will get a glimpse of



a train-the-trainer program designed to make non-entrepreneurship university educators better equipped to bring in entrepreneurship in their courses – both as a phenomenon and as a pedagogy. We will describe the program and involve participants in some of the actual tasks we do in the program.



Tracks for individual presentations (7 tracks x up to 5 presenters, 10 min ppts + 30 min discussion)

Track 1. Theoretical foundations and methodological approaches of Triple Helix

Chair: Dimitri Corpakis, Senior Research Fellow, South East European Research Centre; former Senior EU official, European Commission

- *Shaping a new industrial strategy through a place-based approach: the case of the European Union* by Dr. Dimitri Corpakis
- *Developing University-Industry-Government Research Partnerships in Republic of Kazakhstan: factors enhancing and constraining* by PhD candidate Dilara Orynbassarova
- *Measuring the efficiency of Triple Helix innovation systems* by Gordana Savic and Milica Jovanović
- *Beyond Sight: Eyeing Universities through glasses of Triple Helix Models and Innovation Ecosystems: An Exploratory Systematic Literature Review* by Ibtissam Slimani

Track 2. Concepts and theories to frame the future of innovation

Chair: Annina Lattu, PhD candidate, Tampere University

- *Bridging Innovation and Entrepreneurial Ecosystems: A Case Study of Linköping City* by Dr. Adli Abouzeedan
- *Applying an ecosystem approach and intangible flows in constructing*

futures in Asian cybersecurity context by Jouko Myllyoja

- *Regional Innovation Ecosystems supporting Business Development of Growth Oriented Microenterprises* by student Anneli Manninen
- *Conceptualisation of responsibility and ethics in an ecosystem context* by Adjunct Professor Mika Nieminen and Dr. Nina Rilla
- *Entrepreneurial University: a comparative study of Rio de Janeiro State Universities* by Dr. Branca Terra

Track 3. Innovation in transnational contexts

Chair: Hanna Salminen, Dr., Research Specialist, Tampere University

- *Research and Innovation Infrastructures Boosting Innovation Capacities of Regional Ecosystems* by Development Manager Hanna-Greta Puurtinen
- *Transregional access to innovation on demand* by Lic.Sc. (Tech.) Ari Lainevuori and Lic. Social Sciences Ninetta Chaniotou
- *Quadruple helix relations in innovation networks in EU macro-region. Comparative analysis of regional innovation potential in Baltic Sea Region* by Prof. Seija Virkkala
- *Effects of university-industry interaction in university patents: New evidences from Brazil and Spain* by Miss Lydia Bares López
- *Unveiling cross-country collaboration and knowledge flows through patent reassignments and citation networks* by Dr. Carlo Giglio

Track 5. University reforms for future innovation

Chair: Huub Mudde, Dr., Senior Project Consultant and Lecturer in Institutional Entrepreneurship, Maastricht School of Management

- *Vision 2050 – A Foresight Reflection on Entrepreneurial Ecosystems Stakeholders Expectations towards Higher Education Institutions* by Audrey Stolze
-

- *University assistance mechanisms in launching new academic spinoffs: a comparative analysis between the University of Amsterdam (NL) and the Free University of Berlin (D)* by Jean-Régis Kunégel
- *Experimenting in Organizational Periphery: Introducing Extra-curricular Entrepreneurship Education in Traditional Research University* by Prof. Juha Tuunainen and Dr. Kari Kantasalmi
- *Characterising universities' role in the implementation of Structural Funds Operational Programmes: Reflections from four European case universities* by Maria Salomaa
- *The tough road to Bologna: Exploring the factors hindering the higher education reform in Morocco* by Dr. Zineb El Andaloussi

Track 6. Governance and public policy in shaping future innovative society

Chair: Mika Raunio, Senior Researcher, Migration Institute of Finland

- *Responsible Research and Innovation (RRI) related practices in the Polish innovation ecosystem* by dr.(Habil.) T. Bartosz Kalinowski
- *Smart Specialization Strategies at National, Regional, or Local Levels? Synergy and Policy-making in German Systems of Innovation* by Henriette Ruhrmann
- *Triple Helix actors communication: assessing the institutional affiliation of communication formats* by Liana Kobzeva
- *The Many Roles of Change Agency in the Game of Green Path Development: Seeing Inside Triple Helix Constellations* by Prof. Markku Sotarauta
- *Kairos in Innovation Policy Theoretical Foundations and Practical Implications for the Triple Helix* by Dr. Michael Rothgang

Track 7. Individuals' role in Triple/Quadruple Helix or future innovation

Chair: Tiina Brandt, Haaga-Helia University of Applied Sciences

	<ul style="list-style-type: none"> • <i>Leading Organizations in Information Exchange: University - Industry Collaboration Interfaces</i> by PhD Fellow Dorian Aliu • <i>Experimenting citizen science in South Ostrobothnia, Finland</i> by Dr. Jari Kolehmainen • <i>The business actions and practices in strengthening The Quadruple and Quintuple Helices: A study with Structural Equation Modeling</i> by Dr. Andréa Mineiro • <i>Triple Helix as gendered innovation environment</i> by Dr. Oili-Helena Ylijoki
	<p>Track 8. Other topics related to the theme of the Conference</p> <p>Chair: Malgorzata Runiewicz-Wardyn, Associate professor, Kozminski University</p> <ul style="list-style-type: none"> • <i>Perspectives of Information Technology Industry in Armenia</i> by PhD Ashot Davoyan • <i>Corporate venture capital strategies in open innovation ecosystem</i> by PhD student Meriam Cherif • <i>The Role of Intermediaries in the Evolution of Triple Helix Knowledge Networks. The Case of Life Sciences Industry</i> by Prof. Malgorzata Runiewicz-Wardyn • <i>Assessing Innovation Environments in the State of Rio de Janeiro, Brazil - A multiple case studies on science and technology parks in design and operation stages</i> by Associate Professor Marcelo Amaral • <i>Crossing Triple Helix, Sociology, and Big Data Analysis: Accelerating and Expanding The Realm and Edges of Research</i> by Jim Beddows
	10 min break
17.00 - 18.20	<p>Special session on Triple Helix response to Covid-19.</p> <p>Keynote by Henry Etzkowitz: <i>What can we learn from the Triple Helix response</i></p>

	<i>to the Great Depression?</i> Panel discussion , moderated by Riccardo Viale Panelists: Dimitri Corpakis, Tatiana Schofield, Rahmat Ullah	
	10 min break	
18.30-19.15	Panel discussion with representatives of Academy, Government and Industry: <i>Innovation policy in Finland – Challenges of the past, possibilities of the future.</i> Moderator: Markku Sotarauta , Panelists: Tarmo Lemola, Mikko Möttönen	
	Day 2 – June 16	
11.00-13.15	Networking in individual video-chats in Brella (additional slots are available in Brella throughout the day)	
13.15-13.45	Keynote by Esko Aho , former Prime-minister of Finland “ <i>Innovation to the Future in the light of the contemporary crisis</i> ” Chair: Juha Teperi, Vice President of Tampere University	
	15 min - break	
	Parallel sessions	
14.00-15.30	Panel discussion: <i>STEAM. Methods and instruments for engineering and technical continuing education.</i> Moderator: Nikita Vostrov	<div>  <div> Co-funded by the Erasmus+ Programme of the European Union </div>  </div> Workshop: <i>Building Next Generation of Globally Responsible Digital Entrepreneurs?</i> Moderator: T. Bartosz Kalinowski <p>Digitalisation is becoming a significant area of the current world. <u>It has become even more critical in the current pandemic situation.</u> We can observe business models that rely substantially or solely on the internet to deliver services and products. On the other hand, one of the most critical, present challenges for enterprises is environmental protection. The</p>

	<p>Erasmus+ funded project DIGI-Grent: Building Next-Generation of Globally Responsible Digital Entrepreneurs (2018-1-ES01-KA203-050046) is combining the two mentioned areas. The workshop will <u>aim to present research results on competencies required by responsible digital entrepreneurs and engage workshop participants into validating them.</u></p>
<p>Tracks for individual presentations (6 tracks x 6 presenters, 10 min ppts + 30 min discussion)</p>	
<p>Track 1. Theoretical foundations and methodological approaches of Triple Helix</p> <p>Chair: Dimitri Corpakis, Senior Research Fellow, South East European Research Centre; former Senior EU official, European Commission</p> <ul style="list-style-type: none"> • <i>Knowledge Creation, Appropriation and Diffusion: A Framework for Quadruple Helix Linkages</i> by Associate Professor Marcelo Amaral • <i>Latourian Actor-Network Theory Approach to Studying the Imageries about the Relations of Research, Practice and Policymaking and the Impact and Relevance of Research</i> by PhD researcher Sini Teräsahde • <i>To compete or to cooperate? A case study of innovation and creativity labs in Berlin</i> by Dr. Daniel Feser • <i>U.S. NSF IUCRC Program Redesigned: Multi-Level Evaluation Questions about Outcomes and Impacts</i> by Dr. Lindsey McGowen • <i>Modelling Knowledge and Technology Transfer: A Comparative Analysis of Multi-Disciplinary Approaches</i> by Antonia Muschner 	
<p>Track 4. Innovation and Collaboration for sustainability</p> <p>Chair: Ju Liu, Dr., Senior Lecturer, Malmö University</p> <ul style="list-style-type: none"> • <i>Innovation in healthcare ecosystems: a triple helix approach</i> by Adriana 	

Coutinho

- *Social sustainability in newly multiculturalising SMEs* by Postdoc Henna Jousmäki
- *University-Industry-Government Cooperation within an agricultural context: the case of Penela Business Incubator* by Prof. João Paulo Marques
- *A System Model and An Innovation Approach toward Sustainable Housing Renovation* by Dr. Ju Liu
- *Triple Helix accelerating the green economy* by Mrs. Nina Suvinen
- *Circular Economy and Sustainability – investigating stakeholders' perceptions* by Dr. research specialist Hanna Salminen

Track 5. University reforms for future innovation

Chair: Huub Mudde, Senior Project Consultant and Lecturer in Institutional Entrepreneurship, Maastricht School of Management

- *Universities Resource Mobilisers for the ICT Sector Innovation in Chinese Cities* by Principal Lecturer Sajal Kabiraj
 - *Steps Towards Innovation – Forces that Pushed the University-Industry Collaboration in Georgia* by student Teona Zhuzhunadze
 - *An overarching compendium on the determinants of University Students' Entrepreneurial Spirit in Italy* by Dr. Carlo Giglio
 - *The Impact of University-Industry Collaboration on Absorptive Capacity in Moroccan Context: A Macro Level Perspective* by PhD candidate Rabii Outamha
 - *University-Industry Relationship through Knowledge Transfer Organizations in developing countries: Evidence from an Argentinian Local Innovation Ecosystem* by PhD candidate Ian Hülkamp
 - *European researchers in Chinese Academia: What are their motivations,*
-

Track 6. Governance and public policy in shaping future innovative society

Chair: Mika Raunio, Dr., Senior researcher, Migration Institute of Finland

- *Rebalancing Society in an Age of Digital Transformation: Revisiting Mintzberg's Thesis and Four Sociological Lenses for Consideration* by Professor Nicole Jackson
- *An Analysis of Turkish Innovation Policy from a Gender Perspective* by PhD student Demet Demirez
- *A study on the characteristics and operation model of small world network for university-industry knowledge transfer* by Dr. Han Zhang
- *Triple helix and migration management of highly skilled in the regions without science university - case Seinäjoki Finland* by Senior Researcher Mika Raunio
- *Triple Helix governance for sustainability: cases from the European Green Capital Award* by Prof. Dr. Michele Coletti
- *A Nexus between policy and practice-The Case of the National Youth Development Agency in South Africa and the process evaluation of the Youth Entrepreneurship programme.* By Mrs. Sahar Mohy-Ud-Din

Track 7. Individuals' role in Triple/Quadruple Helix or future innovation

Chair: Tiina Brandt, Researcher, Haaga-Helia University of Applied Sciences

- *Upgrading along Value Chains: Strategies for Thailand's Functional Milk Industry* by Ms. Panisa Harnpathananun
 - *Examining the Role of Universities within UIG Collaborations of the Clothing, Textiles, Leather, and Footwear Industry of South Africa* by Mr. Sipho Mbatha
 - *Flows of academics* by Dr. Taru Siekkinen
 - *The traveling startup scene: Student-steered field landing and the*
-

	<p><i>quadruple helix in Turku, Finland</i> by Dr. Päivi Oinas</p> <ul style="list-style-type: none"> <i>Innovation orientation and entrepreneurial intentions of business students in Finland and USA</i> by Dr. Tiina Brandt
	<p>Track 8. Other topics related to the theme of the Conference</p> <p>Chair: Juha Tuunainen, Professor, University of Oulu</p> <ul style="list-style-type: none"> <i>Boundaries of and possibilities for promoting gender equality in regional networks through action research</i> by PhD Minna Leinonen <i>Enabling university-industry linkages in developing economies: Adaptive collaborations and change creation among partners</i> by PhD researcher Sidath Alwis <i>Strengthening the public-private collaboration within innovative public procurement</i> by M.Sc. Sini Kahilaniemi <i>Study of the evolution and dissemination of technology parks in Brazil as an intermediaries of the Trilple Helix Model</i> by Prof. Dr. Adriana Ferreira de Faria <i>The limits of reporting societal impact for research evaluation purposes - the case of sociology in UK and Norway</i> by Dr. Reetta Muhonen <i>The effect of R&D activity on companies` performance: mapping the field</i> by Mrs. Kseniia Boiko
	15 min - break
15.45-16.45	<p>Plenary session (panel discussion) with Finnish industries – “Innovation expectations of 2020 and experiences from industry towards researchers and society?” Moderator: Harri Kulmala, CEO, DIMECC</p> <p>Mr. Kai Knuutila, R&D director, Glaston Oyj</p> <p>Mrs. Marke Kallio, R&D manager, Metso corporation</p> <p>Mr. Tomi Kankainen, CDO, Oy Fastems Ab</p>

	Mr. Pertti Lukander, director, Nokia Bell Labs
	15 min – networking break
17.00 - 17.30	Keynote: Martin Kenney, <i>Platform-Dependent Entrepreneurship and Private Regulation: What Does It Mean for Entrepreneurs, Small Business and Society?</i>
17.30- 18.00	Keynote: Joanna Chataway, <i>Triple Helix scholarship and transformative innovation agendas: Does the Triple Helix need a new direction?</i> Chair: Marko Seppänen Professor of Industrial Management and Vice Dean for Education at Faculty of Management and Business, Tampere University
	15 min -Networking break
18.20- 19.00	Closing ceremony, chaired by Yuzhuo Cai, THC 2020 Chair <ul style="list-style-type: none"> • Announcing Best Paper Award by Emanuele Fiore, Executive Committee Member of Triple Helix Association • Pre-announcement of Social Media Ambassador Award by Dimitry Corpakis, Executive Committee Member of Triple Helix Association • Announcing the upcoming Triple Helix Summit, Riccardo Fini, scientific Chair of the TH Summit 2020 • Moacir de Miranda Oliveira Junior, Professor and Head of the Business Administration Department at University of São Paulo, Chair of the Organising committee of Triple Helix Conference 2021 • Acknowledging the volunteers, Yulia Shumilova & Annina Lattu • Concluding words by Emanuela Todeva, Vice President of Triple Helix Association

Table of Contents

Program of the Virtual Triple Helix Conference 2020 –	3
Future of Innovation and Innovation for Future	3
Table of Contents	14
Track 1. Theoretical foundations and methodological approaches of Triple Helix.....	18
The role of universities in regional innovation: synthesis of a research programme.....	18
Developing University-Industry-Government Research Partnerships in Republic of Kazakhstan: factors enhancing and constraining	21
Measuring the efficiency of Triple Helix innovation systems	24
Beyond Sight: Eyeing Universities through glasses of triple helix models and innovation ecosystems: An exploratory systematic literature review	28
Knowledge creation, appropriation and diffusion: a framework for quadruple helix linkages	30
Latourian Actor-Network Theory Approach to Studying the Imageries about the Relations of Research, Practice and Policymaking and the Impact and Relevance of Research.....	33
To compete or to cooperate? A case study of innovation and creativity labs in Berlin.....	36
Shaping a new industrial strategy through a place-based approach: the case of the European Union	43
U.S. NSF IUCRC Program Redesigned: Multi-Level Evaluation Questions about Outcomes and Impacts	47
Track 2. Concepts and theories to frame the future of innovation	51
Bridging Innovation and Entrepreneurial Ecosystems: A Case Study of Linköping City...51	
Applying an ecosystem approach in constructing futures in Asian cybersecurity context..52	
The effect of R&D investments on companies' performance in the manufacturing industry	53
Conceptualisation of responsibility and ethics in an ecosystem context	60
Track 3. Innovation in transnational contexts	64

Research and Innovation Infrastructures Boosting Innovation Capacities of Regional Ecosystems	64
Transregional access to innovation on demand.....	66
Quadruple helix relations in innovation networks in EU macro-region. Comparative analysis of regional innovation potential in Baltic Sea Region	69
Unveiling cross-country collaboration and knowledge flows through patent reassignments and citation networks	73
Innovation management in the Brazilian electricity sector: the case of Eletrobras companies	77
Track 4. Innovation and Collaboration for sustainability	79
Innovation in healthcare ecosystems: a triple helix approach.....	80
Innovation for socially sustainable work and leisure	82
University-Industry-Government Cooperation within an agricultural context: the case of Penela Business Incubator.....	86
Effects of university-industry interaction in university patents: New evidences from Brazil and Spain	90
A System Model and An Innovation Approach toward Sustainable Housing Renovation ..	91
Triple Helix accelerating the green economy	94
Circular economy and sustainability – investigating stakeholders’ perceptions.....	96
Track 5. University reforms for future innovation	97
Vision 2050 – A Foresight Reflection on Entrepreneurial Ecosystems Stakeholders Expectations towards Higher Education Institutions	97
University assistance mechanisms in launching new academic spinoffs: a comparative analysis between the University of Amsterdam (NL) and the Free University of Berlin (D)	101
Experimenting in Organizational Periphery: Introducing Extra-curricular Entrepreneurship Education in Traditional Research University	104
Characterising universities’ role in the implementation of Structural Funds Operational Programmes: Reflections from four European case universities	106

Universities Resource Mobilisers for the ICT Sector Innovation in Chinese Cities.....	111
Steps Towards Innovation – Forces that Pushed the University-Industry Collaboration in Georgia.....	144
An overarching compendium on the determinants of University Students’ Entrepreneurial Spirit in Italy.....	147
The Impact of University-Industry Collaboration on Absorptive Capacity in Moroccan Context: A Macro Level Perspective	151
University-Industry Relationship through Knowledge Transfer Organizations in developing countries: Evidence from an Argentinian Local Innovation Ecosystem.....	152
Track 6. Governance and public policy in shaping future innovative society	158
An Analysis of Turkish Innovation Policy From a Gender Perspective	158
Policymaking in Innovation Systems – Measuring Synergy in Innovation Systems at the Local, Regional, and National Level with the Triple Helix Indicator.....	161
Triple Helix actors communication: assessing the institutional affiliation of communication formats.....	165
The Many Roles of Change Agency in the Game of Green Path Development: Seeing Inside Triple Helix Constellations.....	170
Kairos in Innovation Policy Theoretical Foundations and Practical Implications for the Triple Helix	173
Rebalancing Society in an Age of Digital Transformation: Revisiting Mintzberg’s Thesis and Four Sociological Lenses for Consideration	176
A study on the characteristics and operation model of small world network for university-industry knowledge transfer	179
Triple-Helix and migration management of highly skilled in the regions without science-university – case Seinäjoki, Finland.....	180
Triple Helix governance for sustainability: cases from the European Green Capital Award	182
Track 7. Individuals’ role in Triple/Quadruple Helix or future innovation.....	184

Leading organizations in information exchange: University – industry collaboration interfaces	184
Experimenting citizen science in South Ostrobothnia, Finland	186
The business actions and practices in strengthening the Quadruple and Quintuple Helices: A study with Structural Equation Modeling	189
Triple Helix as gendered innovation environment	192
The traveling startup scene: Student-steered field landing and the quadruple helix in Turku, Finland.....	194
Upgrading along Value Chains: Strategies for Thailand’s Functional Milk Industry	197
Examining the role of universities within UIG collaboration of the clothing, textiles, leather, and footwear industry of South Africa	204
Flows of academics	206
Innovation orientation and entrepreneurial intentions of business students in Finland and USA.....	208
Track 8. Other topics related to the theme of the Conference.....	211
Regional Innovation Ecosystems supporting Business Development of Growth Oriented Microenterprises.....	211
Perspectives of Information Technology Industry in Armenia.....	214
Crossing Triple Helix, Sociology, and Big Data Analysis: Accelerating and Expanding The Realm and Edges of Research.....	223
The Role of Intermediaries in the Evolution of Triple Helix Knowledge Networks. The Case of Life Sciences Industry.....	224
Assessing innovation environments in the state of Rio de Janeiro, Brasil – A multiple case studies on science and technology parks in design and operation stages.....	227
Corporate venture capital strategies in open innovation ecosystem	230
Boundaries of and possibilities for promoting gender equality in regional networks through action research.....	234
Enabling university-industry linkages in developing economies: Adaptive collaborations and change creation among partners	236

Strengthening the public-private collaboration within innovative public procurement.....	239
Study of the evolution and dissemination of technology parks in Brazil as intermediates in the Triple Helix Model.....	242
The limits of reporting societal impact for research evaluation purposes - the case of sociology in UK and Norway.....	247

Track 1. Theoretical foundations and methodological approaches of Triple Helix

Chair: Dimitri Corpakis

The role of universities in regional innovation: synthesis of a research programme

David Charles on behalf of the RUNIN research team

Type: Original research paper

Abstract

This paper presents the synthesis findings from a seven country Marie Curie training network, incorporating 14 PhD projects. The RUNIN project on the role of universities in regional innovation has sought to create a body of knowledge on how universities can contribute to innovation and development in the regions in which they are located. We further specified the main research question through exploring in-depth four main channels of interaction between universities and their regions.

People and Networks

The first research theme People and Networks focuses on the role of individuals and their networks in knowledge transfer between universities and firms. While much research on collaboration and knowledge transfer examines networks between organisations, individuals are always the key agents in such collaboration. This is particularly true for universities, where individual academics have wide autonomy and tend to develop extensive personal

networks both within and outside academia. One important dimension is the nature and geography of academics' personal networks across different universities. The project assessed the role of individual- and institutional-level factors in the development of these networks and the role of academic mobility in developing personal networks. We also examined the point of view of firms as well as universities in an analysis of the role of informal personal and socially embedded networks with more formal organisational level networks in creating successful collaboration between universities and firms. Increasingly, PhD students find employment in the non-academic sector after completion of their degree and may retain contacts with supervisors and former colleagues. This can provide important channels for knowledge exchange between universities and firms or public-sector organisations. We examined the extent to which universities adapt to this changing reality by integrating learning and the development of transferable skills in their PhD education, and to what extent this matches the type of skills demanded by employers outside academia. Finally, we explored the role of university-firm interaction in PhD education. Whether in the form of mobility placements, participation in collaboration projects or commercialisation, such interaction can provide important sources of learning for PhD students, in particular in the context of developing transferable skills.

Policies and Interventions

The second research theme – Policies and Interventions – examined the interaction of universities with public policy, both as subjects of policy interventions and as participants in policy networks. On the one hand, universities are targets of public policy, being in the European context mostly publicly owned and regulated by government policy. Thus, public policy plays a large role in determining how universities interact with firms and regions, both through formal requirements and regulations and through monetary or other incentives for such interaction. Nonetheless, the effect of public policy is not always straightforward, but rather interacts with local institutional and organisational conditions at the university in determining outcomes. We explored how particular outputs generated by universities through their regional engagement activities translated into changes in regional economic development performance, and how policy-makers can seek to understand the meso-impacts of their micro-policy interventions around university-regional engagement. On the other hand, universities also provide inputs to public policy, not least in the area of regional development and innovation policy. The university is an important stakeholder in the development of regional innovation programmes and often a major source of knowledge and

learning. The project also examined the contributions of universities to regional innovation policy and regional development programmes by examining how universities act as agents in regional development processes, mapping the range of activities in which they are involved and the institutional and organisational challenges they face in taking up this role across varying regional contexts. Finally, we studied the engagement of universities with regional development policies through participation in Structural Funds and national programmes. Universities and other regional institutions formed regional partnerships to compete for such funding, contributing to the formation of university-business or university-public sector networks.

Places and Territories

The third research theme examines the role of Places and Territories in structuring interactions between firms and universities in terms of both local production structures and global value chains. The roles that universities can play in regional innovation depend crucially on the industry structure and knowledge base of the firms and work force in the region. We explored for example the different contributions of universities to innovation in different types of regions, focusing particularly on the difference between universities located in central and peripheral regions. Universities have an important role to play not only as producers of knowledge within the region, but also as conduits of knowledge within extra-regional networks. One project examined the role of universities as nodes in global knowledge networks between the region and knowledge producers elsewhere in the world. Academic researchers are embedded in global networks that provide access to new ideas and knowledge being generated around the world.

Practices and Governance

The fourth research theme focuses on Practices and Governance, examining changing practices of university-firm interaction and how this is affecting the governance of universities and of their interaction arrangements with firms. Starting from the perspective of assessing the impact of university-firm interaction practices, one project compared firms' financial performance between those collaborating with universities and those not collaborating. The project develops a method of measurement that will quantify the contributions of collaboration with universities to the financial performance of firms and to firm survival. Other projects explore the changing role of universities within broader networks that also include civil society, which are being foregrounded in recent models of

regional innovation governance systems. This has implications for practices of university-firm interaction and for the governance of networks in which universities are involved.

Key words: regional innovation, universities, individuals, governance, practices

¹ De Grande, H. (2009) Ready or not: Different views about transferable skills of doctoral candidates in Flanders, in A. Kluznick-Tőro, A. Csépe and D. Kwiatkowska-Ciotucha (eds) *Higher Education, Partnership, Innovation*. Budapest: Publikon.

² Charles, D. (2003) Universities and territorial development: Reshaping the regional role of UK universities. *Local Economy* 18: 7-20.

³ Tödtling, F., Trippel, M. (2005) One size fits all? Towards a differentiated regional innovation policy approach. *Research Policy* 34: 1203-19.

⁴ Bathelt, H., Malmberg, A., Maskell, P. (2004) Clusters and knowledge: Local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography* 28: 31-56; Fitjar, R.D., Rodríguez-Pose, A. (2013) Firm collaboration and modes of innovation in Norway. *Research Policy* 42: 128-38.

⁵ MacGregor, S.P., Marques, P., Simon, A. (2010) Gauging readiness for the quadruple helix: A study of 16 European organizations. *Journal of the Knowledge Economy* 1:173–90.

Developing University-Industry-Government Research Partnerships in Republic of Kazakhstan: factors enhancing and constraining

Dilara Maratkyzy, Nazarbayev University, dilara.orynbassarova@nu.edu.kz

Today scholars view research as a main source of national competitiveness where heterogeneous actors need to work cooperatively. Research stimulates a nation's economic prosperity and technological development. A set of activities where several actors are involved in research towards shared goals, collectively compounding on their individual background in the creation, production and application of new knowledge and maximization of the effect of research at the societal level is understood as a collaborative research (Borrell-Damian, Morais & Smith, 2014, Dzisah, 2006; Etzkowitz, 2008). Research collaboration that involves university, industry and government (UIG) contributes to knowledge diffusion and is essential to the success of science-based knowledge economy.

Most studies on UIG relationship have been mainly performed in the Western context and by Western scholars. There is a shortage of methodological frameworks studying UIG research collaboration in the context of developing economies. This study aims to identify factors that may stimulate or constrain universities, industries and government research agencies to partner in research in post-Soviet Kazakhstan.

A prosperous country's economic growth and innovation necessitates the establishment of a research system in which the research members could establish and maintain mutual and interdependent relationships as collaborators (Yun & Lee, 2013). Worth pointing out is that maintaining partnership in research between education and science and business is far from new approach in Kazakhstan. During the Soviet period as a part of the planned economy the alignment between the industry, education and science was tight (Bodrunov, 2015). Examples of successful partnership projects during Soviet period based on a close interaction between industry, science and education and an effective use of results of scientific and technological activities includes such projects as the Soviet "Atomic project", rocket and space program and production of electronic computers (Bodrunov, 2015). However, after the dissolution of the USSR, the disintegration of science, education and business in Kazakhstan occurred as a result of numerous reasons. Some of these reasons include the facts that the state has no longer actively regulated and promoted the partnership between these two spheres. During the time when the decentralization of science and the establishment of a cooperation and interaction among government, science and education and industry in the research domain are in the process of active development in Kazakhstan, vital questions are raised about how mutual cooperation among actors in innovative research environment can be advanced in order to facilitate scientific innovations and economic prosperity in the country. More than 25 years have passed since the dissolution of the USSR and the formation of the Republic of Kazakhstan and government activities to establish new approaches to the development of science, and create an independent scientific management system in the country (Law on Science and State Scientific and Technological Policy of the Republic of Kazakhstan, adopted in January 1992; Sultanova, 2009). During this period, numerous research institutes of higher educational institutions, and publicly and privately owned research centers have been established as actors engaged in research and advancing the national research agenda in Kazakhstan (Muhtarova, 2010). However, little is known about how cooperation and interaction among these research actors have been built within the last 25 years (Kozlova & Denisova, 2014). Today Kazakhstan lacks understanding of the mechanisms for coordinating

research interaction among the participants within the innovative environment. Lack of data and conceptual methodological approaches to stimulating the research partnership among the universities, industries and government research institutes serve as an obstacle for new knowledge creation, diffusion and application. Subsequently, a lack of research makes it difficult to understand and assess the relational capacity of these research innovation structures (Minguillo & Thelwall, 2012).

The results of this empirical research based on qualitative interviews study make revelations about the ability of UIG institutions to access each other and attain resources for research collaboration in the context of developing economy. Study identifies ten major factors that stimulate UIG collaborations in research, and eighteen factors hindering its development. Discussion of the findings and implications for improving research collaboration that involves UIG contributing to knowledge diffusion are provided. This study involved 6 UIG research sites, where in depth one-on-one semi-structured interviews were conducted with eight study participants on a voluntary basis employed in research departments of UIG institutions. A two-month timeline limitation, where one month was spent on empirical data collection, and one month on analysis, was a constraint of the study. A longer period of time spent in the field would make the findings stronger.

This study anticipates inputting multiple contributions to research and policy. There is a lack of theoretical examination and empirical research on whether the Triple Helix model is applicable in non-Western contexts and developing economies (Cai, 2014). In addition, there is a shortage of conceptual framework studying the UIG models of partnership in research in the context of Kazakhstan. The example of Kazakhstan, a country located in the heart of Eurasia with a rapidly growing economy in the Central Asian region, makes the case of a developing country particularly distinct from other developing economies; the distinctions are characterized by its undergoing a wide variety of rapid and complex transformations in social, political and economic life (Danilovich & Yessaliyeva, 2014; Papieva, 2006). It is also hoped that this study will contribute to the general discussion on the application of UIG partnership models in research with relation to different international and national contexts; and the field of research surveying factors that may stimulate or constrain the development of UIG partnerships.

Keywords: developing economy, triple helix, factors stimulating, factors hindering, UIG research partnerships

Measuring the efficiency of Triple Helix innovation systems

Milica Jovanović, Gordana Savić, Yuzhuo Cai

Type of research: original research

Purpose

The purpose of the research is to explore a novel approach to measuring Triple Helix (TH) performance. The paper uses the efficiency approach and compares how successful are OECD countries in transforming inputs into outputs through the TH collaboration. The paper aims to examine the rank of the selected countries based on their efficiency score. In the research, the authors will use Data Envelopment Analysis (DEA) to measure the efficiency of the observed countries. This paper aims at establishing the efficiency approach in industry-university-government relations within a country.

Measuring the TH performance is one of the crucial factors for the improvement of the cooperation and collaboration between the pillars, as well as for the identification of the weak links and good practices within the observed systems.

Design/Methodology/Approach

There are numerous attempts and approaches to measuring this performance (Singer and Oberman Peterka, 2012; Jovanović et al., 2020), and one of the most popular is Shannon's equation for measuring the synergy between the actors (Leydersdorff, 2003). The focus of the TH performance measures is put on research and development (R&D) activities observed through the patent and publishing activity (Leydesdorff and Meyer, 2006; Meyer, Sinilainen, & Utecht, 2003; Xu et al., 2015). Nevertheless, these measures are not widely used in practice, which should be their main purpose – to enable the users with proper feedback on their performance and implications for further development (Jovanović et al., 2020). Thus, in this paper, we examine the efficiency approach. This approach examines how successful was an entity in using the provided inputs and transforming them into desired outputs (Ćujić et al.

205). An important feature of the DEA method is that it does not use predefined weight values but allows each entity to determine the weights that are most suitable for it. In this way, it evaluates strengths and weaknesses for each unit and projects the improvements that it can perform to be more efficient (Ćujić et al. 2015).

DEA has several mathematical models that could be applied depending on the type of the examined problem (input-oriented, output-oriented, BCC, CCR, undesired outputs, benefit-of-doubt, hierarchical approach, etc.) (Paradi et al. 2018). In this paper, we will use the hierarchy approach since the indicators will be grouped according to the TH actors. The method will be applied on a set of 36 OECD countries and a selected set of indicators from the official OECD Main Science and Technology Indicators. Previous research of Jovanović et al. (2020) examined the measure of the TH synergy through the two-step Composite I-distance method for creating composite measures of multivariate problems. In this paper, the authors will apply DEA method on the same set of indicators from the official OECD Main Science and Technology Indicators, classified according to the TH actors. The results will compare the efficiency of the OECD countries based on the cooperation between the three pillars.

Research steps that are planned to be conducted are:

1. Selection of the indicators that will be included in the model;
2. Classification of the indicators (input or output-oriented and TH actor);
3. Data collection from the official reports;
4. Application of DEA hierarchy model;
5. Results analysis and discussion;
6. Limitations and implications.

Findings or expected outcomes

This research is another approach to creating a composite index for TH performance could be a valuable tool for policymakers and provide important results through an approach that is not sufficiently exploited. The results will provide feedback on the efficiency of the TH collaboration within a country and provide valuable data on the improvements that could be made.

Limitations/implications

One of the possible limitations of the method is the sensitivity on the number of indicators that can be included in the model. In DEA, the number of the observed indicators depends on the number of the observed units (countries in this case). In general, the multiplied score of inputs and outputs should be the minimum of the countries that are observed (i.e. 4 input and 5 output indicators require at least 20 countries that are going to be observed). Since this paper uses hierarchy approach, this limitation can be mitigated.

Practical and/or Social Implications

One of the specific qualities of DEA method is that it provides feedback on the improvements that should be made within the observed entity to achieve a higher level of efficiency (Paradi et al. 2018). It enables identification of the weak links within a system and provides the exact measure of the improvement that an entity should make to become efficient. This is a crucial contribution of this approach for the policymakers that could be used to determine measures and policies for improving the observed system. The results of this method can be used as a direct input for a decision-making process at a national, regional or local level to coordinate the cooperation between the TH pillars.

Another benefit from the results of the research is that the results of the DEA method provide a benchmark unit for each inefficient country. This feature is important for policymakers to consider which country they should focus on following as a role model if they are not leaders in the global market. This approach should indicate where countries are standing in collaboration of their institutions and give the directions of further steps that should be made for achieving a higher level of innovativeness within their system.

Originality/Value

In the past few years, there are numerous approaches to measuring TH performance. However, the DEA method has not been introduced sufficiently. Tarnawska and Mavroeidis (2015) have applied this method in their research, but have not used more than 6 indicators, which is a small number of for such a complex problem as TH collaboration. This research is an original approach that aims to introduce a comprehensive approach to measuring TH performance.

Keywords: Efficiency, Data Envelopment Analysis, Triple Helix measures, Performance measures, OECD

References

- Ćujić, M., Jovanović, M., Savić, G., and Levi Jakšić, M. (2015) 'Measuring the Efficiency of Air Navigation Services System by Using DEA Method', *International Journal for Traffic and Transport Engineering*, 5(1), pp. 36-44, doi: 10.7708/ijtte.2015.5(1).05.
- Jovanović, M.M., Rakićević, J.Đ., Jeremić, V.M., and Levi Jakšić, M.I. (2020) 'How to Measure Triple Helix Performance? A Fresh Approach' In: Abu-Tair, A., Lahrech, A., Al Marri, K., Abu-Hijleh, B. (eds) *Proceedings of the II International Triple Helix Summit*. THS 2018. *Lecture Notes in Civil Engineering*, 43. Springer, Cham, doi: 10.1007/978-3-030-23898-8_18.
- Leydesdorff, L. (2003) 'The mutual information of university-industry-government relations: an indicator of the Triple Helix dynamics', *Scientometrics* 58(2), pp. 445–467.
- OECD. (2019) 'Main Science and Technology Indicators' [online] Available at: <http://www.oecd.org/sti/msti.htm> (Accessed 10 December 2019)
- Paradi, J.C., Sherman, H.D., and Tam, F.K. (2018) 'DEA Models Overview', In: *Data Envelopment Analysis in the Financial Services Industry, International Series in Operations Research & Management Science*, 266. Springer, Cham, doi: 10.1007/978-3-319-69725-3_1
- Singer, S., and Oberman Peterka, S. (2012) 'Triple Helix Evaluation: How to Test a New Concept with Old Indicators?', *Ekonomski pregled*, 63(11), pp. 608-626.
- Tarnawska, K., and Mavroeidis, V. (2015) 'Efficiency of the knowledge triangle policy in the EU member states: DEA approach', *Triple Helix*, 2(17), doi:10.1186/s40604-015-0028-z.
- Xu, H.-Y., Zeng, R.-Q., Fang, S., Yue, Z.-H., and Han, Z.-B. (2017) 'Measurement Methods and Application Research of Triple Helix Model in Collaborative Innovation Management', *Qualitative and Quantitative Methods in Libraries*, 4(2), pp. 463-482.
-

Beyond Sight: Eyeing Universities through glasses of triple helix models and innovation ecosystems: An exploratory systematic literature review

Ibtissam Slimani (Abdelmalek Essaâdi University), Mostafa Abakouy (Abdelmalek Essaâdi University).

Type: Original research.

Whilst the roller coaster of regional and national development' means proved to be of appealing matter worldwide, we got ourselves tickets to a themed amusement ride labeled universities in the era of innovation models. The aim was to bridge our way towards understanding the mechanism behind regional innovation' achievements. This paper is the first step we are taking towards a familiarization with the stand of universities on the innovation models' map. On our ride, we stumbled upon triple helix models and innovation ecosystems. It is now safe to ambition a better comprehension of a university positioning among the aforementioned models, based on both a bibliometric and a content analysis. Allow us now to share our literature-sightseeing adventure with you by presenting the paper's purpose, design, findings and limitations.

Purpose

In this exploratory systematic literature review, we aim to understand the weight and position given to universities in triple helix models and innovation ecosystems. To do so, we had to attempt a rather first apprehension of the two models based on a chosen handful of scientific production within the field. A systematic literature review allowed us to structure and give bone to the paper's purpose. In that sense, we organized our research around the idea of scientifically bringing an answer to one question: *“what roles could a triple helix model and an innovation ecosystem attribute to a university?”*

The paper ambitions to provide a comparison between the two models by zooming in on some facades of similarities and differences.

Design/Methodology/Approach

First, we worked on figuring out the combination of research strings that could allow retrieving close to exhaustive results. Then, using both Scopus and Web of Science databases, we applied our search strings within titles and abstracts of millions of possible publications

about universities, triple helix models and innovation ecosystems. We, therefore, applied multiple-phased scanning on the results list and proceeded to narrowing the specimen of articles in order to commence both bibliometric and content analysis on a predetermined sample. Final results of the led analysis were obtained after scanning, reading, detailing and coding the input-publications using tools such as Zotero for bibliographic references management and Nvivo 10 for content' analysis.

The results helped us overview tendencies of scientific publications around the subject of universities, triple helix and innovation ecosystems' models.

Findings

In this paper, we concluded, through eyes of decades of theorization, the primordial role attributed to universities in the framework of both triple helix models and innovation ecosystems.

Using a systematic literature review and covering a sample of articles published between 2000 and 2020, this paper conjugates the concept of university in terms of its linkages to the models of triple helix and innovation ecosystems. Furthermore, the bibliometric analysis shows, amongst other results, a continuous interest from the scientific community in the subject of liaisons with universities. It is at this level of the research that we focused on a literature overview resuming definitions, basics and critics of university-industry-government collaborations, universities and innovation ecosystems.

In the light of the paper's aim and findings, we intend to investigate even further the role of the university and the applicability of a triple helix model within the territory of northern Africa, specifically in Morocco.

Limitations

Some limitations to our work do exist. We admit that more refined inclusion and exclusion criteria, when it comes to choosing the sample of study, could have led to more findings.

Keywords: Triple helix– innovation ecosystem – university – systematic literature review.

Knowledge creation, appropriation and diffusion: a framework for quadruple helix linkages

Marcelo Amaral, D.Sc. (marceloamaral@id.uff.br), Triple Helix Research Group Brazil, Fluminense Federal University, Rua Desembargador Ellis Hermydio Figueira, 783, building B, room 105, 27213-145, Volta Redonda, Brazil

Type: Original research

Purpose

This research aims to propose/present a framework to analyze the relationship between the university, industry, government, and society actors. In general, the literature and case studies focuses on traditional metrics, like patents and licensing agreements, based on formal relations (Ivanova & Leydesdorf, 2014). However, in the case of Brazil, a late industrialized country combined with a late implemented National Innovation System (Suzigan & Albuquerque, 2011), the industry and NIS are not connected, and the traditional metrics fail to capture the university-industry-government-society linkages. On the other hand, several informal relations/connections/networks are established. As a result of the literature review and applied studies in several Brazilian organizations (Rapchan, 2019, Minero, 2019, Hora, 2019, Oliveira, 2019, Amaral, 2015), a complete framework is being proposed.

Design/Methodology/Approach

This work is an applied research project with mixed methods approaches. Four steps were performed to achieve the research goal. First, the literature review was done using bibliometrics analysis techniques on papers selected at indexed journal databases. The second step was the collection and document review from the seventeen cases studied in Brazilian universities, federal education institutes, techparks, and companies. The third stage was the analysis and discussion of the material collected. The fourth and last step was the development of the framework proposed.

Findings

The main finding of the research is the relevance of informal and personal relations in the university-industry-society interactions. These relations are organized in a proposed framework. Oliveira (2019) revisited the seminal work by Bonaccorsi e Piccalunga (1994), reinterpretations, like Noveli and Segatto (2012), and complementary ideas and concepts, like

Lester (2005), Etzkowitz (2004; 2016), and Enkel, Gassmann & Chesbrough (2009). All of these approaches are used in the context of the Brazilian SNI framework (Law of Innovation, Law of Good, Legal Framework of S&T&I, among others).

The main categories are the type of interaction (formal and informal; external and internal) and the objective of interaction (knowledge creation, appropriation, or diffusion). Fifty-two interaction activities were identified (17 in knowledge creation, 7 in knowledge appropriation, and 28 in knowledge diffusion). Some examples below from university to the industry and society:

- Informal and external relations to generate knowledge: research or outreach project without funding agreement or contract (ex: donation of material); monographs, dissertations, and thesis;
- Formal and external relations to generate knowledge: calls for collaborative research/outreach projects with internal/budget resources; grants and agreements to support graduate programs; R&D contracted project, including use of labs and equipment; collaborative R&D projects;
- Formal and internal relations to appropriate K: internal Innovation policy integrated to the general strategic planning; formalization of a TTO or Innovation Agency or similar with specialized team and budget;
- Formal and external relations to disseminate knowledge (based on intellectual capital and know-how): training of companies employees (in-company courses); short-term visits “sandwiches” and visiting fellowship based on agreements; orientation/advice from industry supporting nucleus; essays and lab services; outreach activities; licensing of social and/or open technologies
- Formal and external relations do disseminate knowledge (based on Industrial Property Rights); catalogs of IPRs; licensing agreement with or without fees

Limitations/implications

The study has limitations related to the case studies selected and the Brazilian context. The study of other Brazilian and international organizations and its university-industry-society linkage experiences is essential to validate the framework.

Practical and/or Social Implications

The framework proposed is relevant to support several actions. To the academy, it is essential to map and manage the relations correctly from university with industry and other social actors. It is relevant also to draw a strategy to deliver knowledge to society and how to obtain resources from these interactions; beyond to adapt the structure to perform these actions in the way to turn itself into an entrepreneurial university. To the policymakers, it is relevant to design regulations, policies, and funding support. To the civil society actors, it is essential to rethink the relations with the university. To the country, the implication is a better comprehension of how knowledge transfer occurs.

Originality/Value

The work is an advancement in the discussion of knowledge/technology transfer. It has the potential to support several other researchers, policies, and cultural change.

Keywords: knowledge creators; knowledge users, triple helix; quadruple helix; knowledge transfer; technology transfer; economic development.

References

- Amaral, M. (2015). Management and assessment of innovation environments. *Triple Helix Journal*, 2:19. DOI:10.1186/s40604-015-0030-5
- Bonaccorsi, A. & Piccaluga, A. (1994). A theoretical framework for the evaluation of university-industry relationships. *R&D Management*, 24(3):229-247.
- Enkel, E.; Gassmann, O. & Chesbrough, H. (2009). Open R&D and open innovation: exploring the phenomenon. *R&D Management*, 39(4):311-316.
- Etzkowitz, H. (2004). The evolution of the entrepreneurial university. *International Journal of Technology and Globalisation*, 1(1):64-77.
- Etzkowitz, H. (2016). The entrepreneurial university: vision and metrics. *Industry and Higher Education*, 30(2):83-97.
- Hora, A. (2019). Avaliação da Gestão de Ambientes de Inovação: Aplicação do Amaral's model for innovation environment management (AMIEM) em Parques Tecnológicos do Estado do Rio de Janeiro. Master dissertation. Fluminense Federal University. 215 pages.

Ivanova, I. & Leydesdorff, L. (2014). A simulation model of the Triple Helix of university–industry–government relations and the decomposition of the redundancy. *Scientometrics*, 99(3):927-948.

Lester, R. (2005). Universities, innovation, and the competitiveness of local economies: a summary report from the Local Innovation Systems Project. MIT Industrial Performance Center. Cambridge, working paper 05-010.

Minero, A. (2019). Hélice Quádrupla e Quíntupla e Seus Relacionamentos em Parques Científicos e Tecnológicos Consolidados No Brasil. Doctoral Thesis. Federal University of Lavras. 173 pages.

Noveli, M. & Segatto, A. (2012). Processo de cooperação universidade-empresa para a inovação tecnológica em um parque tecnológico: evidências empíricas e proposição de um modelo conceitual. *RAI Revista de Administração e Inovação*, 9(1):81-105.

Oliveira, J. (2019). Um Instituto Federal Como Universidade Empreendedora: Um estudo sobre a maturidade nas interações universidade-empresa-governo-sociedade-sustentabilidade. Master dissertation. Fluminense Federal University. 171 pages.

Rapchan, F. (2019). Núcleos de Inovação Tecnológica e Polos da Empresa Brasileira de Pesquisa e Inovação Industrial em Institutos Federais de Educação, Ciência e Tecnologia: Um Estudo de Casos Seleccionados na Segunda Década do Século XXI. Doctoral Thesis. National Institute of Industrial Property. 220 pages.

Suzigan, W. & Albuquerque, E. (2011). A interação universidades e empresas em perspectiva histórica no Brasil. In: *Em busca da inovação: Interação universidade-empresa no Brasil*. Belo Horizonte: Autêntica, pp. 17-43.

[Latourian Actor-Network Theory Approach to Studying the Imageries about the Relations of Research, Practice and Policymaking and the Impact and Relevance of Research](#)

Sini Teräsahde, PhD researcher, Faculty of Education and Culture, Tampere University,
Finalnd, sini.terasahde@tuni.fi

Type: original research

Purpose

The main research question of the PhD thesis research is: What is the applicability and value of Bruno Latour's Actor-Network Theory (ANT) as an approach to studying the relations of the research, practice and policymaking in adult education?

The research relates to the background of the changing science and higher education policies with regard to the issues of the so-called third mission of the universities and the societal impact of the research, the steering tools for implementing these policies and actors' reflections on the discipline-specific meanings of these policies. Policies also change the imageries of science portrayed, for example, as *top science*, *innovation science*, *evidence science*, *professional science* and *public science* (Kunelius, Alastalo, Muhonen 2014).

Design/Methodology/Approach

Methodologically, ANT is applied in the research by selecting some key concepts, like the *black box*, *mediator*, *translation* and *the diffusion model* and *translation model*, used by Bruno Latour (e.g. 1984, 1987), that direct the analysis of a) the previous research literature and b) the empirical data.

In the previous educational research literature, the relations of the research, practice and policymaking are theorized as triangle models (Usher & Bryant 1989, Hargreaves 1999, Lassnigg 2012). The ANT approach points out the lack of understanding of the role and necessity of mediators and translations in the relations between the actor groups.

The empirical data including key person interviews, group discussions and questionnaire answers provide a sample about researchers', practitioners' and policymakers' conceptions and experiences about the relations of actors as well as the interest and ideas how to improve the relations and the utilization of research in the policymaking and practice. These issues are analysed as *mediated* and *translated* communication between more or less *blackboxed* actors.

Findings or expected outcomes

As a result of the findings of the analysis of the previous research literature and empirical data, new theoretical triangle models about the relations of research, practice and policymaking as well as about the processual construction of the relevance of research are to be presented. New ANT-inspired models will acknowledge and illustrate, especially,

mediators and *translation* in the relations between actors. Models hope to contribute also to the research discussion about the theoretical understanding and methodological approaches to the Triple and Quadruple Helix relations of actors.

Limitations/implications

The research focuses on the Quadruple Helix type of relations of actors with limited view on the industry as an actor.

Practical and/or Social Implications

The research provides views how to improve the relations of actors by paying attention to the structures and processes of communication.

Originality/Value

The research is a type of basic research about the philosophy of the relations of the actors of the research, practice and policymaking.

Keywords: Actor-network theory, research-practice-policy relations, imageries, mediator, translation

References

- Alastalo, M., Kunelius, R., & Muhonen, R. (2014). Evidenssiä eliitille ja kansainvälistä huipputiedettä? Tutkimuksen vaikuttavuuden mielikuvastot tiedepolitiikan resursseina. In R. Muhonen & H-M. Puuska (Eds.) *Tutkimuksen kansallinen tehtävä*, 119–149. Tampere: Vastapaino.
- Hargreaves, D. H. (1999). Revitalising educational research: lessons from the past and proposals for the future. *Cambridge Journal of Education* 29 (2), 239–249.
- Lassnigg, L. (2012). ‘Use of current best evidence’: Promises and illusions, limitations and contradictions in the triangle of research, policy and practice. *International journal of training research* 10 (3), 179–203.
- Latour, B. (1984). The powers of association. In J. Law (Ed.) *The Sociological Review Monograph* 32, Power, Action and Belief. A New Sociology of Knowledge? London: Routledge & Kegan Paul, pp. 264–280.
- Latour, B. (1987). *Science in action. How to follow scientist and engineers through society*. Cambridge: Harvard University Press.

Usher, R. & Bryant, I. (1989). *Adult education as theory, practice and research: Captive triangle*. London: Routledge.

To compete or to cooperate? A case study of innovation and creativity labs in Berlin

Daniel Feser, University of Goettingen

Short abstract

Innovation and creativity labs can provide a support structure to regional innovation at the overlap of university-government-industry interaction. In a growing body of literature the involved parties are illustrated as the interlacing strands of a triple helix structure.

Nevertheless, internal insights are still scarce to understand intermediaries' organizational strategy. Based on a qualitative sample from Berlin-based innovation and creativity labs, this paper shows that the market position of intermediaries in innovation partnerships is influenced by the choice to cooperate, compete or coopete. With a growing number of intermediary participants coordination of public policy activities becomes more important.

Key Words: Triple Helix, Coopetition, Intermediaries, Innovation

Extended abstract

Motivation

For more than 20 years, the rediscovery of regional studies to explain differences in innovativeness levels resulted in an endless number of peer-reviewed articles. The analysis of triple helix structures is the basis for understanding the knowledge economy (Etzkowitz and Leydesdorff, 2000; Leydesdorff, 2009; Leydesdorff and Etzkowitz, 1998). New knowledge creation, knowledge transfer and knowledge recombination have highlighted the role of central actors from universities (Steinmo and Rasmussen, 2018), government (Lee et al., 2017) and industry (Johnston and Huggins, 2016). The upcoming open innovation framework (Chesbrough, 2003; Huizingh, 2011) supported the need for in-depth analysis of networks and intermediaries supporting new services, products and business models.

Network structures have been identified as key driver to enhance innovative capacity to foster knowledge transfer on regional, national and international level (Albahari et al., 2013; Binz et al., 2014; Chaminade and Vang, 2008). Since the beginning of analysis on triple helix ecosystems, the role of intermediaries drew attention evaluating their role in the innovation processes (Agogu   et al., 2013; Howells, 2006). Intermediaries can support innovation due to improving interaction with stakeholders in the triple helix ecosystem (Agogu   et al., 2013; De Silva et al., 2018; Howells, 2006). Research focused in particular on the positive effects occurring when clients benefit from the transfer of innovative knowledge by the intermediaries (Johnston and Huggins, 2016; Shearmur and Doloreux, 2013). Public policy consistently concentrated on supporting intermediary structures (Agogu   et al., 2013; Arenas and Gonz  lez, 2018).

Compared to direct university-industry-government interaction (Benneworth et al., 2017; Ranga et al., 2008), the strategic dimension of intermediaries has been neglected and they have often been solely seen as transmitter of knowledge. While the effects on business, research institutions and administrative actors have been analyzed thoroughly, the internal innovation process of intermediaries have just recently started to be recognized and is in the beginning of the research (De Silva et al., 2018). Despite of acknowledging openness as key strategic element to foster innovative capacity, only few papers presented empirical evidence regarding internal perspectives of intermediaries (De Silva et al., 2018; Krenz et al., 2014). The observed „lack of the interaction between value generation for both the clients of intermediaries and intermediaries“ (De Silva et al., 2018) shows the need for add research to the triple helix literature. Openness has been assumed as key to understand the perspective of intermediaries (Kerry and Danson, 2016). Nevertheless, empirical evidence on intermediaries' strategy is needed to understand the mechanisms in triple helix structures. Therefore, in this study, their perspective is analyzed to understand how strategic considerations impact triple helix structure and which role coordination plays in inter-intermediary interaction.

Case and research methodology

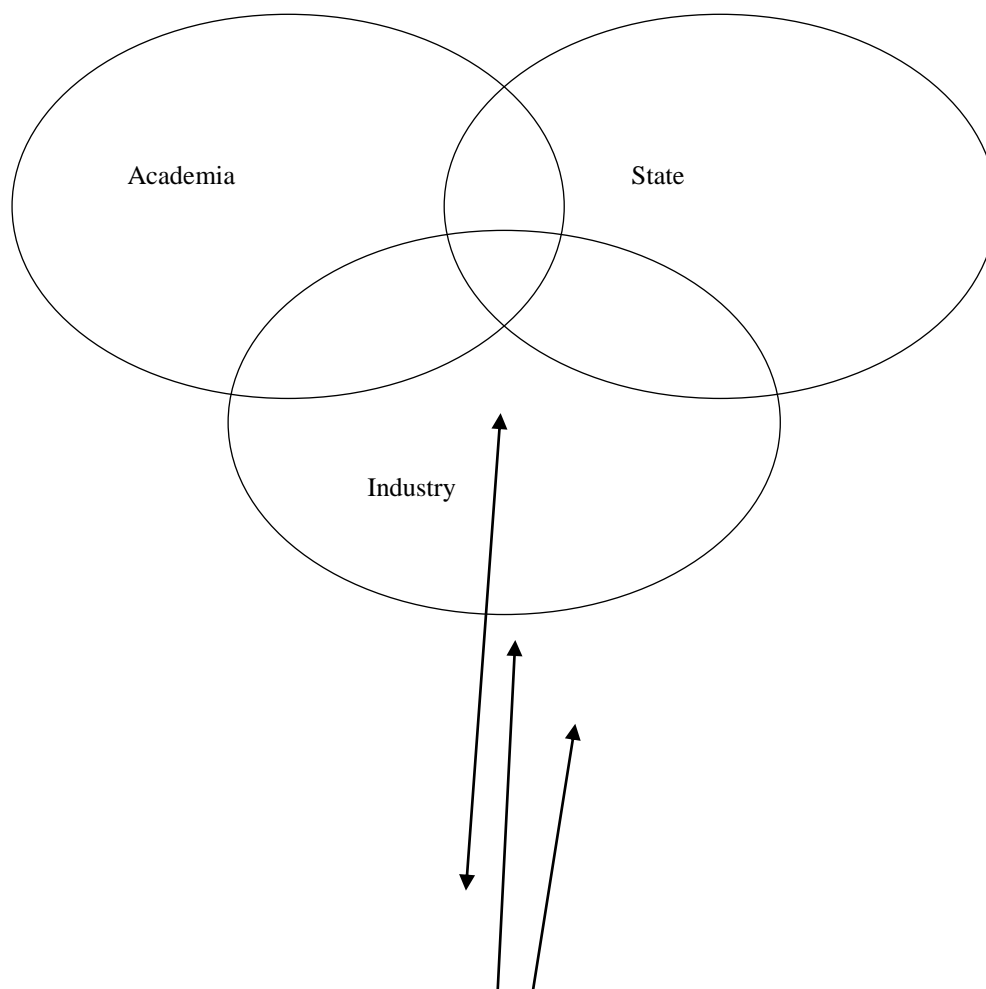
Since the beginning of the 2000s a dynamic development in Berlin can be observed, driven by digital entrepreneurship and a growing ICT-sector. In particular, small and medium-sized companies contribute to regional innovation activities and cooperate with a high share to innovate (Feser, 2019). Especially a growing number of start-ups, internationally recognized

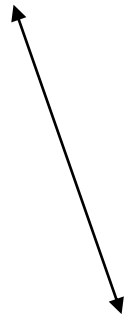
research institutions and national administrations contributed to a transitioned triple helix ecosystem (Fischer, 2011). In the recent years, the city council of Berlin recognized that the number of innovation and creativity labs in Berlin has almost tripled between 2014 and 2018 (Berlin City Council, 2018; Schmidt et al., 2014). Innovation and creativity labs have been defined as places for collaborative innovation at the overlap between research, administration as well as industry and constitute places for open innovation and support regional helix actors at the commercialisation of new products, services and business models (Schmidt et al., 2014).

This study is based on a project about the current situation of Berlin-based innovation and creativity labs and growth-induced changes in the ecosystem. For the case study an inductive approach with qualitative content analysis (Mayring, 2000) was used to present exploratory insights. On the basis of a case study methodology (Eisenhardt and Graebner, 2007) I conducted 18 semi-structured interviews with experts from innovation and creativity labs to explain activities in innovation and creativity labs, barrier for regional innovation and recommendations. The results were consequently triangulated in a stakeholder group discussion.

Results and discussion

Figure 1





Intermediary organization:

- Competition

This paper studies the strategic perspective of intermediaries in triple helix systems. The increased number of innovation and creativity labs in Berlin has led to more heterogeneous services in the last years. Private, public-private and public actors implemented labs for the purpose of offering specialized services. Consequently, reacting to an increased competition in the Berlin entrepreneurial ecosystem, innovation and creativity labs use lab programmes to cooperate with competitors. The triple helix perspective helps to foster knowledge exchange between stakeholders offering entrepreneurship education that can impact the sustainable development of the ecosystem. In particular the coopetition mode of actors offering entrepreneurship education impacts the knowledge transfer. Despite the broader variety of educational offers, systemic support regarding transparency and openness is perceived as valuable contribution by the experts.

The study revises the discussion of the intermediaries' role in regional helix ecosystems in three different ways. First, the case study connects the literature strands between innovation and creativity labs and triple helix focusing on the inter-organizational collaboration mode. This can enhance the understanding of dynamics of regional innovativeness. Second, the connection between coopetition and innovation has been broadly discussed often with focus on enterprises. Coopetition in intermediary organization can also contribute to the differences of innovativeness between triple helix ecosystems. Third, the public policy perspective can benefit to understand that coopetition can foster innovativeness while improving knowledge

transfer. Nevertheless, a risk via knowledge leakages, misuse of knowledge requiring measures by intermediaries can especially in the case of growing number of intermediaries lead to a higher uncertainty.

Acknowledgments

Financial support by the Projekt Zukunft of the Senatsverwaltung für Wirtschaft, Energie und Betriebe and Technologiestiftung Berlin is gratefully acknowledged.

Bibliography

Agogué, M., Yström, A., Le Masson, P., 2013. Rethinking the role of intermediaries as an architect of collective exploration and creation of knowledge in open innovation.

International Journal of Innovation Management 17, 1350007.

<https://doi.org/10.1142/S1363919613500072>

Albahari, A., Catalano, G., Landoni, P., 2013. Evaluation of national science park systems: a theoretical framework and its application to the Italian and Spanish systems. Technology Analysis & Strategic Management 25, 599–614.

<https://doi.org/10.1080/09537325.2013.785508>

Arenas, J., González, D., 2018. Technology transfer models and elements in the university-industry collaboration. Administrative Sciences 8, 19. <https://doi.org/10.3390/admsci8020019>

Benneworth, P., Pinheiro, R., Karlsen, J., 2017. Strategic agency and institutional change: investigating the role of universities in regional innovation systems (RISs). Regional Studies 51, 235–248. <https://doi.org/10.1080/00343404.2016.1215599>

Berlin City Council, 2018. List of innovation labs in Berlin [WWW Document]. URL https://projektzukunft.berlin.de/fileadmin/user_upload/pdf/Liste_Labs/PZ_Inno_Labs_Stand_April19.pdf (accessed 5.5.19).

Binz, C., Truffer, B., Coenen, L., 2014. Why space matters in technological innovation systems—Mapping global knowledge dynamics of membrane bioreactor technology.

Research Policy 43, 138–155. <https://doi.org/10.1016/j.respol.2013.07.002>

Chaminade, C., Vang, J., 2008. Globalisation of knowledge production and regional innovation policy: Supporting specialized hubs in the Bangalore software industry. Research Policy 37, 1684–1696. <https://doi.org/10.1016/j.respol.2008.08.014>

Chesbrough, H.W., 2003. Open innovation: the new imperative for creating and profiting from technology. Harvard Business School Press, Boston, Mass.

De Silva, M., Howells, J., Meyer, M., 2018. Innovation intermediaries and collaboration: Knowledge-based practices and internal value creation. *Research Policy* 47, 70–87.
<https://doi.org/10.1016/j.respol.2017.09.011>

Eisenhardt, K.M., Graebner, M.E., 2007. Theory building from cases: Opportunities and challenges. *AMJ* 50, 25–32. <https://doi.org/10.5465/amj.2007.24160888>

Etzkowitz, H., Leydesdorff, L., 2000. The dynamics of innovation: from National Systems and “Mode 2” to a Triple Helix of university–industry–government relations. *Research Policy* 29, 109–123. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)

Feser, D., 2019. Innovationserhebung Berlin 2018. Innovationsverhalten der Berliner Wirtschaft. Technologiestiftung, Berlin.

Fischer, T., 2011. Regional Innovation Report (Berlin). To the European Commission Enterprise and Industry Directorate-General Directorate D –Industrial Innovation and Mobility Industries. technopolis; Maastricht University; Fraunhofer ISI, Brussels.

Howells, J., 2006. Intermediation and the role of intermediaries in innovation. *Research Policy* 35, 715–728. <https://doi.org/10.1016/j.respol.2006.03.005>

Huizingh, E.K.R.E., 2011. Open innovation: State of the art and future perspectives. *Technovation* 31, 2–9. <https://doi.org/10.1016/j.technovation.2010.10.002>

Johnston, A., Huggins, R., 2016. Drivers of university–industry links: The case of knowledge-intensive business service firms in rural locations. *Regional Studies* 50, 1330–1345. <https://doi.org/10.1080/00343404.2015.1009028>

Kerry, C., Danson, M., 2016. Open Innovation, Triple Helix and Regional Innovation Systems: Exploring CATAPULT Centres in the UK. *Industry and Higher Education* 30, 67–78. <https://doi.org/10.5367/ihe.2016.0292>

Krenz, P., Basmer, S., Buxbaum-Conradi, S., Redlich, T., Wulfsberg, J.-P., 2014. Knowledge Management in Value Creation Networks: Establishing a New Business Model through the Role of a Knowledge-Intermediary. *Procedia CIRP* 16, 38–43.
<https://doi.org/10.1016/j.procir.2014.01.006>

- Lee, S.Y., Noh, M., Seul, J.Y., 2017. Government-led regional innovation: a case of “Pangyo” IT cluster of South Korea.” *European Planning Studies* 25, 848–866.
<https://doi.org/10.1080/09654313.2017.1282084>
- Leydesdorff, L., 2009. The triple helix model and the study of knowledge based innovation systems. arXiv:0911.4291 [physics].
- Leydesdorff, L., Etzkowitz, H., 1998. The Triple Helix as a model for innovation studies. *Sci Public Policy* 25, 195–203. <https://doi.org/10.1093/spp/25.3.195>
- Mayring, P., 2000. Qualitative content analysis. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research* 1.
- Ranga, L.M., Miedema, J., Jorna, R., 2008. Enhancing the innovative capacity of small firms through triple helix interactions: challenges and opportunities. *Technology Analysis & Strategic Management* 20, 697–716. <https://doi.org/10.1080/09537320802426408>
- Schmidt, S., Brinks, V., Brinkhoff, S., 2014. Innovation and creativity labs in Berlin Organizing temporary spatial configurations for innovations. *Zeitschrift Fur Wirtschaftsgeographie* 58, 232–247.
- Shearmur, R., Doloreux, D., 2013. Innovation and knowledge-intensive business service: the contribution of knowledge-intensive business service to innovation in manufacturing establishments. *Economics of Innovation and New Technology* 22, 751–774.
<https://doi.org/10.1080/10438599.2013.786581>
- Steinmo, M., Rasmussen, E., 2018. The interplay of cognitive and relational social capital dimensions in university-industry collaboration: Overcoming the experience barrier. *Research Policy* 47, 1964–1974. <https://doi.org/10.1016/j.respol.2018.07.004>
-

Shaping a new industrial strategy through a place-based approach: the case of the European Union

Dr Dimitri Corpakis, former senior EU official, SEERC Senior Research Fellow

Type: Research Design

Purpose/ Design/Methodology/Approach / Findings or expected outcomes / Limitations/implications / Practical and/or Social Implications / Originality/Value

One of the main political priorities of the new European Commission for the period up to 2024 is to relaunch the European economy through a European Green Deal. The recently unveiled strategy by the new President Ursula Von der Leyen, aims at achieving a thriving economy that would be free from carbon emissions by 2050, while being competitive at the world stage and ensuring a fair treatment for all Europeans (an economy that works for all).

To ensure that the European economy is not only green but also competitive, the EU is determined to address the future of its industry. Caught between the challenges of a new multipolar world, Europe's firms struggle to remain relevant, productive and properly embedded in the global value chains of which they are an integral part. Powerful disruptive trends dominating in the world economy are currently shaking the fundamentals of previously successful industrial and services sectors, putting into question the very existence of entire sectors. Digitalisation under the form of the latest emanations of artificial intelligence, the gradual spreading of the Internet of Things (IoT), the ever increasing electronic commerce, robotics and the arrival of big data and its underlying technologies, play an increasingly transformative role, changing the nature and the form of delivery of every single form of business in the context of the so-called 4th industrial revolution. Global climate change and the imperative of decarbonisation impose new challenges to businesses and especially to manufacturing firms that will have to completely re-design and adapt their operations at all levels. Thus the imperative of a genuine new industrial strategy is almost self-explanatory. The question then focuses on its design, set-up and delivery.

Past industrial policies have all assumed that by adopting a number of specific, interrelated and interconnected headline goals would achieve the expected results, through a vast mobilisation of stakeholders. Efforts have been largely sectorial, mobilising the best minds in industry and science and capitalising on a small number of champions that would seemingly

drive the industrial ecosystem forward, without properly knowing how this would ever happen. Efforts also have been largely location-blind, meaning that they did not systematically taken into account the particular characteristics of the places the industries targeted were located. Places are however important, since they retain particular characteristics of the innovation ecosystems they host and they have strong influence on these by way of geography, economy and society. Ignoring the location factors and what was behind the development, thriving or systemic failure of the industrial sectors involved, could only lead to missed efforts and opportunities. In some cases, historical conjunctures have made so that the particular factors in place were positive enough to combine scientific and industrial potential with successful and imaginative place-based innovation strategies and such cases led to great successes. However policy makers should not leave success only to serendipity and plan with full conscience, taking into account the imperatives of science and technology coupled with the dynamics of place.

This paper would argue that a new European Industrial Strategy would need to combine a strong *research and innovation policy* geared to the challenges of tomorrow (Green growth, sustainability, digitalisation, and inclusiveness) with an equally strong *place-based innovation policy* that would make sure the appropriate local innovation ecosystems are mobilised to the their full potential.

The EU is lucky enough to have already in place much of the pre-conditions needed for this purpose: a total of more than 120 Smart Specialisation Strategies, drawn in the context of the current programming period are in place and financially supported by the European Regional Development Fund (ERDF). Thematic Smart Specialisation Platforms focusing on a number of Industrial sectors are also in place. However the process has to exponentially enlarge and encompass a much wider range of players that currently are left outside the realm of Smart Specialisation actions. A real mainstreaming of Smart Specialisation strategies geared to the entrepreneurial discovery process (mobilising local and national and even cross-border stakeholders) will give the opportunity to more holistic approaches for industrial strategies that can find a new directionality and a new efficiency. Targeting the European value chains that either exist or can be created, would be the ultimate objective of such an effort. The effective combination of dynamic repositioning of industrial players following their real innovation ecosystems, will determine the embeddedness of these efforts and ultimately the efficiency of the policy. A place-based approach is then necessary for a new efficient and inclusive European Industrial Strategy.

Keywords: Regional Innovation Ecosystems, Industrial Strategy, Place-based innovation policy, Smart Specialisation, European Union

References

Barca, F. (2009): An agenda for a reformed cohesion policy. A place-based approach to meeting European Union challenges and expectations. Brussels: European Commission

Boschma, Ron, Asier Minondo, and Mikel Navarro (2011), The emergence of new industries at the regional level in Spain. A proximity approach based on product-relatedness

Castells M. (Ed.) (1985) *High Technology, Space and Society*. Sage Urban Affairs Annual Review No. 28, Berkeley, CA

Clar, G., (2018) Guiding investments in place-based development. Priority setting in regional innovation strategies, Seville: European Commission, JRC112689

Crescenzi, Riccardo, Andres Rodríguez-Pose (2011), Reconciling top-down and bottom-up development policies, *Environment and planning A*, Vol. 43, pp. 773-780.

Crescenzi, Riccardo (2009), Undermining the principle of territorial concentration? EU regional policy and the socio-economic disadvantage of European regions, *Regional Studies*, Vol. 43(1), pp. 111-133

Delgado, Mercedes, Michael E. Porter, and Scott Stern (2013), *Defining Clusters of Related Industries*, mimeo. Institute for Strategy and Competitiveness, Harvard Business School.

Detterbeck, K. (2018) Framework Document (based on existing EDP Analyses and Regions' Experiences), Beyond EDP, Interreg Europe

Dorfmann N. (1983) Route 128: the development of a regional high technology economy, *Res. Policy* 12, 299-316.

Edwards, J., Pertoldi, M. & Morgan, K. (2016): Good governance: principles and challenges, in: Gianelle, C., Kyriakou, D., Cohen, C. & Prezor, M. (Eds.): *Implementing smart specialisation. A handbook*. Brussels: European Commission,

Enabling synergies between European Structural and Investment Funds, Horizon 2020 and other research, innovation and competitiveness-related Union programmes, Guidance for policy-makers and implementing bodies, (2014), European Commission

EPRS, European Parliamentary Research Service, PE 565.873, Briefing, “How the EU Budget is spent”, July 2015

EPRS, European Parliamentary Research Service, PE 589.813, “Smart Specialisation: The concept and its application to EU Cohesion Policy”, October, 2016

European Commission, (2016) “EU Funds working together for jobs and growth *Examples of synergies between the Framework Programmes for Research and Innovation (Horizon 2020) and the European Structural and Investment Funds (ESIF)*”

Foray, D. (2014): Smart specialisation. Opportunities and challenges for regional innovation policy. London: Routledge.

Foray, D. & van Ark, B. (2007): Smart specialisation in a truly integrated research area is key to attracting more R & D to Europe. Knowledge Economist Policy Brief No. 1

Foray, D., David, P. & Hall, B. (2009): Smart specialisation – the concept. Knowledge Economist Policy Brief No. 9

Foray, D., David, P. & Hall, B. (2011): Smart specialization: from academic idea to political instrument, the surprising career of a concept and the difficulties involved in its implementation. MTEI Working Paper, 2001-001. Lausanne: Management of Technology & Entrepreneurship Institute.

Foray, D. & Goenaga, X. (2013): The goals of smart specialisation. S3 Policy Brief Series No. 01/2013. Luxembourg: Publications Office of the European Union.

Foray, D. & Rainoldi, A. (2013): Smart specialisation programmes and implementation. S3 Policy Brief Series No. 2/2013. Luxembourg: Publications Office of the European Union.

Guidance on Ex-Ante Conditionalities, PART II (2013), European Commission, DG Regional Policy

Interim Evaluation of Horizon 2020, (2017), *Commission staff working document*

Lindqvist, Göran, Christian Ketels, and Örjan Sölvell (2003), The Cluster Initiative Greenbook, Stockholm

McCann, P. & Ortega-Argilés, R. (2015): Smart specialisation, regional growth and applications to EU cohesion policy. Regional Studies, Vol. 49 (8), 1291-1302

Oakey R. (1984) High Technology Small Firms: Innovation and Regional Development in Britain and the United States. St Martin's, New York

Senker J. (1985) Small high technology firms: some regional implications, Technovation 3, 243-62

OECD (2013): Innovation-driven growth in regions: the role of smart specialisation. Paris: Organisation for Economic Co-Operation and Development.

U.S. NSF IUCRC Program Redesigned: Multi-Level Evaluation Questions about Outcomes and Impacts

Eric Sundstrom, University of Tennessee

Lindsey McGowen and Denis O. Gray, North Carolina State University

Type: Practical experience analysis

Purpose

Among the longest-lasting exemplars of government-university-industry cooperation encompassed by Triple Helix (Etzkowitz, 2008) – the U.S. NSF (National Science Foundation) IUCRC (Industry-University Cooperative Research Centers) Program – initiated a major re-design in 2016. The redesign raises evaluation questions at several levels for the NSF IUCRC Program, and for Triple Helix research more broadly.

This paper has a three-part purpose, to: 1) overview the IUCRC Program and its evaluation; 2) identify key redesign changes in 2016-18; and 3) frame evaluation questions about their outcomes and impacts.

Overview of the IUCRC Program & Evaluation Database

The NSF IUCRC program – designed to "develop long-term partnerships among industry, academe and government" – has an annual budget of ~\$18M, four program directors, and one staff associate. It offers annual seed-grants to cooperative research Centers, renewable up to 15 years, for pre-commercial, industry-funded research. In a franchising arrangement, an

average IUCRC operates at 2.9 university sites, with 17 member organizations, which pay average annual dues of \$47K to support the research, for total member funding of \$645K per Center (McGowen, Leonchuk & Stoica 2019). The program solicitation defines governance and membership requirements, including Center semi-annual meetings of member representatives (reps), faculty scientists, graduate students, and Center evaluator (Gray, 2008). Since 1986 the program's evaluation unit at North Carolina State University (NCSSU) has built an IUCRC multi-source database, with annual reports of Center structural information; evaluator reports; and surveys of member reps, faculty, and students (McGowen & Leonchuk, 2019).

The Program today has **71** active IUCRCs, operating at 182 university sites, involving 810 research scientists, with 1,787 graduate students, and funding from 1,164 memberships by private-sector ("industry") and government organizations, totaling \$45M in annual member funding, with total average Center budget of \$1.2M.

A major policy report judged the program highly successful (Atkinson & Mayo, 2010), but it may be paying a price for success. Contrary to Atkinson and Mayo's suggestion that IUCRC program funding be quintupled, and notwithstanding the fact that from 2010 to 2015 the program expanded from 42 to 73 centers (McGowen et al., 2019), program budget and staffing have not kept pace with growth.

Program Redesign 2016-18

NSF issued new solicitations in 2016 (16-504) and 2017 (17-516) making significant changes, apparently intended to streamline NSF administration, tighten program requirements, incentivize center growth, and increase management control. Changes were made to Center funding rules and levels, roles of Program Director, Center Director, and Center Evaluator, and a contractor to manage the evaluators. Changes in the solicitation have been accompanied by changes in Program Directors.

The role of PD was streamlined by: 1) reducing travel – from having a PD at many Center meetings to limiting PD visits to planning / launch meetings, onboarding new PDs, and problems; 2) having 20+ evaluators report to a contractor instead of a PD; and 3) simplifying Center funding by reducing sources of supplemental awards (and review cycles), eliminating extra lead-site funding in favor of co-equal site funding; prohibiting University "cost sharing"; and defining member funding as program income, to be spent in the award period or returned to NSF.

The role of Center Director (CD) changed in two primary ways. The change to co-equal funding, combined with entrepreneurship focused “member discovery” training for new center directors, tightened membership requirements, and increased base award that facilitates greater administrative support shifted the center director role from as technical leadership role (Rivers, 2012) to a more entrepreneurial, recruitment focused role. National, annual CD meetings were discontinued after 2015, and replaced with a meeting every few years

Multi-Level Evaluation Questions about Impacts and Unintended Consequences

While a large and robust literature examines the impacts of new and established triple helix programs, we found little about the impacts and consequences of redesigning established programs with demonstrated effectiveness. Against this background, we propose to address the following:

Center level questions concern changes to the CD role and Center operation.

1. What have been the impacts of program changes on Center coordination across sites, recruitment, membership management, administrative performance, and other Center operations?
2. What impacts have program changes had on CD peer networking and information sharing?
3. What impact have program changes had on Center fidelity to the IUCRC program model?

Program level. A second set of questions concerns outcomes across all 71 current IUCRCs.

1. Since redesign, how if at all, has CD longevity and/or turnover changed?
2. How have program-wide membership, member funding, and member turnover changed?
3. How has funds leveraging changed for NSF, for Centers, and for members?

Organization level. Questions for NSF – beyond the scope of IUCRC evaluation – concern the intended consequences of the redesign:

1. To what extent did redesigning the PD role reduce PD workload?
2. Has the program office operated more efficiently, as reflected by PD response times to IUCRC queries or turnaround times for reviews? These questions can be addressed via variety of quantitative and qualitative methods. First, at the program level, the IUCRC

evaluation program at NCSU has used the same, **basic longitudinal evaluation design** over the life of the IUCRC program: annual tracking of key structural, process, and outcome variables with before-and-after comparisons and sub-group comparisons about variables archived in the database.

While some center-level questions can also be addressed via the basic longitudinal design with tailored comparisons – using new measures and data-collection, others cannot. In this case, we will rely on the observations and judgments of the evaluators who continue to be embedded within each center. This paper details evaluation approaches related to each of the questions posed, and presents some preliminary analyses of available data and informal interviews with Center stakeholders.

References

Atkinson R. & Mayo (2010). *Refueling the U.S. Innovation Economy*. Washington, DC: The Information Technology and Innovation Foundation.

Etzkowitz, H. (2008), *Triple Helix Innovation: Industry, University, and Government in Action*. London: Routledge.

Gray, D. O. (2008). Making team science better: Applying improvement-oriented evaluation principles to the evaluation of cooperative research centers. *New Directions for Evaluation*, 118, 73-87.

McGowen, L. C., Leonchuk, O., & Stoica, A. (2019). *National Science Foundation Industry / University Cooperative Research Centers Program 2017-18 Structural Information*. Raleigh, NC: North Carolina State University.

McGowen, L. C. & Leonchuk, O., (2019). *National Science Foundation Industry / University Cooperative Research Centers Program 2017-2018 Process Outcome Survey Results for Industry and Faculty*. Raleigh, NC: North Carolina State University.

Rivers, D. & Gray, D.O. (2012). *Final Report: Social and Human Capital Impacts of the IUCRC Program on Faculty Directors*. IUCRC Evaluation Project, North Ca

Track 2. Concepts and theories to frame the future of innovation

Chair: Annina Lattu

Bridging Innovation and Entrepreneurial Ecosystems: A Case Study of Linköping City

Adli Abouzeedan, Department of Management and Engineering (IEI), Linköping University, SE- 581 83 Linköping, Sweden, E-mail: adli.abouzeedan55@gmail.com

Magnus Klofsten, Department of Management and Engineering (IEI), Linköping University, SE- 581 83 Linköping, Sweden, E-mail: magnus.klofsten@liu.se

Henry Etzkowitz, International Triple Helix Institute, Palo Alto, USA, E-mail: h.etzko@gmail.com

ABSTRACT

Through the years, researchers proposed models explaining the interaction between basic economic players and connecting that to conditions for regional and national growth. These models were developed within the context of two types of ecosystems: innovation and entrepreneurial. While innovation ecosystem analysis emphasized innovation input, the entrepreneurial ecosystem analysis dealt with the entrepreneurial output. Historically, these ecosystem models were developed separately in each of these two knowledge spheres neglecting the common region among them. In this paper, we addressed this gap by bridging the two approaches and demonstrate why such bridging is important to have a holistic view of regional development and how. In this paper we used Triple Helix Model (or THM) as representative for the innovation ecosystem models and the Remedy Entrepreneurial Model (or EREM) as of the entrepreneurial ecosystem models. Before the Triple Helix approach to understand innovation systems two type of models were proposed, circulated and accepted. The first is the etatistic model where government, industry and academia enclosed in their own spheres with minimum interaction. In such a model the state has the largest inference

and dictating the role of game. The other model is the “Laissez-faire model where the three sectors do have equal impact with some level of connectivity.

We used a new case study method, the Narrative-Textual Case Study (NTCS), to run an analysis of bridging the two types of models in Linköping City, Sweden. NTCS method is very reliant on available information in the public sphere and as thus more exploratory in its nature. The paper is important in establishing a strategy where different models of the innovation eco-systems with conjunction with the entrepreneurial eco-systems do work in parallel to understand the nature of the firm regional environment. This work presents a first attempt to bridge two spheres of ecosystems, innovation and entrepreneurial. It thus addresses an apparent gap in innovation and entrepreneurial research.

Key words

Triple Helix Model, Entrepreneurial Remedy Model, Innovation Ecosystems, Entrepreneurial Ecosystems, Innovation Capital

[Applying an ecosystem approach in constructing futures in Asian cybersecurity context](#)

Jouko Myllyoja, VTT Technical Research Centre of Finland Ltd.

Abstract

Our presentation builds on experiences achieved in workshops for co-creation of the cybersecurity innovation ecosystem held in Asia. Workshops were executed as a part of research project YAKSHA (Cybersecurity Awareness and Knowledge Systemic High-level Application) - funded by the European Commission under the Horizon2020 Programme. The stakeholders convened belonged to YAKSHA's stakeholder target groups: SMEs and large corporations; Critical infrastructure organizations; Government and policy making organizations; Knowledge and research and development organizations; and Associations, network of organizations and other interested parties. Stakeholders identified national needs and gaps related to cybersecurity. They also built visions and action paths to be reached in these countries by 2030. Topics discussed in the workshops related to ideal national ecosystem structure, multi/stakeholder cooperation, governance of ecosystems, technological interdependences, orchestration of actors, challenges, needs and capabilities, etc. The ecosystem was considered here as a network of innovation actors, including government, academia, industry and other types of economic actors, and society at large, aiming at promoting the development of cybersecurity capabilities within a national context and

enabling the resilience and collaboration of the system in the international arena. There, performing of science and research have evolved over the years and emphasise today more collaborative and inclusive forms. In particular, citizens and civil society have an increasingly important role in this process of change not only in priority setting of research and innovation but also in its actual implementation. Simultaneously, emerging novel forms of knowledge production integrate and combine different ways of knowledge production by creating diversity, heterogeneity, and creative and innovative organizational designs (Campbell & Carayannis, 2016; Carayannis & Campbell 2006). The development concerns also policies that should emphasise support to research collaboration across sectors. There, innovation policy researchers have introduced ideas of transformative innovation policy (e.g. Steward 2012), in which different actors should take even more active and experimenting role in solving major societal problems and increasing social impact of research and innovation. In large, our approach composes its theoretical framing on exploration of multiple layers - organisational, sectoral, regional, national and international dimensions of innovation - of ecosystems in foresight design (Pombo-Juárez et al. 2017). In parallel, we have identified key areas of intangibles that capture the nature of different processes showing significance in supporting development of system capabilities. As a result, we present theoretical approach that we call as a capability dynamo. This approach highlights the value of intangibles as an enabling ground for improving innovation capabilities in a multi-level perspective.

The effect of R&D investments on companies' performance in the manufacturing industry

Kseniia Boiko, PhD student, kboiko@hse.ru, Doctoral School of Management, National Research University Higher School of Economics

Abstract

In the global world R&D is at the core of business strategy for companies to maintain their competitive position on the market. Nowadays, R&D activity is becoming linked with firm's growth and profitability. However, little is known about the relationship existing between R&D investments and financial indicators. The understanding of the linkage between R&D

investments and performance is relevant to R&D departments and helps managers to make strategic choices. The goal of the proposed research is to examine the impact of R&D investments on firm's performance by modeling non-linearity in relationships. Observations lead us to suppose that R&D activities should positively correlate with firm's performance. The study deals with the hypothesis that R&D investments increase firm's efficiency. Moreover, the relationships depend both on the firm's size and on the time lag. The empirical analysis is based on a sample of manufacturing companies with R&D activity during the period 2008-2018. Correlation analysis will be used as the main research method. It is expected that our findings will provide guidelines for managers with regard to the implications of strategic decision-making in R&D.

Key words: R&D intensity, performance, strategic decision, time lags, intangible assets

Introduction

In today's business world companies achieve their competitive advantage through different strategies. Firm's functional strategies, such as capital structure, advertising intensity, labor force productivity affect the sustainable competitive capability. Among these strategies research and development (R&D) investment strategy is considered as one of the means to obtain competitive position on the market. The growth of manufacturing companies is mainly based on the development of innovative products and services, thus forcing them to invest in R&D.

Decisions made by management today on investment in R&D can influence the firm's profitability in the future. Successful R&D can create new products and services, which bring positive values to a firm's performance and lead to market growth and profits. For instance, due to high R&D investments and the improvement of manufacturing operations, Japanese high-tech industries are taking a dominant market position (Lee & Shim 1995).

Despite the substantial role of R&D activity, managers may avoid to invest in R&D. Unlike tangible assets, investments in R&D are long-term expenditures, and they have no immediate return. Thus, intangible investments may involve a big risk and have a greater probability of failure than tangible. On the other hand, risky activity provides a company with monopoly power on the market and guarantees its future growth (Zhu & Huang 2012). From this point of view, the understanding the linkage between R&D investments and firm's profitability is a core issue for making a strategic decision.

Yet, little is known about the relationship existing between innovation and firm's performance. The idea that R&D investment is an important source of firm's growth is well established in the theoretical literature (Brenner & Rushton 1989; Morbey & Reithner 1990). However, the question how R&D investment affects firm's performance has not the definite answer. Insights into the relationship between R&D and firm's performance are limited, and the results remain contradictory (Morbey & Reithner 1990; Lee & Shim 1995). Moreover, the previous studies do not take into account that investments in R&D are the investments for the future of a company. It means that they have lagged effects on firm's performance.

The aim of this study is to investigate the impact of R&D investments on a firm's performance and growth within the U.S. and Russian companies. Since innovations are more important in the manufacturing industry, the study focuses on manufacturing companies. We suppose that there is a strong correlation between R&D activity and subsequent firm's profitability and growth. Furthermore, the relationship strongly depends on the industry and the firm size as well as whether R&D investments are considered time lagged. Therefore, the research question can be formulated as follows: "How does R&D activity affect firm's performance?" We will answer this question both for medium- and large-sized firms by considering time lags.

The present study will not approach the issue theoretically but rather from the practical viewpoint of strategic R&D decisions that depend on the firm's size and different time lags. The future research may be limited in the amount of necessary information about R&D expenditures. Annual company reports will provide the main financial indicators for analyzing the linkage between R&D investments and profitability. However, financial results and amount of R&D investments may not be published by companies.

From a policy perspective, the results of the study shade a light on the question of whether R&D activity is linked to gaining a higher profitability. In the study, the optimal R&D decision configurations will be found. Moreover, we will provide guidelines for managers with regard to the implications of strategic decision-making in R&D.

Methodology

Theoretical Background and Hypotheses

The literature review presents insights into the relationship between R&D activity and firm's financial performance. Despite the general growth of interest in this issue, there is a lack of

research about non-linearity in the R&D-profitability relationship. Existing studies mainly focus on definition and measurement of financial performance and R&D activity. As we have mentioned previously, the limited number of studies analyze the linkage between R&D and profitability from the practical view-point.

In order to test our assumptions, we focus the study on manufacturing companies because their activity mainly based on the R&D results. Based on the literature review, we formulate the following hypotheses:

H1: In the manufacturing industry firm`s performance increases with the intensity of R&D investments.

H2: R&D intensity has a moderating effect on firm`s performance.

H3: The relation between R&D intensity and company`s performance demonstrates a non-linear linkage, i.e., there will be a positive and a negative relationship.

Variables

Following previous studies, we use R&D intensity as dependent variable. We calculate the ratio of R&D expenditures to sales as proxy for R&D intensity (RD). Four different variables are used to control other determinants of the firm performance. Capital structure is highly correlated with firm performance (LEV). Making strategic decisions may be restricted by available financial recourses. Due to firms with greater financial resources achieving greater levels of R&D investments, we control for debt leverage, computed as total liabilities to total assets. Firm age can be a proxy of a firm`s managerial capability and experience (AGE).

Previous studies find that firm size is an important factor influencing the impact of R&D investments (Teirlinck 2017). Thus, to gain a detailed insight into the relationship between R&D intensity and financial performance, we analyze the impact in relation to different firm size classes. Small-sized firms have lack of financial resources and absence of financial strength. That is why they may face liquidity problems and have a big risk of bankruptcy. Medium-sized firms have technological and financial sources to invest in R&D and can benefit from risk diversification. However, they are not flexible enough to deal with unexpected difficulties. Large firms have more research-intensity because they can use a wide range of resources and financial tools. Firm size is measured as the log of sales (SIZE).

In addition, we use industry affiliation as a control variable, because some empirical studies claim that sales in growth are related to the industry (Schimke & Brenner 2014). The specific industry characteristics are included in the model as a group of dummy variables

(INDDummy).

Time lags

Besides firm size, time of the effect of R&D activity is an important issue. In general, R&D are investments for the company's future and they may require time to impact on firm growth. Investments in R&D do not usually have an impact immediately (in the same period) and lead to firm growth only in the following periods. The time lag can vary among industries. Because of this variation, attempts to consider a fixed time lag are unsuccessful. As it was mentioned previously, some studies consider time lags ranging from one to three years, the others studies investigate the impact of R&D activity on the financial performance with a time gap of more than 5 years (Brenner & Rushton 1989; Schimke & Brenner 2014). However, this lag may not represent the clearest relationship because after five years R&D may lose its economic value. Thus, the choice of the time periods is crucial. To study the relationship between R&D decisions and financial performance, we will consider different time lags over the period 2008-2018.

Research Method

To link R&D activity with performance most of the studies use the regression approach. According to the hypothesis and the variables we suggest above, a series of multiple regression analysis will be conducted. First of all, we test significant relationships between independent and dependent variables, which can be verified with the correlation analysis. Correlation analysis is conducted to examine the existence of relationship between R&D intensity and performance. Secondly, a critical mass of existing studies has found that the linkage between R&D activity and performance is positive. Some studies find a negative trend. These findings lead us suspect a non-linearity in R&D-performance relationships. In our study, we follow the lines of the some recent research and attempt to estimate the impact of R&D on firm growth by accounting for non-linearity. In other words, we suppose that linear relationships might not be the case.

Data Sources and Sample

For the purpose of our analysis, we use data from the 2008-2018 annual reports of the manufacturing companies that disclose their R&D investments. The year 2008 is chosen as the start period because this year was a financial crisis that hit industries. An annual data set is provided by SPARK and Thomson Reuters databases. These data sources provide information about financial indicators such as R&D investments, growth in sales, debt leverage. The manufacturing companies will be categorized according to the size: medium- and large-sized.

Anticipated Results

The study will confirm the hypothesis that the impact of R&D activity on firm growth is positive. This positive effect of R&D investments will tend to be time lagged and may vary with the size of firms. We suppose that management can influence the future growth of a company by its decision about R&D investment. Thus, it is expected that the study will demonstrate that a firm must be prepared to invest heavily in R&D because only with sustained R&D investments it will continue to grow. The main anticipated outcome of the proposal is going to be the optimal R&D decision configurations different for medium- and large-sized firms.

Our study will provide theoretical contributions to previous literature. Firstly, the study will confirm the lack of previous research on existing non-linear linkage between R&D activity and firm's performance. We suppose that relationships between R&D investments and financial performance can be explained only by a non-linear model. These findings will provide a new understanding of relationships between R&D investment and firm growth. Secondly, it will take into consideration the R&D time-related financial outcomes. Finally, the study will offer in-depth theoretical analysis regarding the moderating role of R&D intensity.

The understanding of the relationship between R&D activity and financial performance is important because of its relevance to setting R&D budgets, and it can help to make a strategic choice by a company's manager. The study is relevant for the manufacturing companies, as the results will help them to improve their R&D strategy. On the one hand, R&D departments can use our guidelines to generate increased sales for a company by promoting successful R&D projects. On the other hand, the findings can be used by top-management in models simulating R&D and innovation policy.

Conclusion

In today`s global economy, R&D is one of the key strategic factors that helps firms to sustain their *competitive* advantage, but its greater probability of failure and absence of an immediate return make managers to avoid R&D investments. However, successful R&D projects can bring values to firm`s performance and lead to market growth and profits. That is why R&D investments are becoming linked with firm`s profitability.

Review of the literature reveals contradictory results. In general, the literature states that R&D activity is strongly related to firm`s growth and profits. The main highlights of the literature review are that: 1) studies focus on the relationship between R&D investment and financial performance of the same year, while R&D activity is future-aimed; 2) they consider the pool of industries, but R&D activity has into-sectoral differences; 3) they do not pay much attention to the size of firms and time lags.

In our study we attempt to answer the question: how does R&D investments affect firm`s performance? This question is strongly relevant both for R&D managers and policy makers, but is not answered in the literature successfully. Our proposal presents the linkage between R&D activity and firm`s performance by modelling non-linearity in relationship. We suppose that R&D activity should positive correlate with firm`s performance. Furthermore, we deviate from the usual approach by focusing on the time frame of the relationship between R&D investments and firm`s growth. We also consider differences in firm size and industries. In addition, we mostly focus on the manufacturing industry, because innovations are more important for the manufacturing companies.

Hence, from the policy perspective, linkage between R&D investments and profitability is a particularly promising area for future research. A future study could investigate different types of innovations, such as technological and service innovations, separately because technological and service innovations can have different impacts on firm`s growth.

Moreover, it is important to study more about motives for R&D investments and how these motives depend on firm growth. Finally, in our research, we focus on the manufacturing industry, but the study can be conducted with samples from other industries. The analysis of other industries will help to find out whether a general relationship exists between R&D activity and growth. Thus, future research can provide additional insight into the strategic effects of R&D on firm`s profitability and growth.

References

- Brenner, B. H., & Rushton, B. M., 1989, 'Sales growth and R&D in the chemical industry', *Research Technology Management*, 32(2), pp. 8-15.
- Kancs, D., & Siliverstovs, B., 2016, 'R&D and non-linear productivity growth', *Research Policy*, 45, pp. 634-646.
- Lantza, J., & Sahutb, J., 2005, 'R&D investments and the financial performance of technological firms', *International Journal of Business*, 10(3), pp. 251-269.
- Lee, J., & Shim, E., 1995, 'Moderating effects of R&D on corporate growth in U.S. and Japanese hi-tech industries: An empirical study', *The Journal of High Technology Management Research*, 6(2), pp. 179-191.
- Liang, L., & Yan, S., 2006, 'Empirical research on R&D expenditure and its economic effect of listed companies', *Science of Science and Management of S&T*, 7, pp. 34-38.
- Morbey, G. K., & Reithner, R. M., 1990, 'How R&D affects sales growth productivity and profitability', *Research-Technology Management*, 33(3), pp. 1-10.
- Schimke, A., & Brenner, T., 2014, 'The role of R&D investments in highly R&D-based firms', *Studies in Economics and Finance*, 31(1), pp. 3-45.
- Teirlinck, P., 2017, 'Configurations of strategic R&D decisions and financial performance in small-sized and medium-sized firms', *Journal of Business Research*, 74, pp. 55-65.
- Tubbs, M., 2007, 'The relationship between R&D and company performance', *Research Technology Management*, 50(6), pp. 23-30.
- Zhu, Z., & Huang, F., 2012, 'The effect of R&D investment on firms' financial performance: Evidence from the Chinese listed IT firms', *Modern Economy*, 3, pp. 915-919.
-

Conceptualisation of responsibility and ethics in an ecosystem context

Adjunct professor Mika Nieminen & Dr. Nina Rilla, VTT Technical Research Centre of Finland

In this paper, we are interested to study how an ecosystem co-creates responsibility and ethical values? In particular, our focus is on governance of such ecosystem and steering practices to support development of responsibility and ethical values in artificial intelligence (AI)-driven ecosystems.

Development of responsibility in constellations, which aim to generate and take up innovations, depends on complex interactions between various actors. Achieving responsibility in innovation demands reflexivity of actors' motivation, inclusiveness of various stakeholder and citizen interests, values and perspectives, and anticipation of future impacts (Owen et al., 2013). Furthermore, the process needs to lead to learning. The core idea is that value is a multidimensional and multilevel phenomenon (Ben Letaifa, 2014), which is unavoidably co-created in a network of mutually dependent actors.

Today, value co-creation happens largely in an ecosystem which facilitate interrelatedness of innovation actors. Organisational strategies and capabilities are shifting from actor centric to ecosystems to capture benefits of shared value. Because value is commonly created and shared that makes essential to understand how an ecosystem functions. Ecosystems are different and one can comprehend ecosystem in multiple ways (Phillips & Ritala, 2019), our approach however relies on the ecosystem concept that stresses the structure and dependencies between participants, technological complementarities and cognitive processes (Thomas & Autio 2014).

An essential question is hence governance of ethical aspects and responsibility in a complex constellation of triple helix actors. Does an ecosystem need an orchestrator that forms a basis for the governance and steering of actions within the ecosystem? Or does ethical value co-creation function better without an orchestrator?

Nevertheless, responsibility as ecosystem value in the AI context is prolific, given that AI currently generates technological hype in industry and academia but simultaneously raises ethics, safety and responsibility as core discussion topics. We feel that this discussion is easily left aside in AI's technical implementation, therefore more rigorous understanding of responsibility of AI is needed to observe societal impacts.

Approach

Our paper uses multiple case study design (Ragin 1994) to understand enabling of responsibility and ethics in the complex system of actors. We follow an action research

approach, given that researchers have active involvement in solving ethics related challenges in some of the ecosystem organisations.

Our cases are from distinct fields, health care and transport. A common nominator for them is that both are complex, multi-professional environments where multiple domain experts need to cooperate to advance and adopt AI-solutions. Also, both fields are strongly regulated and boost for adopting AI is high.

Case: Current home care services for ageing people increasingly rely on utilizing intelligent technologies to collect, process, and interpret data to support individual and organisation level decision-making. These AI-related services change the nature of home care and breed novel questions of ethics and responsibility. While these innovations seek to answer user-demand, there is less focus on how implementation of these technologies support wellbeing and socially responsible outcomes. Research on technology ethics and responsibility have shown that adoption of technology can be a complex value-laden process involving many stakeholders with potentially conflicting interests, and can profoundly affect service quality and wellbeing. To ensure socially responsible outcomes, there is a need for systemising how to make responsibility and ethics an integrated part of home care solutions. Current home care ecosystem is rather a set of loosely linked actors but in the future when it increasingly relies on utilizing intelligent technologies common ethical values become central focus area of the ecosystem.

Case: One of the key actors of an autonomous systems in transport in Finland is RAAS alliance which is the leading interdisciplinary innovation ecosystem and service platform for R&D. RAAS is involved in many pilots, e.g. self-driving cars and ferries, and cooperate tightly with Traficom who administers permits for the pilots. Transport is an interesting case area to observe how shared understanding of ethical values evolve, and is ultimately governed among the ecosystem actors when level of autonomy increases in transportation towards full autonomy. Due to newness of AI solutions, authorities need to solve ethical questions one by one that creates inefficiency in regulative processes.

Expected outcomes

Outcomes of the study centralise on two areas: 1) dynamics and interconnectedness of ethical value creation in ecosystem, and 2) organisation and governance of such ecosystem. We follow first a framework proposed by Phillips and Ritala (2019) who suggest it is essential to examine conceptual, structural and temporal dimensions of the proposed ecosystem to

understand dynamics and interconnectedness. Second, we apply an ethical assessment and design framework for producing ethically acceptable services (Leikas et al., 2020) to make sense of co-creating responsibility as ecosystem value. Third, we investigate how social impact-driven governance tools and models could foster collaboration of key ecosystem stakeholders in producing responsible outcomes (Nieminen & Ikonen, forthcoming).

Limitations

The fact that ecosystems in both areas are only emerging, can limit in observing right things at the right moment to collect desired empirical evidence.

Implications

As a practical implication, our case studies aim to systematise ethical challenges and create practical guidelines for case partners who need ethical guidelines to steer their work as authority, designer, service provider, or consumer. Once ethical challenges related to AI are made more prominent, discussion in the society can turn into benefits rather than threats.

Originality

While recent years we have seen a rapid increase in the number of studies dealing with the wider ecosystem approach - implying also triple helix-type of interaction between public, private and research actors - as well studies which deal with responsible research and innovation or AI ethics, these approaches and perspectives have not been, to our knowledge, connected to each other. If an ecosystem is essential for value creation, how wider societal value creation, responsibility and ethical aspects are taken into account in the development of such an ecosystem? Similarly, what kinds of dynamics there are in place in the development of an ecosystem-based ethical value-creation is worth looking in this increasingly technology intensive era.

Keywords: Ecosystem; responsibility; Governance; AI

Track 3. Innovation in transnational contexts

Chairs: Ju LIU / Johanna Kujala

Research and Innovation Infrastructures Boosting Innovation Capacities of Regional Ecosystems

Petri Pohjola, Timo Rainio, Hanna-Greta Puurtinen, Tampere University of Applied Sciences, Tampere, Finland

Purpose

Higher Education Institutions (HEIs) are recognized as regional key players in RIS3. They build innovation capabilities and capacities in regions and facilitate regional science and business cooperation. HEIs' academic offer and the region's business, industry needs often do not match and this potential opportunity of bridging the gap between HEIs and business is not fully exploited.

Approach

The poster presents the approach of regional diagnosis performed in the context of a transnational InnoHEIs project including partners from six European regions. The aim of the regional analysis is to map the Research and Innovation Infrastructures (RIIs) of higher education institutions in Tampere Region. The regional analysis of HEI RIIs in Tampere Region focuses Industry 4.0 and related sectors such as digitalization, software and AI while making use of the methodology jointly agreed by the project partners of the InnoHEIs project at transnational level to allow for identifying best practices and benchlearning.

Expected outcomes

The process of making the regional analysis brings together different stakeholder groups from all triple helix organizations in the region with the common goal to better exploit the RIIs and facilitates the regional ecosystem stakeholders for better use of facilities and related competences. An example is TAMK FieldLab, a demonstration and learning environment enabling agile experimentations of Industry 4.0. TAMK FieldLab responds to the rapidly emerging new skills needs induced by digital transformation. Simultaneously, the activities leverage the potential for exploiting and commercializing new technologies.

Practical Implications

Close collaboration and partnerships can function as the cornerstone of even more intertwined collaboration of different triple helix stakeholders, including also the precious integration of individuals and citizens via the Living Lab approach. This offers new perspectives in co-creating new sustainable services and products as well as establishing new start-ups and supporting entrepreneurial mindsets. Updating and upgrading of skills and competences is a necessary prerequisite for economic and environmental prosperity and increased social equality and quality of life.

Value

The novelty and added value of the presented process is threefold: Firstly, it widens the triple helix approach to quadruple helix, acknowledging the value of individuals and engaging them into the process. Secondly, it integrates the regional triple helix stakeholders in the ecosystem even tighter to support the common goals of the region. Thirdly, it harnesses the existing HEI RIIs to better serve the future skill needs, upgrading and updating in a sustainable co-innovation process with all triple helix stakeholders.

Keywords: Research and innovation Infrastructure, regional ecosystem, co-innovation, competence development, Industry 4.0

Transregional access to innovation on demand

Bartzanas, Th. (University of Agriculture, Greece), Chaniotou, N. (Kainuun Etu Oy, Finland), Lainevuori, A. (Helsinki-Uusimaa Regional Council, Finland) and Martínez, J.-C. (CEEI Burgos, Spain)

Type: Practical experience analysis

Purpose

To discuss how the Interreg Europe project BRIDGES (Bridging competence infrastructure gaps and speeding up growth and jobs delivery in regions; index number PGI00040, <https://www.interregeurope.eu/bridges/>) applies innovation options in transnational contexts to address mismatches between the economic, research & knowledge bases of the partner regions through interregional solutions, and improve the RIS3 delivery of the partner regions. The point of departure was identifying & realising at interregional level research-to-business projects, as part of the RIS3 implementation.

The BRIDGES project was approved on 10.2.2016; Phase 1 closed on 31.3.2019. Phase 2 is on-going and closes on 31.3.2021.

Partnership

Finland (Kainuun Etu Ltd, Regional Council of Kainuu, Helsinki-Uusimaa Regional Council Regional Development), Greece (ANKO- Regional Development Agency of Western Macedonia S.A.), Hungary (Pannon Business Network Association), Poland (Lubelskie Voivodeship) and Slovenia (Soča Valley Development Centre); and 3 advisory partners (Centre For Research & Technology-Hellas / Institute For Bio-Economy & Agri-Technology Greece, Stichting DLO Netherlands (withdrew in November 2016), and the European Business and Innovation Centre of Burgos Spain). The partnership brings together innovation advanced & less advanced regions, sharing bio-based economy among their RIS3 priorities.

Approach

Conforming to the Interreg EUROPE provisions, BRIDGES dedicated Phase 1 to policy learning and drawing of the action plans. Six regional action plans were expected to be formulated during Phase 1 and implemented during Phase 2.

Policy learning was organised along two interactive paths: (i) regional analyses: understanding the RIS3 of the partner regions, concrete research-to-business mismatches and

related interregional cooperation opportunities; and (ii) good practices: identifying, analysing and transferring good practices effectively addressing challenges identified in (i).

Expected outcomes and findings

FINDINGS TO DATE: The regional analyses revealed that in most regions RIS3 was more about sectors than industries, a rather common characteristic of first generation RIS3:s. More importantly, it was also revealed that, in the case of less advanced regions, mismatches between the economic / knowledge & research bases were not so much about research-to-business; rather, they were more about research-to-industry and research-to-regional innovation systems gaps. I.e., for individual businesses to benefit from research-to-business schemes and facilitations, enabling, framework pre-conditions had to be addressed.

Regarding innovation advanced regions, regional analysis showed that mismatches were not structural (they were not gaps), rather they were quantitative, for example the present economic base did not suffice to sustainably support the research base. So, the importance of critical mass in regions was another important finding. It was also found that, regardless of the innovation level of a region -as measured by the European Regional Innovation Scoreboard, research with commercialisation potential was possible there where basic research was present; i.e. regions lacking basic research activities did not have research results to commercialise nor a tradition in that direction.

The good practice discussion identified & analysed 34 good practices and retained 17 (<https://www.interregeurope.eu/bridges/good-practices/>). Out of these 17, most in demand for transfer were those replicating the processes of successful innovation infrastructures with well-defined, specialised knowledge transfer processes; those bridging innovation absorptiveness gaps of SMEs & involving research and technology transfer actors in the process; and those dealing with interregional innovation access tools.

During the interregional meetings, accessing innovation resources at interregional level - when lacking at regional or national levels, beyond the efforts of 'EU projects' was repeatedly discussed. Three regions tested such options during Phase 1 and three regions decided to invest more in this concept. It was decided to apply for a pilot action addressing the theme of transregional access to innovation on demand. The pilot action was approved on 31.7.2019. The pilot action activities were integrated into the action plans of the regions that formed the pilot action partnership (Kainuu, Helsinki- Uusimaa and West Macedonia). One

more region joined later as observer (Slovenia). Currently, six action plans are being implemented.

EXPECTED OUTCOMES/FINAL OUTPUTS AND RESULTS: The BRIDGES project added value is in

- concrete, tangible outputs: new products from research-business partnerships;
- policy improvements integrating lessons learnt. The policy impact can be distinguished into:
 - (i) a precondition for the implementation of the action plan (Lubelskie, Goriška, West Macedonia): this is demonstrated by modifications (new project criteria for example) in the Structural Funds calls. Transnational innovation options are addressed only through the good practice transfer;
and
 - (ii) capitalisation of the action plan implementation (Kainuu and Helsinki-Uusimaa), demonstrated by modification of the RIS3 of the two regions to include permanent transregional linkages and cooperation potential. This is one of the very important benefits of the pilot action. These transregional cooperation options build around three themes: research – to- business, research-to-industry and research-to- regional innovation system.
- conceptual contributions: solutions implementing research-to-business objectives and tools for win-win cooperation schemes between advanced and less advanced regions. It advances the argument that such co-operations can contribute to advanced regions' RIS3 economies of scale through growth and diversification; while they can contribute to less advanced regions' RIS3 economies of scope, through specialisation and growth.

Limitations/implications

“While innovation – advanced regions tend to think of growth strategies in terms of the 3rd & 4th waves of development, less advanced regions are still sometimes thinking in terms of the 2nd wave” ¹. The BRIDGES project helped us understand that the language (language) & concepts of growth rather than location or status (= current innovation performance) of regions, might matter more.

Practical and/or Social Implications

Win-win partnerships between innovation advanced and less advanced regions.

Originality/Value

Transnational innovation cooperation contexts as permanent cohesion policy tools.

Keywords: RIS3, interregional cooperation, knowledge transfer.

2

¹ Online meeting with West Macedonia 7.1.2020.

² Research confirms this project finding, e.g. (1) Gråsjö, U. (2006) Spatial Spillovers of Knowledge Production. Jönköping International Business School. Dissertation series number 034. © 2006 Urban Gråsjö and Jönköping International Business School ISSN 1403-0470, ISBN 91-89164-68-7. Page 69: “The results ... indicate that accessibility to university educated labour has the greatest positive effects. The value of exported products is mainly affected by local accessibility to university educated labour (and company R&D). The intra- and inter-regional accessibilities play a more important role when the number of high valued export products in Swedish municipalities is the output”. (2) Stoetzer, M.-W., Pfeil, S., Kaps, K. and Sauer, Th. (2011) Regional dispersion of cooperation activities as success factor of innovation-oriented SME. University of Applied Sciences, Jena, Departement of Business Administration, Jahrgang 2011 / Heft 4 ISSN 1861 – 2806 ISBN 3-939046-23-X. <https://www.researchgate.net/publication/254459296>. Abstract and pages 33-35: “The main finding is that the results show no influence of the geographical variables. But we confirm a significant and positive influence of the intensity of competition in all models. ... product- and process innovations of SME depend on cooperative activities with scientific and research institutions”.

Quadruple helix relations in innovation networks in EU macro-region. Comparative analysis of regional innovation potential in Baltic Sea Region

Seija Virkkala, Åge Mariussen and Antti Mäenpää, University of Vaasa, Regional Studies

Type: original empirical analysis, based on a unique method measuring TH/QH relationships, analysis of new empirical data

Purpose

The paper presents comparisons on findings of mapping of innovation networks in eight regions in Baltic Sea Region (BSR). The purpose is to reveal the innovation potential in the regions by analyzing the structure and functioning of the regional innovation networks. The basis of transnational learning is the identification of the gaps in innovation networks and learning from the good practices in connectivity in other regions.

All regions have a potential for innovation driven growth through better exploitation of existing place-based resources and better access to missing knowledge resources and tools of governance through exploiting the diversities of macro-regional networks. A key element in achieving this is improved regional governance and partnership coordination. We need to study the relationships and networks in and between regions.

Methodology

The paper introduces a tool for measuring and improving the relationships in innovation networks consisting of actors representing different helices (companies, universities, public organizations and NGOs). The method measuring the innovation network has been developed and described by Virkkala et al. (2017). The study of innovation potential in BSR, is based on a detailed survey in eight regions. We asked first the importance of different quadruple helix (QH) relationships in the innovation networks. Second, we asked the expectations and experiences of these relationships in order to find out the functioning of the innovation network. The difference between expectation and experience is a gap, which describes the quality of and a tension in a relationship.

Gap analysis is based on the assumption that improving connectivity favours regional development. However, improvement might sometimes require extra-regional links to avoid a possible regional lock-in situation. Gap analysis provides a soft power approach to multi-level governance in QH coordination through the identification of problems and by setting the parameters of the dialogues to resolve them. (Virkkala et al. 2017)

In mapping the innovation networks in the case regions (Ostrobothnia, Västerbotten, Päijät-Häme, Lithuania, Latvia, Hamburg, Oppland) we examine the different relationships of helix actors toward other four type of helix actors, in three spatial levels: own region, own country and international level. The partners of the case regions have made a survey following a structured questionnaire in which the networks of their selected sector cluster or value chain was examined. Measurements of importance, expectations, and experiences of relations start as assessment by 141 informants. The relationships were mapped in a quite detailed

questionnaire. For instance, the relationships towards universities from other helix actors were mapped based on their functions like research, education and development. The survey was conducted during the year 2018.

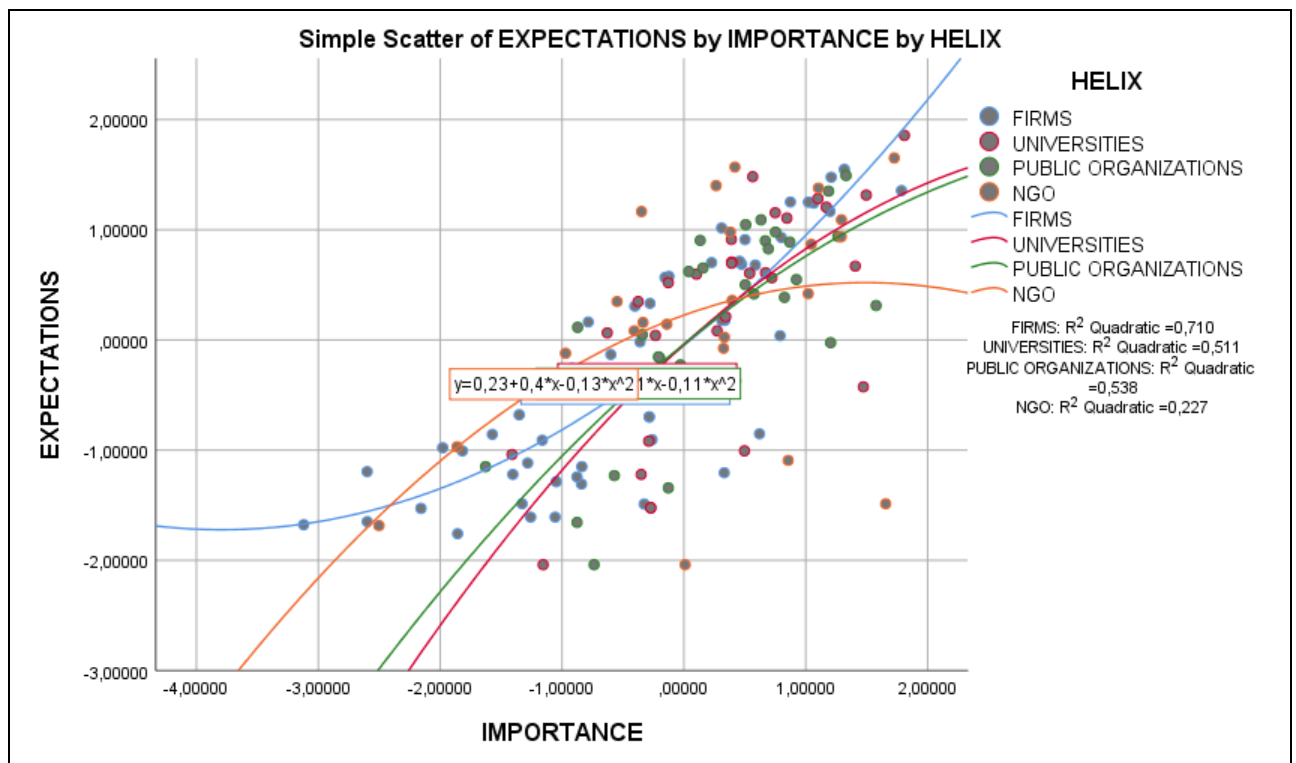
We have analysed the empirical data with the help of three indicators (“factors”) measuring 1) the importance of actors of a helices indicating the general level of network centrality; 2) convergence between expectations and experiences, indicating how strong and demanding the relationships are (quality), and 3) differences between expectations and experiences (gaps) indicating the tensions in relations.

Preliminary findings

In all case regions, the regional level helix actors are more important than the national and international helices. The mean score for each helix on the indicator IMPORTANCE is a measure of network centrality. (based on factor analysis). High levels of IMPORTANCE means that networks both within and between the helices are relatively strong. The well-connected NGOs, universities, public organisations, and companies may be a source of good practices.

The regions with the highest levels of IMPORTANCE (Latvia, Ostrobothnia and Västerbotten) have more integrated networks than regions with low score (Oppland and Hamburg). Regions with high level of QH integration (high score on IMPORTANCE) may be able to inspire regions with low levels. Different levels of network integration should be taken into consideration in discussing innovation strategies. Oppland and Päijät-Häme have several good practices, which seems to be well adapted to their situation as a relatively fragmented region.

When looking at the mean GAP between helices, we can notice that compared to other helices companies have small gaps. The other extreme is NGOs. NGOs are often set up to relate to conflicts of interest. Their gaps are high. Large GAPS might signal missing relations, or relations with disruptive institutional actors who might block progress. Regions with high GAPS and high level IMPORTANCE have a potential for innovation. They might go through dynamic change, and are in need of good practices from other regions



Scatter diagram of expectation and importance, by helix (n=141). Dots are respondents and color of dots indicates helix. The exponential blue line going up shows the relation between importance and expectations for companies.

Limitations

The importance of helix actors, as well as the expectation and experience of a relationship is based on the subjective evaluation by the respondents. The respondents were the key actors in the case regions, selected through stakeholder analyses with the attributes of power, legitimacy and urgency.

Practical Implications

We have developed a clear measurement of TH/QH relationships, which can be used in mapping and comparison of the innovation networks, and in evaluation of the regional strategies. The research on innovation potential in the BSR is part of project LARS (Learning Among Regions on Smart specialisation), which aims to improve the innovation policies through learning from good practices from other regions in innovation policies. The aim is to find solutions tackling the fragmentation of regional systems of innovation within circular

economy, advanced production methods and energy technologies through transnational learning.

Keywords: innovation network, gap analysis, connectivity, Baltic Sea Region, transnational learning

References

Mariussen, Å., Mäenpää, A. & Virkkala, S. (2019). Revealing of the innovation potential in Baltic Sea region – comparative analysis, LARS WP3 report. <https://www.lars-project.eu/>

Mäenpää, A. (2020). *The Challenges of Public Organisations in Coordinating Smart Specialisation and a Connectivity Model as One Solution*. Acta Wasaensis (forthcoming).

Virkkala, S., Mäenpää, A. & Mariussen, Å. (2017). A connectivity model as a potential tool for smart specialization strategies. *European Planning Studies* 25:4, 661–679.

Unveiling cross-country collaboration and knowledge flows through patent reassignments and citation networks

Dr. Garlo Giglio, University of Calabria; Mediterranean University of Reggio Calabria

Type: Original research

Purpose

This study aims at investigating cross-country knowledge flows through patent reassignments in two subject areas: the blockchain (BC) and the aircraft, aviation and cosmonautics (AAC) industries. This research analyzes existing patent reassignment networks and patent citation networks in order to shed some light on whether owners' countries have benefited - e. g. in terms of collaboration and learning - from knowledge flows coming from inventors' countries, whereby two basic conditions are satisfied: (a) firms owning previously granted patents have acquired them by attracting knowledge resources from other countries; (b) the patents at hand have been cited in subsequent granted patent applications.

Design/Methodology/Approach

Two datasets have been gathered from the Bureau Van Dijk database, with about 40,000,000 AAC-related and 30,000,000 BC-related patents granted between 2010 and 2015. Patents have been selected by avoiding the patent office bias and other methodological limitations. Consolidate techniques and algorithmic approaches (Giglio, 2019; Giglio et al., 2018; Li-Ying et al., 2013; Kessler and Bierly, 2000) are utilized to understand whether beneficial collaborative effects and knowledge flows can be identified for owning firms and their headquarter countries.

Findings or expected outcomes

This study provides an in-depth understanding of cross-country knowledge flows, learning effects, and technological evolution of national industries in the AAC and BC fields, that are hitherto unexplored.

Findings suggest that current owners operating cross-country patent acquisitions through reassignments are able to internalize inventors' knowledge and to file subsequent patents. Therefore, the "learning-by-patent-acquisition" effect is proven: firms increase their innovation potential and their business competitiveness, while countries strengthen their national innovation systems and foster their economic growth. Control variables show that the environment does not play a significant role in fostering positive patent acquisition effects, thus, identifying a gap in the policy-making perspective. Policy makers may, then, conceive measures nurturing national industries, encouraging firms to acquire foreign patents – e. g. through incentives, tax-reduction – to develop new patents. Moreover, there is no clear indication for targeting older and more cited patents compared to more recent, but less cited ones.

Limitations/implications

Despite learning effects are proven, nothing can be said about to what extent owner-firms have learned. Only some variables have been investigated, without testing possible moderating/mediating effects. Hence, this work paves the way for future research efforts on cross-country knowledge flows and the corresponding effects.

Practical and/or Social Implications

The contribution of this work is twofold.

On the firm side, managers of patenting firms operating in the case study-related industries, and interested in monitoring, acquiring or even anticipating technological advancements, may identify in advance potential technological innovations and recognize evolutionary pathways.

On the government side, policy makers may obtain supporting guidelines to design and implement measures nurturing the technological competitiveness of industries deemed relevant to national interest.

Originality/Value

This work claims a threefold originality. Firstly, it focuses on the underexplored “learning-by-patent-acquisition” effect in the BC and AAC industries. Secondly, few studies have analyzed the spillover properties characterizing specific technological fields. Hence, this work enriches also this perspective of analysis by focusing on two different areas. Thirdly, studies on knowledge flows and patent citations have a two-pronged relevance - macroeconomic and microeconomic -, but extant literature neglects their combination. This work fills this gap.

Keywords: Patent Citation Networks; Patent Reassignment Networks; Knowledge; Innovation; Technology Management.

References

- Bekkers, R. and Martinelli, A. (2012). *‘Knowledge positions in high-tech markets: trajectories, standards, strategies and true innovators’*. *Technological Forecasting & Social Change*.
- Binz, C., Truffer, B., and Coenen, L. (2014). *‘Why space matters in technological innovation systems - Mapping global knowledge dynamics of membrane bioreactor technology’*. *Research Policy*.
- Borgatti, S. (2002). *‘NetDraw software for network visualisation’*. Lexington, KY: Analytic Technologies.
- Borgatti, S., Everett, M., and Freeman, L. (2002). *‘Ucinet for Windows: Software for social network analysis’*. Harvard, MA: Analytic Technologies.
- Chen, Z. and Guan J. (2016). *‘The core-peripheral structure of international knowledge flows: evidence from patent citation data’*. *R&D Management*.

Criscuolo, P. and Verspagen, B. (2008). '*Does it Matter where Patent Citations Come From? Inventor vs. Examiner Citations in European Patents*'. *Research Policy*.

David, B.-T., Fernando, J.-S. and Itziar, C.-M. (2011). '*Mapping the importance of the real world: the validity of connectivity analysis of patent citations networks*'. *Research Policy*.

Giglio, C., Musmanno, R., and Palmieri, R. (2018). '*Cross-country learning from patents: An analysis of patent citation networks in the aviation industry*'. IPDMC Proceedings. Porto (Portugal).

Giglio, C. (2019). '*Investigating creativity and knowledge flows through patent citations networks*'. IFKAD Proceedings. Matera (Italy).

Hall, B. H., Jaffe, A. B., and Trajtenberg, M. (2001). *The NBER Patent Citation Data File: Lessons, Insights and Methodological Tools*. NBER Working Paper no. 8498.

Hall, B. H., Jaffe, A. B. and Trajtenberg, M. (2005). '*Market Value and Patent Citations*'. *Rand Journal of Economics*.

Hu, A.G.Z. and Jaffe, A. B. (2003). '*Patent citations and international knowledge flow: the cases of Korea and Taiwan*'. *International Journal of Industrial Organization*.

Jaffe, A. B., Trajtenberg, M. and Fogarty, M. S. (2000). '*Knowledge Spillovers and Patent Citations: Evidence from a Survey of Inventors*'. *American Economic Review*.

Kessler, E. H. and Bierly, P. E. (2000). '*Internal vs external learning in new product development: Effects on speed, costs and competitive advantage*'. *R&D Management*.

Lanjouw, J. O. and Schankerman, M. (2004). '*Patent Quality and Research Productivity: Measuring Innovation with Multiple Indicators*'. *Economic Journal*.

Li-Ying, J., Wang, Y., Salomo, S. and Vanhaverbeke, W. (2013). '*Have Chinese firms learned from their prior technology in-licensing? An analysis based on patent citations*'. *Scientometrics*.

Ma, Z.Z., Lee, Y. and Chen, C. (2009). '*Booming or emerging? China's technological capability and international collaboration in patent activities*'. *Technological Forecasting & Social Change*.

Malerba, F. and Montobbio, F. (2003). '*Exploring Factors Affecting International Technological Specialization: The Role of Knowledge Flows and the Structure of Innovative Activity*'. *Journal of Evolutionary Economics*.

Malerba, F., Mancusi, M. and Montobbio, F. (2007). '*Innovation, International R&D Spillovers and the Sectoral Heterogeneity of Knowledge Flows*', CESPRI Working Paper no. 206.

Innovation management in the Brazilian electricity sector: the case of Eletrobras companies

Juliana de Souza Oliveira, Marcelo Gonçalves do Amaral

Type: original research

Purpose

This paper studies the Research, Development, and Innovation Policy of Eletrobras, and how the firm is being prepared to foster, guide and prioritize R&D+I in the controlled companies, part of the Eletrobras group. Eletrobras is a Brazilian public holding company responsible for power generation in the country, controlling several other hydroelectric, thermal, and nuclear generation companies. It is also the objective of this research to describe the current innovation policy and the innovation management techniques used, considering characteristics, ideas, guidelines for the holding company and for the other companies from Eletrobras. This study also discusses how Eletrobras ensures the synergy of innovation actions with their alignment with strategic planning.

Design/Methodology/Approach

This is descriptive applied research with a predominantly qualitative approach. Several research techniques are used, such as a literature review, documentary research, and a case study, with interviews and participant observation. The procedures for data collection were: Document Collection, Semi-structured Interviews, and Observation. Regarding the Document Collection, were consulted websites, technical reports, minutes, and internal documents of

Eletrobras companies, with data and information about the electric sector, that also contributed to the literature review of this work. About the interviews, these were conducted throughout 2019. The analysis of the information collected was made using content analysis techniques and subsequent theory-case-theory triangulation. To analyze how companies are structuring their R&D+I areas, the five measures applied by the Galbraith Star Model were used: strategy, structure, processes, people, and reward systems.

Findings or expected outcomes

An overview of the R&D+I process at Eletrobras is developed. From this result, it is possible to propose strategies, specific practices, and guidelines about innovation policies. As a consequence, the idea is also promoted that although the National Electric Energy Agency (ANEEL) boosts R&D projects, the innovation should be a priority at Eletrobras and at its companies, increasing the investments in R&D+I, even if there is not a legal obligation.

Limitations/implications

It is essential to highlight the work does not intend to propose a specific innovation policy for Eletrobras or any its group company. Nor is it previewed to document the practice of innovation management in the sector.

Practical and/or Social Implications

With this work, it is expected to obtain more active participation of the companies of the Eletrobras group in the scope of the Technological Policy Commission (CPT) and to increase the number of R&D+I projects executed by the companies. Mainly with the best structuring of innovation management across the Eletrobras group, and with the benchmarking and exchanging information R&D+I, this all practiced in CPT.

Originality/Value

Since the late 1990s, Brazil seems to be aware of the S&T&I policy's need, that is explicitly articulated with the Brazilian development process. In 1999, the Sectoral Funds for Science and Technology were created and, in the mid-2000s, the Innovation Law (Law N° 10,973/2004) was promulgated. The legislation on tax incentives for innovation was improved, which composed the third chapter of the Law of Good (Law N° 11.196/2005). In this context of the new millennium in the public sector, the Law N° 9,991/2000 is highlighted as the milestone of the beginning of the Technological R&D movement of the Electric Power

Sector in Brazil. Companies operating in the electric sector (generation, transmission, and distribution) are required to have minimum investments in research and development (R&D) and energy efficiency, according to regulations established by the National Electric Energy Agency (ANEEL). The update of the Innovation Law, with the advent of Law N° 13.243/2016, was considered the new legal framework for S&T&I in Brazil. The law has led to important reflections on the need to eventually propose regulations that protect individual and collective rights and guarantees, without at the same time, it to be a barrier to technological development. The area of S&T&I in Brazil has not been achieving the necessary results to fulfill its relevant role in the economic and social development of the country. Brazil participates in the technological race on different fronts and forms of action focused on R&D+I. It is important to consider that the development of a country requires the participation of the state, through public companies, and the expansion of interfaces with the private sector and the university, featuring the Triple Helix linkages. It can be stated that the main company in the sector is Eletrobras, which under the Brazilian federal government's control. It acts as a holding company, divided into generation, transmission, and distribution and coordinates several companies in the electricity sector. It is in this context that studying, in a broad and detailed way how is being established the Eletrobras R&D+I Policy and how this company has been managing its innovation, becomes valuable and important to contribute to the technological development of Brazil. There is a shortage of empirical work on innovation management in the Brazilian electricity sector, which makes this study have originality in its essence, taking as reference a real case. Eletrobras' innovation policy was promulgated in 2018 and the company is working to implement a culture of innovation, considering the various maturity levels of the controlled companies. This work is presented as a way to boost this process.

Keywords: P&D; Innovation; Eletrobras; electric sector; Brazil.

Track 4. Innovation and Collaboration for sustainability

Chairs: Ju LIU / Johanna Kujala

Innovation in healthcare ecosystems: a triple helix approach

Daniel Polónia, Professor Auxiliar and Adriana Coutinho Gradim, Research Fellow

Department of Economics, Management, Industrial Engineering and Tourism, University of Aveiro

Type: Research design for studies in-progress

Purpose

The ability to innovate is often considered a key factor to achieve sustained growth, especially in an ever increasingly ageing society that values wellbeing and health. The combination of these factors leads public authorities to increase their investment in innovation, research and entrepreneurship in the healthcare sector, calling for a specific analysis on how the healthcare innovation environments behave. When assessing innovation there are key aspects that need to be considered such as the understanding of the innovation activities, the parties involved and the interaction between them (Bassis & Armellini, 2018). The concepts of triple, quadruple and quintuple helix models emerged as ways to better understanding the evolution of the increasing complex collaborations established between academia, industry, government and society in a specific context (Cunningham, Menter, & O’Kane, 2018). Considering this, the paper aims to study which approach is more suitable to study healthcare contexts – one based on the (triple) helix theory or one based on the ecosystem theory.

Design/Methodology/Approach

Review of articles considering the ecosystems, triple helix theory and innovation in healthcare sector. The primary search focused on TOPIC (“healthcare sector”) and TOPIC (“innovation”) to assess the state of the art in innovation in the healthcare sector, with a total of 284 articles. This search was done using SCOPUS and ISIS Web of Knowledge and the chosen articles were those with open access for other researchers being able to analyse some of the articles present in this study. When the authors of this paper screened the articles through title and abstract a lot referred to knowledge and technology transfer. So, a new

search with the TOPIC (“healthcare sector”) and the TOPIC (“knowledge transfer”) and/or (“technology transfer”) gave the total of 15 articles. Moreover, a search with the TOPIC (“healthcare sector”) and TOPIC (“ecosystem”) or TOPIC (“triple helix model) or TOPIC (“quadruple helix model) or TOPIC (“quintuple helix model) was conducted. It was surprising to see that relating to ecosystems there are 31 articles comparing to 3 relating to use of triple helix models, 1 of quadruple helix models and 0 articles for quintuple helix models and 0 using both approaches.

Findings or expected outcomes

Is it obvious that investment in innovation in the European Union has being considered an important topic with programs being developed over the years to foster innovation in different areas (European Comission, 2014; European Commission, 2018). Moreover, innovation in the healthcare sector is an important topic of today’s society. Also, following the sustainable development goals for 2030, it is mentioned that one aim is to assure the access to health care and assure social wellbeing (United Nations, 2019).

However, there are countries in the EU that are innovating in healthcare faster than others (European Commission, 2018; Sánchez-Carreira, Peñate-Valentín, & Varela-Vázquez, 2019). So, the context surrounding the healthcare organisations must be considered. In this way, the healthcare innovation ecosystem concept emerges, since when considering this ecosystem the study includes not only healthcare organisations but also all other parties involved with these institutions (Toma, Secundo, & Passiante, 2016).

Limitations/implications

Even though presenting important information on how fast the healthcare sector is evolving, the study has a fundamental limitation – the lack of a practical study. So, this paper aims to serve as a basis for future research on the study of healthcare innovation ecosystems and the need to innovate, not only in terms of products and/or services, but also in terms of the type of collaborations that are established.

Practical and/or Social implications

In practical terms, this study reinforces the need for the development of more innovative activities in healthcare organisations. Managers from these institutions must be aware of the importance of innovation and how it is transforming the provision of healthcare services. Moreover, by identifying the need for the development of more case studies comparing

different contexts, this study offers a new research avenue. Researchers can analyse different ecosystems and the links established among healthcare organisations and other parties, comparing the results to other contexts to achieve best practices.

Also, this paper offers insights of social trends that are changing the way healthcare services are being transformed and provided. Due to the society of knowledge and the rapid technological evolution, concepts such as “patient 2.0” and “digital healthcare” are arising and not only physicians but also the society need to be aware of these to assure that they are receiving the best treatment possible (Ghaferi, Myers, Sutcliffe, & Pronovost, 2016; Ostrovsky & Barnett, 2014). The analysis of the context surrounding healthcare organisations and how new collaborations can be established is a gap in the literature. Most of the healthcare systems are designed to provide large scale services aiming economies of scale that are not suitable for introduction of radical or even incremental innovation.

Originality/value

Studies analysing the healthcare innovation through an ecosystem or a triple helix approach emerge in the literature, even if in low number. However, this paper is the first to compare the use of a triple helix or an ecosystem approach to categorise innovation in the healthcare sector. Moreover, based in the previous authors, the study suggests a framework to identify different entities that can be studied in hospitals innovation ecosystem according to the phases of the innovation process, considering that this can be adapted according to the aim of each study and country policies for the healthcare sector. Also, the effective management of partnerships along the process can help to achieve the goal number 3 for the 2030 United Nations’ Agenda “Ensure healthy lives and promote wellbeing for all at all ages” (United Nations, 2019).

Keywords: innovation, healthcare sector, ecosystem, technology and knowledge transfer

[Innovation for socially sustainable work and leisure](#)

Since the World Commission on Environment and Development (1987) report, social sustainability has formed one of the three core issues in sustainable development. In the

Triple Helix context, sustainable development plays a central role in innovation itself and, given the present-day challenges in meeting the 17 Sustainable Development Goals of 2030 in time (see UN, 2019), especially in innovation *for future*. In manifesting the 17 goals, the United Nations General Assembly (2015) placed increasing emphasis on the social pillar within sustainable development – and, we propose, the same should be the case in innovation studies.

The workshop sheds light on the assets social sciences and humanities can bring to innovation studies by analyzing two central domains of human life – work and play. Socially sustainable work, in the context of this workshop especially, involves equality, inclusion and fairness in recruitment, leadership and management. Second, in this workshop, socially sustainable leisure time is approached from the perspectives of interculturalism and subcultural space.

By addressing these issues, the workshop wishes to foster discussion on the role of communication, (sub)culture and inclusion in innovation for a socially sustainable future.

Participants

Chair Henna Jousmäki Postdoctoral Researcher, Tampere University,
henna.jousmaki@gmail.com

Presenters Dorothea Breier, Postdoctoral Researcher, University of Helsinki,
dorothea.breier@helsinki.fi

Kati Tähtinen Research trainee, University of Turku, kati.tahtinen@gmail.com

Heidi Lehtovaara, Service supervisor, City of Helsinki Project manager, Women to work (2019-2021), heidi.lehtovaara@gmail.com

Henna Jousmäki, Postdoctoral Researcher, Tampere University, henna.jousmaki@gmail.com

Presenter profiles and abstracts:

Breier	If we assume ‘social inclusion’ to be one of the key principles of social sustainability (Shirazi & Keivani, 2018), the next step would be to ask how we can achieve something as complex,
--------	--

fragile and hard to grasp as social inclusion tends to be. By drawing on ethnographic material from my study on a DIY, self-governed sub-cultural centre in Helsinki, I point out the importance of grassroots initiatives and forms of activism in enhancing a socially more inclusive society. In line with scholars working on similar topics (e.g. Smith et al., 2016), I argue that such initiatives have the potential to notice issues that may otherwise remain unnoticed by authorities, and simultaneously to find solutions to said issues, because of their very grassroots position.

Tähtinen

Socially sustainable leisure time approached in the contexts of tourism and subcultural space needs to be valued to its full extent for epoch-making sustainability. The role of active, open, language barrier-free sociocultural worldwide communication and scientific discussion is essential for international sustainable development and genuine intercultural cooperation. Interculturality and subculture and its inclusion are the key tools in innovation for a socially sustainable future. For profound sociocultural interaction language barriers are important to be minimized, and therefore adequate common language for rapid dialogue through efficient language teaching in schools should be concerned as one of the main sectors for tourism industry, sustainability and climate change communication. Eventually it is the national identities and the language personalities that cause the need for this pivotal approach in subcultural space (Schneider, 2019; Davidovitch, 2018).

Lehtovaara

Although Finland, together with the other Nordic countries, has a strong principle of equality, highly educated migrant women face major difficulties and discrimination in their job application process in Finland. Women often move to Finland for family reasons and consequently do not have a job or degree place waiting for them. Regardless of their country of origin, women's position is weakened by the segregation and pay inequality of the

labour market (Wrede 2010, 18). In addition, women's success in finding employment is also affected by other factors such as age, gender, marital status and the number of children they have.

Drawing on interview data and the concept of intersectionality, I describe migrant women's experience of themselves and their societal position in relation to their job application processes. I further discuss how women with a migrant background should be taken into account and integrated more fully when planning a genuinely inclusive working life.

Jousmäki

In rural contexts in Finland, small and medium-sized enterprises are in need of skilled labour as well as residents and tax payers. To these ends, many wish to recruit foreign workers. In these types of newly multiculturalising SMEs, the diversity of employees needs special attention to guarantee the provision of appropriate working conditions and work-related well-being. An important part of these is manifested through communication. Therefore, to recruit and to keep employees – to engage them in an inclusive and socially sustainable manner – a primary concern in multiculturalising working communities should be communication.

Format

The 90-minute session is organised as follows: first, each presenter gives a 10-minute speech, followed by an immediate 5-minute reaction from listeners (both other presenters and the audience). The remaining 30 minutes will be spent discussing and interrogating the issue further.

Goals

The workshop kicks off co-operation between scholars and practitioners interested in the potential for future innovations that lie at the intersections of communication, culture, and inclusion. The workshop facilitates networking and is followed by a memo to participants to spark and support the planning of further ideas for collaboration.

Keywords: Social sustainability, inclusion, work, leisure, culture

References

Davidovitch, N. and Khyhniak, K. (2018) 'Language personality in the conditions of cross-cultural communication: case-study experience. *International Education Studies*, 11(2), p.13-26.

Schneider, S. and Heinecke, L. (2019) *The need to transform science communication from being multi-cultural via cross-cultural to intercultural*. Advances in Geosciences 46, pp. 11-19. Mathematisch-Naturwissenschaftliche Fakultät. Universität Potsdam.

Shirazi, M. R. and Keivani, R. (2018) 'The triad of social sustainability: defining and measuring social sustainability of urban neighbourhoods', *Urban Research & Practice*, 12(4), p448-471.

Smith, A, Fressoli, M., Abrol, D., Arond, E., and Ely, A. (2016) *Grassroots innovation movements. Pathways to sustainability*. London: Routledge.

UN (2019) *The sustainable development goals report 2019*. Available at: <https://unstats.un.org/sdgs/report/2019/#> (Accessed: 16 December 2019)

United Nations General Assembly (2015) *Transforming our world: the 2030 Agenda for Sustainable Development*. A/RES/70/1, available at: <https://sustainabledevelopment.un.org/post2015/transformingourworld> (Accessed: 16 December 2019)

World Commission on Environment and Development (1987) *Our Common Future*. Oxford: Oxford University Press. Available at: <http://www.un-documents.net/our-common-future.pdf> (Accessed: 16 December 2019)

Wrede, S. (2010) 'Suomalainen työelämä, globalisaatio ja vieraat työssä' [Finnish working life, globalization and strangers at work] in Wrede, S. & Nordberg, C. (eds.) *Vieraita työssä. Työelämän etnistyvä eriarvoisuus* [Strangers at work. The growing ethnic inequality in working life]. Helsinki: Gaudeamus, pp. 7–31.

University-Industry-Government Cooperation within an agricultural context: the case of Penela Business Incubator

Prof. João Paulo Marques, Politechnic Institute of Coimbra

Types: Original research

Purpose

Nowadays, knowledge is an important output for universities as well as for industries in order to supply innovative products/processes, thereby gaining competitive advantages (Etzkowitz, 2008). The problem of knowledge/technology transfer (KTT) can be viewed through the Triple Helix model of university-industry-government (U-I-G) relationships (Etzkowitz and Leydesdorff, 1996), where the Business Incubator (BI) is seen as an effective knowledge transfer mechanism (Etzkowitz, 2002; Marques et al, 2006) and a driving force for entrepreneurship, innovation and technology commercialization (Wonglimpiyarat, 2016).

Despite the economic impact of BI, few of the studies analyzed incubators as an important innovative actor that promotes U-I-G collaboration. In this respect, some previous studies show incubators as cheap rented space (Bakouros et al, 2002), while others (Marques et al, 2010) focused on U-I interaction and revealed the dominance of human resources and informal links, with simple transfer of KTT. The role of the university is more related to the provision of information and training of human resources than with the innovation itself. Besides, inter-firm links in BI were weak, predominantly of an informal nature (Bollingtoft, 2012).

These studies have raised the question of how the BI can be used to increase U-I-G collaboration in the agricultural sector in the Penela region, Portugal.

Methodology

This study focuses on the Penela BI as an example of U-I-G relationships in the context of the Triple Helix model. It is particularly interested in answering such questions as:

- The main characteristics of the firms to be based in the BI;
- The cooperation links established between the tenants of the incubator and University (formal R&D links, human resources and informal links);
- The main forms of KTT resulting from cooperation;
- The local authority and incubator relationships;

- The contribution of the Penela BI to the development of agriculture and biotechnology for sustainability.

The main results of the research emerged from personal interviews with the management of the BI, managers of the 13 firms based in the BI, and a representative from the Municipality of Penela. Personal interviews were conducted, using previously-devised “interview scripts”. Field work was carried out from April to June 2018. Finally, a qualitative analysis was carried out.

Findings

Of the 13 firms based in the Penela BI, 10 firms (76.9% of the total) responded to the survey. Most of them belong to the biotechnology and agricultural sectors, which is consistent with the strategic orientation of the BI and local municipality. Predominantly, the companies were start-up micro enterprises. However, the tenants' perception of the incubator was as a cheap rented space and for prestige, rather than the opportunity to develop R&D links with the university, which was also confirmed in previous research.

70% of the total sample confirmed cooperation links with universities, with the informal type of U-I interaction being the most frequent, of which “personal contact with university staff” and “firm's access to the university department's research” obtained 57.1% each. Formal links were indicated by 5 companies, where “university academic staff as part-time consultants” cooperation links were most often quoted (42.9% of the total with U-I links). In human resources links “recruitment of recent university graduates” prevailed (3 companies). Relations between tenants demonstrate a low level of interaction, where social and commercial operations dominate.

“Simple transfer” was recognized as the main form of KTT (57.1% of firms that have U-I links). The main benefit of collaboration with academia was “chance of acquiring know - how”, indicated by 4 companies, while benefits for the university is “chance of applying scientific knowledge in organizations” (50% of total sample). 6 companies (85.7% of the sample that have U-I links) consider “product and/or process innovation” as the final results of KTT.

The Municipality of Penela started to follow the Triple Helix strategy with the adoption of a regional program for the development of innovative and entrepreneurial ecosystems. The

Penela BI has been shown to be an important KTT mechanism which aims to solve the problems of rural areas.

Limitations

Due to the lack of the statistical data it was not possible to estimate the direct impact of the Penela BI in terms of quantitative results and evaluate its effectiveness. Also, it was not possible to obtain the opinion of the university representatives concerning U-I-G links.

Implications

The practical implications can be considered from the perspective of stimulating entrepreneurship and promoting U-I-G links, which may lead to solving problems of rural development.

Value

By focusing on the development of U-I-G interactions, the study expands knowledge on the application of the Triple Helix in the agricultural sector.

Keywords: university-industry-government cooperation; business incubator; Triple Helix, innovation, agricultural sector.

References

- Bakouros, Y.L., Mardas, D.C. and Varsakelis, N.C. (2002). Science park, a high tech fantasy?: An analysis of the science parks of Greece. *Technovation*, 22(2), pp.123-128.
- Bollingtoft, A. (2012). The bottom-up business incubator: leverage to networking and cooperation practice in a self-generated, entrepreneurial enabled environment. *Technovation*, 32, pp.304-315.
- Etzkowitz, H. and Leydesdorff, L. (1996). The future location of research: a triple helix of university-industry-government relations II. *EAAST Review*, 15 (4), pp.20-25.
- Etzkowitz, H. (2002). Incubation of incubators: innovation as a triple helix of university-industry-government networks. *Science and Public Policy*, 29(2), pp.115-128.
- Etzkowitz, H. (2008). *The Triple Helix: University – Industry – Government Innovation in action*. New York: Routledge.

Marques, J.P.C., Caraça, J.M.G. and Diz, H. (2006). How can university–industry–government interactions change the innovation scenario in Portugal?—the case of the University of Coimbra. *Technovation*, 26(4), pp.534-542.

Marques, J.P.C., Caraça, J.M.G. and Diz, H. (2010). Do Business Incubators Function as a Transfer Technology Mechanism from University to Industry? Evidence from Portugal. *The Open Business Journal*, 3(1), pp.15-29.

Wonglimpiyarat, J. (2016). The innovation incubator, university business incubator and technology transfer strategy: The case of Thailand. *Technology in Society*, 46, pp.18-27

Effects of university-industry interaction in university patents: New evidences from Brazil and Spain

Kelyane Silva, Lydia Bares and Josealdo Tonholo, University of Cadiz, Spain

The main objective of the work is to examine the experience of Brazil and Spain in institutional collaboration in university patent applications considering the latest public policies implemented in the respective countries. Our unit of analysis is the patents originating in Brazil and Spain published according to the Patent Cooperation Treaty (PCT) in the period 2001-2017, with a total of more than 3,900 patent documents. Our results show that Brazilian and Spanish universities respond positively to their participation in economic activities, strongly promoting their "third mission". However, the same effect was not observed for technical progress in collaboration with the industrial sector, since, in both countries, approximately 70% of patent applications are exclusively owned by the universities themselves. The results here presented evidenced that: a) the TTO's urgently need to overcome the patent-focused vision and make a greater effort to search the market for the demand for technologies developed in the academic field; b) universities have to change the strategy to reinforce the joint cooperation with industrial sector in the initial stage of research; c) the needs for promoting the academic spin offs; and d) proposition of internal policies to increase the social and commercial appropriability of technology.

A System Model and An Innovation Approach toward Sustainable Housing Renovation

Dr. Ju Liu, Malmö University

Type: original research

Purpose

In recent years, **housing renovation has been increasingly accepted as an urgent issue for the economic, social, and environmental sustainability** of the society. In many European countries, houses built between 1970 and 1990 account for about one quarter of the total building stock, and they are now facing major renovation needs (Meijer et al., 2010).

The renovation of rental housing presents some specific challenges. On the one hand, **a renovation project involves all aspects of sustainability**, namely economic, environmental and social sustainability. In some circumstances, the sustainability goals are compatible in housing renovation and other circumstances conflicting. The possible conflicts between economic, environmental and social goals may fundamentally undermine the potential of sustainable urban development. On the other hand, **a renovation project involves a wide range of stakeholders**, such as the owner/landlord, the tenants, the communities, the contractors, the government regulatory bodies and so forth. These are all interest groups with different preferences and priorities. Therefore, crucial to all forms of housing renovation is how to address **the two challenges of the conflicting sustainability-goals and conflicting stakeholder-interests**.

The conflicts among sustainability-goals and the conflicts among stakeholder-interests are not completely avoidable. What we can do is to reduce the conflicts and to expand the shared and compatible parts so as to create a healthier balance between conflicting goals and interests. Nevertheless, in the area of **sustainability research**, there is generally **a lack of guidance by models and frameworks** (Stirman 2012). Identifying models or frameworks for specific

sustainability challenges is highly encouraged in the sustainability research community. The **conventional project management tools**, focusing on time, quality, and cost, **do not offer effective measures** to address the system challenge of conflicting-sustainable-goals and conflicting-stakeholder-interests.

The purpose of the paper is **to develop a theoretical tool** for understanding sustainable housing renovation as a system phenomenon which has multiple sustainability goals, complicated dynamic processes, diverse actors, and a sophisticated institutional environment. It also aims **to develop a practical guidance** by which innovation is generated through an open, learning-based, trial-and-error innovation process within the system context. Product versus process and business versus social innovation toward sustainable housing renovation are discussed.

Design/Methodology/Approach

The paper is a theoretical paper.

Findings or expected outcomes

First, the paper develops **a system model for understanding sustainable housing renovation**. It adopts a system perspective combining the project processes, the sustainability goals, the stakeholders and the institutional environment to create a holistic picture of housing renovation as a system phenomenon rather than a set of engineering activities. Second, it introduces **an innovation approach to guide housing renovation** for better addressing the challenges of conflicting sustainability-goals and conflicting stakeholder-interests.

Limitations/implications

The paper is just a theoretical discussion. Our model **should be further tested, developed, refined and modified** by future empirical research, where the theoretical concepts of the model are translated and operationalized into concrete observable social and physical entities, in a similar way that we have tried in this paper. The model **could also be tested in practical applications**, e.g. where the actors involved in a certain housing renovation process open up a systematic dialogue with the shared purpose of minimizing the segments of incompatible goals of sustainable housing renovation and incompatible stakeholder-interests.

Practical and/or Social Implications

The real estate industry is currently going through considerable structural change as a result of fast urbanisation, urgent social challenges, rapid technological change and increasing knowledge intensity of the production. In this transitional phase, we see the prerequisites as particularly favourable for our paper to contribute to new knowledge and better understanding for innovation and sustainability in the real estate industry.

In fact, **our model has been adopted by one of the biggest real estate company** for their internal training.

Originality/Value

This model contributes to sustainability literature with a focus on the TBL model in two ways.

First, the model **introduces systematic thinking into the application of TBL model** by taking housing renovation as a system in which different groups of actors are engaged at different levels in different phases of the process, and sees the institutional environment as a driving and hindering power of the system. One criticism to the TBL model has concerned its lack of systematic thinking (Doppelt 2003). The introduction of systematic thinking into the application of TBL entails the ability of understand the complicated relations, interactions and situations in housing renovation that can hardly be explained by simple cause-and-effect relations.

Second, the model introduces **an integration focus into the application of the TBL model**. The TBL model pays more attention to the co-existence of the three aspects while somehow ignoring their dynamic interdependence (Hahn et al. 2015). This may lead to “a tendency to ignore the profound interdependence of these factors, and to see them as likely to be conflicting rather than potentially complementary” (Sridhar and Jones 2013). It may also encourage a static perspective which assumes that sustainability is about balancing the three aspects within a given total benefit. The integration of the three aspects of the TBL model has two meanings. On the one hand to enlarge the compatible parts of the projects and realise the potential of synergy between different goals; on the other hand, to reduce the conflicting parts or to minimise the negative impact of these conflicts. Provided an integration focus, the model can be used as a tool to find agreement on mutual supporting activities in relation to all aspects of sustainability.

Keywords: Sustainability, Housing Renovation, Challenges, System, Innovation

Triple Helix accelerating the green economy

Nina Suvinen, Urban and Regional Studies Group, Tampere University

Abstract

This paper illuminates how Triple Helix constellation accelerates sustainable development, especially a development of green economy. While different parties execute their own activities, the main focus in this paper is on those activities either affecting on others or executed in collaboration. The key question of this paper is then, how the Triple Helix constellation promotes the green economy to develop? This is followed with sub-questions of how and in what types of arrangements Triple Helix parties collaborate to make the green turn and the green economic development?

The importance to exam linkages between particular parties comes from understanding, that green economy is not developing in vacuum but is embedded to entire sustainable development of societies. In addition, societies need markets to provide solutions to solve multiple issues which cause climate change, or which are consequences of climate change. There is then a profound interdependence between market and society. However, the needed solutions are to be produced in new types of societal contexts. Hence, new knowledge and research are perhaps more than ever needed. They then again become a source of new findings and innovations. And not just technological but as much process and social innovations that are needed for both the green economy and the sustainable societies. (Jänicke 2012; Gibbs and O'Neill 2014; Sotarauta & Suvinen 2019) That all forces industrial actors to collaborate with research.

The paper is based on research executed in the project called Where does the green economy grow? (2017-2020). The original data consists of two Finnish regional cases of cleantech and bioeconomy, including also national level policy analysis. The results in this paper are based on 32 semi-structured interviews of key regional and national level industrial, research, and policy/government actors, identification of relevant policy /industry networks on regional and national level, and a survey of national, regional, and local level policy documents between 2005-2018.

To study the development of the green economy, Triple Helix – model provides a fruitful approach for variety of reasons. The literature on Triple Helix emphasizes those very same parties and their mutual linkages as identified in emergence of the green economy, namely the linkages between industry, research and government to generate innovations and economic development (Etzkowitz & Leydesdorff 1997). While simplifying the research setting, the Triple Helix model is open to varied fields and contexts (Etzkowitz 2003). By that it enables to reveal uniqueness and to highlight differences between empirical cases, as is a purpose in this paper of two regional cases. With a decades long research tradition, Triple-Helix literature has also generated variety of findings from other empirical studies and hence provide important aspects for the data analysis of the development of green economy. (Etzkowitz 1996; Gunasekara 2006; Goldstein 2010; Suvinen et al 2010)

Preliminary analysis of the two Finnish cases revealed that the development of green economy has strongly been an outcome of Triple Helix constellation and activities. For example, sustainable society had been aimed at by the government and policy-makers in collaboration with industry, research, associations, etc. for example in variety of co-produced strategy and action plan processes and implementations of these. All in all, government has had power and resources to push research and industry to collaborate for the societal and economic green turn. To accelerate green economy, it has also initiated special networks, and provided collaboration platforms for industrial and industry-research collaboration.

The Finnish cases show also that research and industry have collaborated for long for the green economy. On the one hand research has taken active role with industry and it has scanned and developed new green technologies, materials, products and processes. On the other hand, industrial actors, especially the leading companies have collaborated repeatedly with variety of research institutions, and not only in regional or national contexts but also globally. This for its part has generated remarkable new green business. Furthermore, both industry and research parties have had indirect or direct connections to policy-making. While research party has often provided policy-makers knowledge on new findings and future prospects of sustainable society and green economy they have also lobbied for better resources. Industrial actors have also had variety of connections. In addition, that they have also lobbied their special needs, they have also joined forces with public actors for development of future local, regional or national economies.

The limitation of this paper is that it presents results from the green economy cases in Finland. The comparisons with other countries' green economies would bring light on how varied ways green business could be accelerated. Anyway, the paper will provide interesting findings from one of the leading country of green businesses and brings up how Triple Helix constellation may multiple ways accelerate green economy and development of sustainable societies.

Circular economy and sustainability – investigating stakeholders' perceptions

*H. Salminen¹, M. Marjamaa¹, R. Tapaninaho¹, A. Heikkinen¹, L. Gonzalez Porras¹ & J. Kujala¹

¹Tampere University, Faculty of Management and Business, Kanslerinrinne 1, FI-33014 Tampere University, Finland *hanna.salminen@tuni.fi

Abstract

A transition from linear economy towards sustainable circular economy (CE) is high on the political agenda in many countries at the moment (Geissdoerfer et al., 2017; McDowall et al., 2017). Planetary boundaries and climate change are major reasons for the transition towards CE (Ellen McArthur Foundation, 2020; Korhonen, Honkasalo & Seppälä, 2018a).

Furthermore, CE is seen as a way to promote sustainable business models (Murray, Skene & Haynes, 2017), economic growth and create new jobs (Antikainen & Valkokari, 2016).

CE has received increasing attention among scholars in recent years. Although, there has been literature reviews on CE (see e.g. Merli, Preziosi & Acampora, 2018; Prieto-Sandoval, Jaca & Ormazabal, 2018; Winans, Kendall & Deng, 2017), the concept of CE remains rather vague and it is unclear how CE is linked to sustainability (Geissdoerfer et al., 2017).

Furthermore, it has been argued that environmental aspects have been dominated in the discussions of CE and less attention has been given to the social dimension of sustainability (Witjes & Lozano, 2016; Murray et al., 2017).

This study investigates how CE and its linkage to sustainability are understood among key stakeholders involved in the promotion of circular economy in Finland. This study is a part of CICAT2025 Circular Economy Catalysts: From Innovation to Business Ecosystems -research

project, funded by the Strategic Research Council, Academy of Finland. Totally 26 qualitative semi-structured interviews were made among professionals representing ministries, federations, research and development organizations, regional actors, cities and companies. A qualitative content analysis was used for analyzing the data.

Resource efficiency, sustainable use of natural resources, circling of non-renewable and renewable materials and waste management as central components of CE among the studied stakeholders. Also, new service concepts were closely related to CE. In the broadest sense, CE was understood as a new economic and societal model - a totally new way of thinking and acting. There were also several concepts which were closely related to CE, such as bioeconomy, green economy, sharing economy and industrial symbiosis, but it was somewhat unclear, how CE differs from those concepts. Majority of the professionals perceived CE as a way to promote sustainability at the society. However, while, ecological and economic sustainability were clearly linked with CE, the association between CE and social sustainability was not that explicit. In order to accelerate the transition towards sustainable CE, it is vital that the key stakeholders share a mutual understanding of what constitutes CE and how it can promote different dimensions of sustainability.

Keywords: Circular Economy; Sustainability; Stakeholders; Finland

Track 5. University reforms for future innovation

Chair: Huub Mudde

Vision 2050 – A Foresight Reflection on Entrepreneurial Ecosystems Stakeholders
Expectations towards Higher Education Institutions

Audrey Stolze, Munich University of Applied Sciences and University of Hohenheim

Purpose

Reforms and new policies in higher education systems across the globe changed Higher Education Institutions (HEIs) autonomy, public financing, mission and accountability. Now, stakeholders expect HEIs to be innovative and address economic, technological and social demands of knowledge societies. Nonetheless, this ideal of HEIs 'third mission' also suffers criticism, regarding legitimacy and conflicts between HEI's three missions. Hence, without a unanimous agreement, many embarked in a journey replete of challenging organizational changes.

Despite a growing literature, the understanding of HEIs' entrepreneurial pathways remains a main research agenda. Thus, this article offers a foresight perspective discussing the results of an exercise in which an expert group assessed scenario propositions build upon entrepreneurial ecosystems' stakeholders' expectations towards HEIs.

Approach

Foresight methods can support actors to foresee, systematically, in long-term, creating desirable futures. This study employed one of the most used foresight method: scenario planning, considered a starting point to address under post-normal conditions the need to supplement existing empirical evidence on a phenomenon with a future perspective build upon strategic stakeholder dialogues. Henceforth, anticipating multiple novel yet plausible futures, built upon storytelling narratives about the future that challenge assumptions and promote mindset change.

We structured the study in 4 phases: project preparation, scenario exploration, scenario development and scenario utilization. Data collection employed participatory methods facilitated by the authors and divided in 3 steps: workshop, visioning exercise and experts' assessment. In total, we engaged with 35 informants who are academics, government representatives, entrepreneurs and corporate representatives from 16 different countries and 4 international experts in higher education entrepreneurialism issues.

Findings

The resulting propositions are exploratory normative scenarios grounded on present trends, reflecting the expectations of entrepreneurial ecosystem stakeholders towards HEIs and

encompassing its three missions: teaching, research and the ‘third mission’. Furthermore, two key factors driving all scenarios are the potential impact of (a) digital transformation and (b) collaborative networks and co-creation processes. The five-scenarios are:

1. Worldwide scenario: Collaboration among international Entrepreneurial Universities evolve to become a worldwide organization.
2. Transdisciplinary Scenario: Entrepreneurship evolves to become the enabler of transdisciplinary formats, integrating all disciplines.
3. Adaptive-Learning Scenario: Adaptive Education evolves to become a central aspect on entrepreneurial universities with personalization of curriculum and learning experience supported by artificial intelligence tools.
4. Blended Scenario: Flipped-classroom evolves to take a central role in entrepreneurial universities with most content delivered online and international classrooms and international teamwork enabled by virtual reality.
5. Ecosystem Scenario: Co-creation evolves to become the central process in entrepreneurial universities enabling agile co-development and co-financing of research, teaching and service formats.

These scenarios are not mutually exclusive, being it a key aspect for its utilization assessment. The most positively assessed scenarios, based on the applied criteria (consistency, plausibility, pertinence and completeness) are propositions ‘4. Blended’ and ‘2. Transdisciplinary’. Experts agreed these scenarios are already a reality, at least in some contexts, or a likely pathway for HEIs in the short-term. This fact seems aligned with a sense of ‘urgency’ influenced by exogenous forces. However, it is still unclear if there is sufficient support for these to become the norm.

Experts did not perceive the remaining scenarios as promising as the previous ones. Experts considered Scenario ‘5.Ecosystem’ neutral, though a welcomed trend. Scenario ‘3. Adaptive Learning’ was considered inconsistent, while scenario ‘1.Worldwide’ was the least complete.

Overall, experts agreed that there are few potential losses in HEIs pursuing entrepreneurial pathways to address stakeholders expectations, as *“the greatest risk is in not developing a more entrepreneurial and value-creation mindset”*, since it might reduce *“the actual viability of institutions”*. However, when exploring and exploiting opportunities HEIs must be mindful

not to let “*energy dissipate in inconsequential projects*”. Hence, implementation is the key factor. Independently of the pathway(s) chosen, HEIs have the opportunity to “*increases centrality as engine of postindustrial knowledge-based society*”.

Implications

Results illustrate why HEIs cannot ignore or downplay endogenous and exogenous forces influencing them to engage in entrepreneurial ecosystems. As significant public resources fund schemes towards an entrepreneurial agenda, HEIs decision-makers shall acknowledge the influencing forces and pro-actively manage their institutions’ strategic development. To live up to future expectations, HEIs management need to find innovative ways to produce human, knowledge and entrepreneurial capitals.

The five scenarios proposed in this study provide valuable insights for HEIs to prepare for a number of plausible futures, framing decision-making agendas and supporting the generation of strategies to reduce risks, to take advantage of opportunities and avoid potential threats, identifying the best possible entrepreneurial pathway(s). Hence, marking a clear contribution to practice. Pragmatically, our study findings are ready for utilization, in e.g. analysis of opportunities and treats during strategic planning activities. However, independently of the pathway(s) pursued, the adopted implementation strategy shall be a key success factor, as each institution must develop its own ways, based on its individual context.

Notwithstanding, our findings are contextual and limited by potential partial and biased views, as entrepreneurial ecosystem stakeholders, as well as experts in higher education entrepreneurialism are partisans of HEIs transformation into entrepreneurial universities. In this sense, future research would benefit from the inclusion of different sets of stakeholders, e.g. controlling the sample for informants pro and against higher education entrepreneurialism. Furthermore, subsequent studies might test the feasibility, acceptability and sustainability of our findings against HEIs decision-makers advancement strategies to inform better the scenarios’ utilization phase.

Value and Originality

This reflection exercise intends to challenge conventional thinking and enable testing-contesting of courageous conversations around a wise future for the timely phenomenon of Entrepreneurial Universities. It proposes novel *insights* and *foresights* for policy-making and HEIs organizational development. It enriches the literature on HEIs entrepreneurialism,

adding a systematically developed global collective vision(s) for this timely phenomenon. It also contributes to entrepreneurship research by exemplifying how to apply futures thinking as a research method.

Keywords: Foresight, Entrepreneurial Universities

University assistance mechanisms in launching new academic spinoffs: a comparative analysis between the University of Amsterdam (NL) and the Free University of Berlin (D)

Jean-Regis Kunegel. Ph.D. candidate, Economics, Lumiere University Lyon 2 (Lyon, France), Laboratory Triangle (UMR 5206 CNRS); Ph.D. visiting scholar, Free University Berlin (Germany), Digital Entrepreneurship Hub & Profund Innovation.

Type: Original research – Empirical.

Knowledge transfer may take different paths for universities. Setting up spin-offs (USOs) based on university research is one of them. USOs may be defined as “new firms created to exploit commercially some knowledge, technology or research results developed within a university” (according to the definition set by Pirnay, Surlemont and Nlemvo, 2003).

A key feature of the USOs definition is the use of universities’ intangible assets developed within the university by academic scientists. An effective use implies university assistance in helping building a business around these assets (Rasmussen, Borch, 2010). In other words, launching science-based ventures is not just about science (Pisano, 2006). Many methodological tools exist to fulfill this purpose such as Intellectual Property (IP), business model (BM), business plan (BP) and different sort of seed and early stage funding. These tools are put closer to the academia sphere thanks to university affiliated organizations such as technology transfer office (TTO), proof-of-concept center (POCC), incubator and accelerator.

The parent organization plays a key role in spurring spinoff companies’ creations (Hayter, 2018; Slavtechev, Göktepe-Hulten, 2016). The entrepreneurial university is often contemplated in one very specific dimension such as university policies, university management, university incubation, university external network (Soetanto, van Geenhuizen,

2019 ; Riviezzo et al., 2019). Despite all their interests, many papers underestimate the need for science and business marketing to be dovetailed. This would give a deeper and more dynamic view of the process of converting technology into new products and services on the market. For entrepreneurs, creating and managing intangible resources are keys to foster new ventures scale-up (Presse, Terzidis, 2018).

I postulate entrepreneurial universities are those that adapt themselves at best to their ecosystem. In this sense, there is no one standard solution to become entrepreneurial (Etzkowitz, 2017). This is rather the combination of a deep understanding of the surrounding environment and the ability to create dynamic interactions and synergy through all layers embedded within an organization (institutional, organizational and operational levels) that thrive entrepreneurship (Presse, Terzidis, 2018).

My research aims to understand how entrepreneurial universities are organized internally to support at best USOs creations.

The university is my unit of analysis. I will lay out a comparison of two universities: the university of Amsterdam and the Free University of Berlin. They both present many common features. They are, notably, public, multidisciplinary, with a long-standing tradition of fundamental research, with an independent Medical Center, with a similar budget (roughly 600 million euros per year), a similar academic workforce (between 2.450 and 2.750 academics), the same number of enrolled students (between 31,000 and 32,000). In addition, they are both located in multimillion inhabitant's capital in highly innovative countries in continental Europe (the Global Innovation Index 2019 ranks the Netherlands fourth and Germany ninth). Nevertheless, the Free university spun off twice as many companies as the university of Amsterdam in the last five years. This suggests different internal organization and processes within the two selected universities.

Through a holistic approach, my research would take into account the interactions between the macro, meso and micro levels within the university and between the university and USOs. The university macro-level refers to the institutional features (university policies and overall strategies for the most part). The university meso-level relates the organizational characteristics, which concerns the TTO, POCC, incubator/accelerator, fab-lab and other related university establishments. These would also provide valuable insights for the understanding of the operational process, which is the micro-level of the two studied universities.

I employ an inductive approach in order to provide meaningful insights on the role of university business supports for new USOs launches. This is also an exploratory and qualitative method. This seems relevant for offering a broad and deep understanding. Such approach has not been frequently explored in this way in the literature.

The first research step was made up by the literature review and both formal and informal discussions with TTO's staff in both universities. I mainly talked with business developers and legal experts to get input about their missions, how they handle USOs creations and their related business matters.

The second step is a survey with many stakeholders involved in USOs creations. There are TTO's staff and other affiliated programs staff (such as fab-lab, incubator, public funding program and so on), the management of the university, academic scientists and spinoffs CEOs. I conduct one hour semi structured face-to-face or phone interviews. The goal is first to collect valuable input about new ventures launch with regard to knowledge transfer.

The third step is based upon a more refined analysis of trajectories of three selected USOs per university, in the life science industries. I carry this out during further in-depth interviews with founders of studied USOs. During these meetings, special attention is paid to the iterative process of business modelling and the university assistance to this regard. In the end I would have conducted at least 70 interviews (35 interviews per university).

In addition of these two sets of interviews, I collect secondary data for each university and spinoff, through official reports and patent and business databases, and other online publicly available information.

In each university, data collection will be followed by coding of all interviews. I already have achieved the full data collection of the university of Amsterdam. By June 2020, I will have achieved the same work with regard to the Free university of Berlin and the data analysis for both universities.

This research apprehends both legal and business supports universities may provide to foster USOs creations. I extract my conclusions from only two universities with specific features. To this extent, my results might not be generalized to all kind of universities all over the world. However, I expect to be able to share some recommendations to professionals (such as staff in TTO and university incubator/accelerator) and some understanding of knowledge

transfer operational issues in order to help policy makers in their supporting actions and reforms in favor of entrepreneurship and innovation.

Key words: Innovation, Industrial Economics, Technology Transfer, Entrepreneurship, Entrepreneurial university, Spinoff.

Experimenting in Organizational Periphery: Introducing Extra-curricular Entrepreneurship Education in Traditional Research University

Juha Tuunainen, Kari Kantasalmi & Sari Laari-Salmela

This paper improves understanding of the organizational experimentation in decision-making about entrepreneurial education in the transformation of a two different kinds of research universities. It applies a promising systems-theoretical approach in sociological organization studies to analyze university management from the point of view of decision-making communication. Aligning its work with Luhmannian organizational analysis the paper investigates how conditions of politico-economic environment are observed and interpreted by the management and how these translate into administrative-managerial decisions of the university aligning its educational programs with entrepreneurial expectations.

Among the main concepts that have addressed the reformation of the university organization is the idea about the entrepreneurial university, which claims that the universities are assimilating themselves with their external environments. Etzkowitz, for instance, emphasizes intermingling of science, politics and industry, and the resulting transformation of the university organization into an entrepreneurial one, which incorporates economic development alongside scientific research and higher education via hybrid structures of various kinds. Clark, in turn, delineates a managerial pathway to the entrepreneurial university using five elements that support the university's self-determination: the strengthened steering core, expanded developmental periphery, diversified funding base, stimulated academic heartland and integrated entrepreneurial culture. By these mechanisms, universities actively manage themselves to develop entrepreneurial responses in the face of new environmental demands, a trend which has been witnessed in many countries where

universities have turned into “organizational actors” or “complete organizations” in their own right.

Of these five elements of transformation, we address in this paper the first one, the strengthened steering core of the university. We do so because it fosters the development of experimental periphery by means of establishing mediating structures between the university and its societal environment thus potentiating quick and flexible responses to the environmental demands. What Clark and other authors addressing the university’s entrepreneurial transformation do not adequately consider is the organizational complexity of the university, which explains the strengthening of the steering core. In our view, this complexity does not refer to external causal forces but, above all, to the self-referentially produced internal complexity of the university, which leads to the diversification of the organization’s administrative-managerial structure. Thus, although Clark’s inspiring research point to the emergent self-regulation and self-steering of the university organization, it does not adequately conceptualize the evolving administrative-managerial operations within the university. To provide this, we approach the threefold university organization, which includes science, education and administration, by means of Baecker’s “systems primer,” but with more detailed insight into the inner differentiation of the university’s administrative-managerial decision-making, its newly arranged societal context, and related observational variance in how to adequately respond to the societal expectations to enhance entrepreneurship education.

Our emphasis is thus on analyzing and discussing novel organizational forms designed to advance entrepreneurship at the interface between the university and society. We focus on the university’s administration office, which is in need of a detailed analysis of the ways in which its different branches (i.e., teaching, research, public relations, human relations, finances and real estate) process the societal expectations directed at developing entrepreneurship education within the organization. We observe the ways in which these administrative branches selectively use available information to absorb environmental uncertainties in decisions about the new forms of extra-curricular entrepreneurship education, which are easily at odds with the traditional discipline-based educational programs of the university.

Focusing on two case examples – Helsinki Think Company (University of Helsinki) and Business Kitchen (University of Oulu), both of Finland – that exemplify “enhanced developmental peripheries” of the university, we address the trend in higher education to

organize university teaching programs according to optional credit units. Barnett, for instance, points out that there are new kinds of modular curricula, which from the point of view of administrative decision-making imply intensified oscillation between the discipline-based design of teaching and competence-based curriculum development. For us, such a development suggests that the university is a loosely coupled organization where disciplinarity of scientific knowledge cannot assume tight binding with the selection of knowledge contents offered by the university's educational programs. Academic degrees, however, can have binding consequences to a variety of career opportunities via providing means of labor market inclusion and exclusion. Thus, credentialing performances of higher education offer ample potential for societal coordination via labor markets across function systems of education, science and entrepreneurship.

The design of the forms of education in the sites studied here illustrate the organizational decision-making within the university in terms of creating a temporal leeway for widening the scope of possibilities also for designing the university's educational credit programs. The other side of the coin, however, is the fact that the increasing variation of educational content increases the need for administrative capacity to absorb uncertainties in the university's decision-making communication. This, in our view, turns the administrative attention on the temporal dimension of how education and science are organized within the university to potentialize the "creation of possibilities for change beyond the presently imaginable". Based on such assumptions, our paper analyzes the complexity of decision-making about entrepreneurial education in the Universities of Helsinki and Oulu.

Characterising universities' role in the implementation of Structural Funds Operational Programmes: Reflections from four European case universities

Maria Salomaa, PhD Research Fellow, Lincoln International Business School,
msalomaa@lincoln.ac.uk

Introduction

Current EU policies place an increasingly important role in supporting national and regional R&D activities and innovation systems (European Commission, 2010). Cohesion Policy implemented through national Structural Funds (SF) Operational Programmes are among the key tools for supporting local level innovation to reduce economic and social disparities in the EU (EU 1301/2013). Currently, the programme level approach is dominated by the smart specialisation concept, which promotes a more place-based strategy for regional development (McCann and Ortega-Argilés, 2015). In parallel, the role of universities has become crucial both in regional innovation strategy formulation, especially in RIS3 processes identifying the regional priorities (e.g. Foray et al., 2009), but also in the implementation of these strategies (e.g. Santos and Caseiro, 2015). These strategies guide regional access to local European Regional Development Fund (ERDF) and European Social Fund (ESF) programmes, which can facilitate matching universities' research more closely with regional needs (Fonseca and Salomaa, 2019).

Universities are increasingly recognised as important actors in regional development (Charles et al., 2014) and a 'third mission' focused on engagement and external services has been acknowledged as an addition to the traditional core functions of teaching and research (Chatterton and Goddard, 2000; Jongbloed et al., 2008). Policymakers expect universities to facilitate entrepreneurship and technology transfer, binding the third mission to interaction with regional industry and society (Arbo and Benneworth, 2007; Roper and Hirth, 2005; Zomer and Benneworth, 2012), but this role of fostering regional entrepreneurship and economic growth may be challenging for universities (Gibb and Hannon, 2006).

Over the past two decades, the discussion has been widely dominated by the concept of the 'entrepreneurial university' (Clark, 1998; 2004; Vorley and Nelles 2009), which is strongly linked with universities' enhanced engagement role. The entrepreneurial university has been described as an organisation that embeds economic and social development more closely into research, education and technology transfer activities so that all three academic missions support one another (Etzkowitz and Klofsten, 2005; Etzkowitz, 2013). However, in practise, the volume of expected entrepreneurial spillovers from academia has not been realistic in recent policy frameworks, even more so in peripheral regions with a limited innovation capacity: In such regions, it has been suggested that the focus of innovation policies should be on supporting the absorptive capacity of local SMEs and promoting networking and knowledge exchange (Brown, 2016), which resonates well with ERDF funding priorities for programme period 2014–2020¹.

Previous studies indicate, that universities seeking to become more entrepreneurial should acknowledge that their regional contexts steer their engagement activities (e.g. Salomaa, 2019). Therefore it is important to identify how the third mission can be delivered on a micro scale instead of using the concept merely in ‘promotional terms’ (Lebeau and Cochrane, 2015). SF programmes can play an important role in the implementation of these activities: they enable universities to engage with a variety of local stakeholders and provide additional R&D funds, in particular in less-developed regions.

Even though universities are among the key beneficiaries of these funds (e.g. Spilanis et al., 2016), their role in the implementation of SF activities is a widely under-researched area. However, there is some evidence that they have contributed to creating the foundations of regional systems of innovation as well as having reinforced universities’ regional engagement (Charles and Michie, 2013). Taking part or leading Structural Funds projects may thus be a concrete way to engage with regional development and initiate entrepreneurial activities beyond spinoffs and other research spillovers.

The research questions set for this study is: How entrepreneurial universities can manage and deliver their regional engagement activities through SF programmes? A series of in-depth case studies from Finland, UK, Portugal and the Netherlands form a basis for creating a typology of different types of university-led SF projects. Examination of specific types of SF projects conducted by universities can reveal how universities can respond to regional needs in different national contexts while linking the projects to core missions, and how the management of these activities could be enhanced. A qualitative analysis of the university engagement with SF programmes in different national contexts identifies how universities can respond to regional needs while linking the projects to teaching and research, and how the regional and academic outputs from these activities could be optimised.

References

- Arbo, P. & Benneworth, P. (2007): *Understanding the Regional Contribution of Higher Education Institutions: A Literature Review*, OECD Education Working Papers, No. 9, OECD Publishing, Paris.
- Brown, R. (2016): *Mission impossible? Entrepreneurial universities and peripheral regional innovation systems*, pp. 189-205 in *Industry and Innovation*, 23:2.

Charles, D. (2016): The rural university campus and support for rural innovation, pp. 763–773 in *Science and Public Policy* Vol. 43, No. 6.

Charles, D. & Michie, R. (2013): Evaluation of the main achievements of cohesion policy programmes and projects over the longer term in 15 selected regions. Case Study North East England.

Chatterton, P. & Goddard, J. (2000): The Response of Higher Education Institutions to Regional Needs, pp. 475–496 in *European Journal of Education*, Vol. 35, No. 4.

Clark, B.R. (1998): *Entrepreneurial Universities. Organizational Pathways of Transformation*, IAU Press.

Etzkowitz, H. (2013): Anatomy of the entrepreneurial university, pp. 486–511 in *Social Science Information* 52(3).

Etzkowitz, H. & Klofsten, M. (2005): The innovating region: toward a theory of knowledge-based regional development, pp. 243–255 in *R&D Management* 35, 3.

European Commission (2010): *EUROPE 2020. A European strategy for smart, sustainable and inclusive growth*. Available at:

<http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf>, accessed 30th August 2017.

European Regional Development Fund and on specific provisions concerning the Investment for growth and jobs goal and repealing, Regulation (EC) No 1080/2006

<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R1301&from=EN>, retrieved 1st of August 2019.

Fonseca, L. & Salomaa, M. (2019): *Entrepreneurial universities and regional innovation: matching smart specialisation strategies to regional needs?* RUNIN Working paper series, 03/2019.

Foray, D., David, P. A., & Hall, B. H. (2011): *Smart Specialisation from Academic Idea to Political Instrument, the Surprising Career of a Concept and the Difficulties Involved in its Implementation*. Retrieved from EPFL website: <https://infoscience.epfl.ch/record/170252>

Gibb, B. & Hannon, P. (2006): Towards the Entrepreneurial University?, pp. 73–110 in *International Journal of Entrepreneurship Education* 4.

Jongbloed, B., Enders, J. & Salerno, C. (2008): Higher education and its communities: Interconnections, interdependencies and a research agenda, pp. 303–324 in Higher Education 56.

Lebeau, Y. & Cochrane, A. (2015): Rethinking the ‘third mission’: UK universities and regional engagement in challenging times, pp. 250-263 in European Journal of Higher Education, 5:3.

McCann, P., & Ortega-Argilés, R. (2015): Smart Specialization, Regional Growth and Applications to European Union Cohesion Policy, Regional Studies 49:8, 1291-1302.

Spilanis, I., Kizos, T., & Giordano, B. (2016): The effectiveness of European Regional Development Fund projects in Greece: Views from planners, management staff and beneficiaries. *European Urban and Regional Studies*, 23(2), 182–197.

Santos, D., & Caseiro, N. (2015). The Challenges of Smart Specialization Strategies and the Role of Entrepreneurial Universities: A New Competitive Paradigm. In Carmo Farinha, L. M., Ferreira, J. J. M., Smith, H. L. & Bagchi Sen, S. (Eds.), Handbook of Research on Global Competitive Advantage through Innovation and Entrepreneurship.

Salomaa, M (2019): Third mission and regional context: assessing universities’ entrepreneurial architecture in rural regions, Regional Studies, Regional Science, 6:1, 233-249.

Roper, C.D. & Hirth, M. A. (2005): A History of Change in the Third Mission of Higher Education: The Evolution of One-way Service to Interactive Engagement, pp. 3-20 in Journal of Higher Education Outreach and Engagement, Volume 10, Number 3/2005.

Vorley, T. & Nelles, J. (2009): Building Entrepreneurial Architectures: a conceptual interpretation of the Third Mission, pp. 284–296 in Policy Futures in Education, Vol 7. No. 3, 2009.

Zomer, A. & Benneworth, P. (2011): The Rise of the University’s Third Mission, pp. 81-102 in Reform of Higher Education in Europe, Enders, J., de Boer H.F. and Westerheijden, D.F. (eds.), Sense Publishers.

¹ https://ec.europa.eu/regional_policy/en/policy/how/priorities/, 1st Aug 2019.

Universities Resource Mobilisers for the ICT Sector Innovation in Chinese Cities

Sajal Kabiraj, Hämeen ammattikorkeakoulu Oy

Abstract

We explore Chinese universities' diversity and prestige in the city's ICT sector development. From the organisational prestige and diversity perspectives, it posits that the former universities mobilise explorative oriented resources and the latter types mobilise exploitative oriented resources. Based on a sample of 358 universities, four pairs of explorative-exploitative resources, and city innovation through ICT sectoral development. The empirical research supports it as follows. (i) The university prestige mobilises foreign capital investment to the city and diversity mobilises foreign enterprises. (ii) The university prestige mobilises state-owned-enterprises and diversity mobilise private-owned-enterprises ICT in the city (iii) The university prestige mobilises patents as output, and the diversity mobilises tacit knowledge of scientific personnel. (v) The university prestige mobilises managerial capital and diversity general human capital to the ICT development in the city. These explorative roles of prestige and exploitative roles of the diversity show the comparative of institutions as resource mobilisers.

Keywords: University-industry Proximity; University's prestige and diversity; FDI in the city; the ICT sector; Domestic enterprises; knowledge type; managerial resource

INTRODUCTION

Do universities play multiple roles in city innovation and development? This study explicates the explorative and exploitative absorptive capacity of the city, and it tests the moderation of the prestige and diversity of city universities in the ICT (information and communication technology) sector innovation in China. This focus of the research complements prior research that has left some gaps. For instance, one study links university research to ICT sectoral development ([Eesley et al., 2016](#)). This literature overlooks the explorative and exploitative paths, moderation of universities to other types of resources, and the sectoral

development at the city level because it focuses on a fraction of high-ranking universities. This focus includes the prestige path but excludes the diversity path of the university in the city innovation. This void raises a need for the proposition of whether and how universities contribute to city innovation ([Harrison and Turok, 2017](#)). Hence, universities bridge the gap between resources and the city.

The extant literature takes the supply side or the demand side of resources to bridge this gap. The supply side of the argument suggests that FDI contributes to city development. These studies link the amount and type of FDI to regional innovation. Some of these studies, conducted across space and time, explain that the spill-over effect from the FDI explains the variation in regional innovation. The demand side literature suggests that absorptive capacity and infrastructural development attract resources from FDI and domestic sources ([Shi et al., 2018](#)). For instance, developed regions benefit from FDI for innovation ([Huang et al., 2012](#); [Sun, 2000](#)), and knowledge diversity of the region further improves the role of the FDI in the regional innovativeness ([Wang et al., 2016](#); [Zhao and Zhang, 2007](#)). These studies emphasise the importance of regional development before the positive effects of FDI to avoid the inter-regional wash-back effect. Both perspectives focus on FDI supply side or regional absorptive capacity as the demand side.

Such focused studies leave the university type, city's absorptive capacity type, sector type, and moderated resource type to the city. In this research, we focus on explorative and exploitative universities for the city's absorptive capacity towards the ICT (information and communication sector), and four types of moderated resources. Explorative universities refer to their prestige, and exploitative universities refer to diversity in the city. The moderated resources come in four groups of explorative and exploitative dualities. First, the FDI amount correlates with exploitative and the FDI firms with exploitative activities. Second, the SOE links with explorative, and the POE links with exploitative resources. Third, codified knowledge in patents links explorative and tacit knowledge links with exploitative universities. Last, the managerial human capital links with explorative and the general human capital links with exploitative structures.

FRAMEWORK

The framework builds on the institutional framework of universities as a moderator of resources to the city. From a technical perspective, universities build the absorptive capability

of the city. This notion of absorptive capacity depends on explorative knowledge and exploitative knowledge ([March, 1999](#)). The explorative capacity builds searching and experimenting with new knowledge, and exploitative absorptive capacity builds on the test, refining and improving the existing knowledge for a practical purpose in the environment. For instance, with the ICT sector, the explorative absorptive capacity of the city emerges from scientific discoveries of new products or processes, and the exploitative absorptive capacity of the city emerges from development and improving the existing technologies for efficiencies ([Hong and Fu, 2011](#); [Wu, 2000](#); [Shi et al., 2018](#)). Together, universities in the city contribute to both types of absorptive capacity through different paths of sectoral development in a high-technology context. Hence, a city can have the explorative, exploitative, or ambidextrous absorptive capacity for its innovation and development.

The explorative university search for new knowledge takes risks, embraces uncertainty, and envisions managing the future. The exploitative university applies the existing knowledge, improves its efficiencies, avoids uncertainty, manages the cost, and conforms to existing norms of knowledge across space and history. Two mechanisms separate explorative and exploitative attributes for the two sets of universities. Explorative universities build on their prestige power, and they increase their discretionary decisions and actions. Prestigious universities interpret rewards versus risk based on their interpretative identity in their field. Their discretionary power gives them the confidence to evaluate future values against risks. In contrast, exploitative universities interpret their identities as followers and conformers the standards of knowledge in space and time. Thus, the exploitative university complements the city's exploitative absorptive capacity to mobilise resources for the innovation and development of the city in the ICT sector innovation.

ICT Sectoral Innovation

The ICT sectoral development enhances city capability through firms within and between sectors via explorative and exploitative paths. At the firm level, the evidence shows that the ICT ambidexterity enhances the adaptive organisational capability, suggesting that the ICT sector improves the the organisational innovativeness performance ([Lee et al., 2015](#)).

Likewise, at the aggregated level of analysis, the ICT sector contributes to the city innovation. For instance, conducive cities attract explorers and exploiters of knowledge for entrepreneurial activities, as it appears in the case of Silicon Valley. Since the late 1950s,

Silicon Valley has been pulling creative people and high-technology entrepreneurs in a variety of ways, improving multiple performance indicators in the region ([Jacobs, 1969](#)). These patterns of ICT development enhance geographic conditions to attract people, firms and industries from other regions.

An evidence from Germany reveals similar patterns of the ICT-based clusters of firms in support for regional innovativeness ([Maurseth and Frank, 2009](#)). A comparative study between Germany, the UK and Italy shows that ICT improves regional absorptive capacity for a better innovation ([Santangelo, 2002](#)). Evidence from China supports the role of ICT in cities towards attracting resources ([Hong and Fu, 2011](#); [Wu, 2000](#); [Shi et al., 2018](#)). In China, firms and their contributions to absorptive capabilities of the region attract foreign firms, leading innovation in the ICT sector in the city ([Hong and Fu, 2011](#)). Some Chinese researchers link FDI to urban growth through the role of FDI in innovation the city ([Wu, 2000](#)). The studies address a variety of questions that offer similar logic explaining the direct and indirect role of FDI, ICT and regional absorptive capacity in the innovation.

Going a step further in exploring the link between the factors of city innovation, some authors argue that a threshold level of regional development determines the flow of resources to regional development ([Huang et al., 2012](#)). The threshold level of development implies the city's absorptive capacity. Beyond the Chinese regional research attributed to the FDI in the technology transfer to selected regions, research from India shows similar patterns that regional clusters with high absorptive capacity of domestic firms fosters the technology transfer and regional development ([Hong and Fu, 2011](#); [Nepelski and De Prato, 2015](#); [Wu, 2000](#); [Shi et al., 2018](#)). These studies show that the regional absorptive capacity complements the FDI in regional development.

Another set of studies links the ICT to the regional absorptive capacity through the technical perspective and the organisational perspective. From the technical perspective, the ICT devices business cluster in innovative regions and ICT services production clusters in larger urban areas. From the organisational perspectives, the key individuals form bridges between the ICT and the local environment. For instance, a typical role of the chief technology officer (CTO) serves these bridges between internal technology development with external environmental evolution. Likewise, inter-firm relations plan the internal and external environment within the region in the ICT towards the regional absorptive capability ([Wang and Lin, 2013](#)). One visible performance of the ICT sector relates to the efficient delivery of

services to the public from governing agencies ([Constantinides and Barrett, 2015](#)). This way, the ICT sector enhances the participative development of the city by reducing unnecessary barriers, contributing to social inclusion ([Van Winden, 2001](#)), resulting into the efficient and effective transfer of knowledge from the supplier to the user.

The ICT sector symbolises the absorptive capacity and its functional role in regional development, which leads to the sources of ICT sectoral innovation. The literature on the ICT sectoral development draws on the university-industry paths of technology transfer, and. In the former case, universities contribute through knowledge resources such as intellectual capital, and the latter case, university mobilise other resources. For instance, in the pharmaceutical sector, universities play a direct role, and in the ICT sector, they play a secondary role in regional development. Likewise, universities bridge other factors necessary for innovation in the city. Together, universities mobilise development resources to the region, moderating foreign capital, entrepreneurial capital, intellectual capital and managerial capital. In mobilising those resources to the city, universities play a dual role: first, they make up the knowledge-based of the region, and second, they transform internal and external knowledge into the regional development.

By extending the prior literature that explains regional development through the lenses of universities as a mediator to the absorptive capacity of the region, the following sections develop an argument to support hypotheses on the moderating role of the university in the city. In this role, the argument posits that the university in the city mobilises FDI, entrepreneurial structure, intellectual capital and managerial capital to the city. We have considered FDI from OECD countries to China in the ICT sector as Chinese exports in the ICT sector to OECD and other countries. Both the inflow of FDI and outflow of products stem from explorative R&D and exploitative commercial activities near universities. Supplementary figures (S1 and S2) show trends of FDI and exports in the ICT sector.

Explorative versus exploitative universities

Explorative universities mobilise one type of resources through their prestige structure, and exploitative universities mobilise another type of resources to the city through intensity in the city. The prestige university mobilises the explorative dimension of the critical resources, and the intensity of universities mobilises exploitative resources. Among other resources, knowledge plays a central attractor in the university-industry proximity and flow. This flow

of knowledge and alternative paths to the city development occurs through proximity, firms' absorptive capability, and the city ecology ([Kloosterman and Lambregts, 2001](#)). Evidence from the Netherlands shows that the university-city development relates to the geographical proximity and university-industry network ([Ponds et al., 2010](#)). Likewise, a study from Europe and China show that firms' capabilities circulate the knowledge resources in regional development ([Hong and Fu, 2011](#)). Most authors support the view that universities play a leading role in this knowledge flow to regional development ([Boucher et al., 2003](#)).

Besides providing direct knowledge to technological advancement in the region, universities mobilise, mediate and connect societies ([Addie, 2016](#)). For instance, universities create city status, and the city status attracts creative people, direct investment, and social attention. While high-ranking university attracts the city image and symbolic value more than technical development, the city offers prestige to the university through various developments. For instance, universities highlight regional identity and induce inter-university competition between regions development ([Boucher et al., 2003](#)). Likewise, universities shape societies, create awareness for social issues ([Addie, 2016](#)). Foreign and domestic flows to the city because universities mediate resources in high-technology sectors. Table 1 facilitates the paths of hypotheses.

Insert Table 1 About here

FDI and city innovation

The FDI flows to the city because prestigious universities mediate foreign capital investment to the city and diverse universities mediate foreign firms to the city. The prestige path attracts explorative FDI, and the diversity path attracts exploitative FDI. The explorative FDI draws on financial capital investment, and the exploitative FDI draws on the contractual agreements of foreign firms. Most explorative FDI reflects R&D investment, and most exploitative FDI reflects business exploitations. Since the FDI capital measures the monetary amount invested in the city and the FDI enterprises reflects complementary resources, the FDI divides into these two dimensions. For instance, a small set of large firms invests a large amount of capital in the region, and many small firms invest a limited amount of capital. The capital invested shows the R&D focus, and firms' entries show peripheral support in the sector, we

draw the prestige path for explorative FDI resources and the diverse path for exploitative FDI resources as relative positions in the city in the ICT sectoral development.

Prior literature offers support for the university's prestige and explorative FDI and universities diversity for exploitative FDI. Studies on the explorative FDI suggest that the capital invested in the location promotes R&D activities ([Ambos, 2005](#)), which implies that the foreign investment through equity reflects explorative purpose in the development of a product for the home, foreign or host market. These investments also suggest that, even in manufacturing R&D that dominates in China, scientific experiments link university orientated science to the firm. A survey of foreign top-100 firms shows that 60% of them originate from ICT sectors, and they interact with top universities in the city. Microsoft, Intel and others fall into this category. The flow of small and medium firms to the city implies that they enter the value chain to exploit resources through contractual development, using knowledge and skills supplied in the city ([Hong and Fu, 2011](#); [Shi et al., 2018](#); [Kloosterman and Lambregts, 2001](#)). This comparative proposition of the explorative FDI through the prestige factor exploitative FDI through the diversity factor induces the following.

Hypothesis (H1): *The university prestige mobilises foreign capital investment for explorative purpose and diversity mobilises foreign firms for exploitative purpose in the city innovation*

Entrepreneurial orientation and city innovation

Foreign ventures become a less significant player in China's innovation system, while both state-owned and collective-owned industries contribute to the creations of new products in China ([Sun et al., 2013](#)). In the change patterns of university-industry interaction in China, domestic enterprises come in two forms: state-owned enterprises (SOE) and private-owned enterprises (POE), and their governance structure reflects different incentives, purpose, and strategies. Although the SOE exists in every country in the world, its intensity and dormant role in China merits special attention. For instance, the SOE takes a dominant position in the industrial setting. The state becomes an entrepreneurial actor; it develops R&D policy in high-technology sectors ([Altenburg et al., 2007](#)); it streamlines human capital and skills for those industries ([Asuyama, 2012](#)). Thus, national institutions shape university-industry to science and technology development ([Malik and Huo, 2019](#)).

In Chinese universities and SOE's entrepreneurial state's support, prestigious universities receive state funding more than a less prestigious lot. For instance, the project-985 universities receive billions of dollars funding from the government, and these universities rank higher than a pool of other universities that engage in teaching and training of educations education ([Eesley et al., 2016](#)). In line with the prestigious universities, the SOE supports the high-technology policy of the entrepreneurial state ([Malik and Huo, 2019](#)). In contrast, private enterprises draw on resources from diverse universities specialised in different disciplines. They engage in teaching and replication of existing knowledge. According to this division between the university's prestige versus diversity and SOE versus POE, the logic suggests that the former mobilises the SOE to the city development and the latter mobilises the POE to the city development.

Hypothesis (H2): *The university prestige mobilises national state-owned enterprises for explorative purpose and diversity mobilises private enterprises for exploitative purpose in the city innovation*

Intellectual capital and city innovation

The city innovation needs two kinds of knowledge and two types of universities to mobilise it. The knowledge types vary on the explicit-tacit dimension, in which the explicit knowledge refers to the codification process and its economic viability, and the tacit knowledge refers to the experiential knowledge-based on individuals or collective routines ([Polanyi, 1967](#)). For instance, the codification of scientific discoveries in patents demands inflated the cost and economic incentives. The tacit knowledge personnel rests with the R&D scientists, engineers and technicians in the city. The creation of explicit knowledge comes from experiments and explorative activities, and the tacit knowledge forms through application and experience of doing things. These two knowledge dimensions have implications for the universities' duality.

In the Chinese contexts, the university prestige supports the explicit knowledge for patents because of the social support, endowed resources and autonomy to envision the future and make related decisions. These prestigious universities in China engage in explorative activities as science-based institutions of higher learning ([Wu, 2007](#)). Their endowed

resources support them to engage in entrepreneurial activities. For instance, a patent costs about \$ 20,000 ([Bessen and Meurer, 2008](#)), and the prestigious university and their enterprise partners engage in such high risk-reward ventures ([Sine et al., 2003](#)). On the parallel path, the intensity stream of universities produces tacit knowledge for exploitative activities. They produce professions such as engineers, accountants, doctors and scientific technicians. This diversity path of universities promotes experts in the city. Therefore, in relative position, the prestige mobilises explorative resources and diversity mobilises exploitative resources to the city.

Hypothesis (H3): *The university prestige mobilises codified knowledge in patents for explorative purpose and diversity mobilises tacit knowledge in personnel for exploitative purpose in the city innovation*

Human capital and city innovation

The managerial versus non-managerial resources ICT sector development through two parallel paths. Prestigious universities mobilise explorative resources; therefore, they need to attract managerial resources. For instance, firms that engage in R&D source technology from universities, and the R&D of the firm depends on managerial decisions. This position links the university prestige to the managerial resource in the industrial development in the city. In parallel, the university intensity (number of universities in the proximity of the city) increases ordinary human capital—the knowledge workforce. Such diverse universities product a large workforce across disciplinary lines ([Abel and Deitz, 2012](#)). Universities produce and consume human capital in the city.

Besides these direct implications of the university for human capital development, they contribute to mobilising resources into the region, between regions, and between countries ([Boucher et al., 2003](#)). In China, Beijing and Shenzhen regions show the broader roles of universities through their prestige and diversity for the city development. The university prestige has a long history in mobilising multiple types of resources to the region. For instance, the leading universities in the education sector support the research and science production; emulating universities follow in teaching and practice. For instance, high prestige produced managerial human capital, and low prestige (number of universities) produce

ordinary human capital—the labour force. Based on these analogies, we draw inferences that the prestige of the university mediates the managerial resource for the ICT sectoral innovation and city development.

Hypothesis (H4): *The university prestige mobilises managerial resources for explorative purpose and diversity mobilises human capital for exploitative purpose in the city innovation*

METHODS

The context of the research falls into four contextual levels. These contexts refer to the region associated with the city, sector based on ICT development, universities associated with reputation versus diversity, and resources based on explorative versus exploitative types. By combining the ICT sectoral and location context, the literature shows a link between the high-technology sector ([Maurseth and Frank, 2009](#)) and clustering of ICT firms in the region ([Nepelski and De Prato, 2015](#)). Between the resources and ICT development as an indicator of the city development, universities appear intermediaries in high-technology sectors, in the biopharmaceutical sector and often in the ICT sector. These subtle interactions rationalise the contextual elements and methodological design.

Three stages mark the methodology process. The first stage drew insights from observations and interviews across regions over an extended time, from 2013 till this report. The second stage shifted to the literature on regional studies, high-technology sectors, university-industry relations, and foreign direct investment. The third stage led to secondary data for analysing the developed propositions. This methodological process explains the socio-technical development, relevance, importance and procedures. These spatial and temporal dimensions of the research methods enabled pulling data from multiple resources, which appear in the list below.

- Web of science: Scientific data for secondary analysis.
- World Bank: International data
- CEIC (Consensus & Economic Information Centre): Regional data
- Factiva: Media attention

- Osiris: Listed enterprises
- Zypher: Equity investment
- MOE: Chinese Ministry of Education
- Websites of the university: Relevant information
- Interviews /personal visits to university-industry links in regions.

Variables

Dependent variable: The dependent variable measures the ICT sector innovation in Chinese cities in two stages. In the first stage, we used the growth of ICT enterprises in the city. Some earlier studies have used the entrepreneurial activity in the region as an indicator for the sector development. In China, the researchers have used ICT development as a measure of city innovation. We used a factorised version of the dependent variable. In this version, we estimated a composite variable from seven measures of the ICT sector in the city. The factorised measure conforms to the institutional framework at the sectoral system introduced earlier in the article. Table 2 shows the factors in the composite dependent variable.

- Number enterprises in the ICT sector in the city
- Employee size in the computer services and software industry city
- Wages of the workforce in the ICT in the city (100 million yuan)
- The average salary of the personnel in the ICT sector in the city
- Fixed assets investment in the ICT sector in the city (100 million yuan)
- Fixed assets investment in services/software industry in the city (100 million yuan)
- Fixed asset investment growth in the ICT sector in the city (100 million yuan)

Independent variables: The independent variables, which become interaction variables for their moderating roles, include the interaction between two types of universities and four pairs of resources. Table 2 shows their types, measurements and interaction. Except for the FDI capital measured monetary units (US\$), all other units show count variables.

Insert Table 2 about here

Control variables: The first control variable measures the city population because the size correlates with resource endowment, and the backwash effects of such dominant region pull resources from smaller regions. The second control variable measures the count of the postgraduate level of education in the city population. The third control variable measures the count of the undergraduate level education in the city population. The postgraduate level education reflects research-based learning, and the undergraduate education reflects instruction-based learning. The former type can influence prestige, and the latter can influence diversity hypotheses. Fourth, the set of independents become control variables when included in the analysis.

Analysis:

Two measures for the ICT sectoral development demanded two types of regressions. The first measure based on the count of ICT firms uses its compatible Poisson Loglinear model in the Generalised Linear Model (GLM). The second measure based on the factorised function of analysis used the GLM linear regression because of the continuous dependent variable.

$$innovation = \alpha + \beta(universities\ type \times resources) + \gamma X + \varepsilon$$

Innovation: The dependent variable measures the ICT sector innovation in Chinese cities.

α : Constant

universities type: two indicators of types of universities, i.e., diversity and ranking

resources: four pairs of resources, i.e., foreign firms and foreign capital, privately owned enterprises and state-owned enterprises, scientific personnel and patents in the city, employees in the sector and managers in the city

β : Vector of coefficients of interest

X : Vector of control variables

γ : Vector of coefficients of control variables

ε : Estimation error

RESULTS

The results presented in the tables below build on several background figures in supplementary material, referred to as supplementary figures and their respective sequence, S3 to S7). These charts show categories of Chinese universities (2394). Beijing and Shanghai have 3.6% and 2.8% respectively. Among these disciplines, the top spot goes to engineering universities (35), followed by comprehensive universities (24%), leading to business universities (10%). The share of other disciplines takes a lower position. Science, engineering and business disciplines, engineering and business disciplines lead in China, and social sciences lag in the Chinese higher education system ([Malik and Huo, 2019](#)). From the university type to an industrial firm's development, the next chart in S4 provides noticeable differences in the ICT sector.

Before 2011, foreign direct investment leads in the ICT sector, and after 2011, the domestic investment takes over foreign direct investment. This contrast between the foreign and domestic investment shows two noticeable points. First, the ICT sector shows a gradual development; second, national development takes over foreign direct investment in China. Furthermore, foreign investors prefer stakes (64%) to joint ventures or wholly owned modes (26%) in the ICT sector firms. In comparison, domestic investors prefer a balanced investment: 50% in wholly owned or joint ventures and 50% minor equity stakes shows healthy patterns of the ICT sectoral development nationally and internationally. The supplementary data in S5 shows these preferences for high or low equity in the ICT sector.

The ICT sector has two distinctive categories: the software and the hardware. As the essence of this research, we have divided the ICT sector in these two patterns of development in China. The software part of the business takes 35% of the sector, and hardware part of the sector takes 65% of the share of the enterprises. As intuitively expected, the Chinese ICT sector leads in the hardware. Towards the end of these background data detailed in supplementary charts, we include a contrast between the university and industrial development in China on the temporal line.

In this contrast between the university system and the entrepreneurship system, on the temporal line (1999 to 2016), the entrepreneurial system grows faster than the university system up to 2010, and afterwards, the university development takes over the industrial entrepreneurship proportion measures. The two trend lines interact in 2010 when the increase in universities proportionally increase in the entrepreneurial firms in the country. These background charts support the results presented in the tables.

Table 3 shows summary statistics of the dependent variable and independent variables. The dependent variable consists of seven measures of ICT categories, and we factorised these variables into a single dependent variable. The independent variables show a summary of six main predictors and control variables.

Insert Table 3 about here

Table 4 shows the inter-variable correlations. Some correlations appear higher than 70% and others lower than 30%. However, we expected that because of interaction effects we proposed and tested in the main argument. These interaction effects suggest that many factors interdependently influence ICT sector development in the city. The generalised linear model (GLM) handles these correlations.

Insert Table 4 about here

Table 5 shows two types of results from the GLM (generalised linear model). The first type applied the GLM log-linear, it shows estimated Odd Ratio, and it uses the dependent variable as the count of the ICT firms in the city. The second type applied the GLM linear, it shows estimated coefficients, and it uses the dependent variable as a continuous variable based on the factor drawn from seven inputs for the ICT sector development in the city. The two types show similarities and slight differences. They differ because of the different dependent variables, models and statistical significances variables, models and statistical significances. Compared to the first model attributed to the GLM log-linear, the second model attributed to

GLM linear shows that the university ranking (quality) and diversity in the city show either non-significant or negative results. These main effects suggest that the direct contribution of the university to the ICT sector and city development has limited implications. Instead, the indirect effects of universities moderate many other factors. We test those moderating effects of the universities' quality and diversity in the next table.

Insert Table 5 about here

Table 6 shows the interaction effects of the university's quality (national ranking) and diversity in the city. The interaction effects of these two attributes of universities serve two purposes. First, the interaction effect accounts for the universities ranking and size in the city region. Second, the two moderators (university ranking and university intensity) interacted with four types of resources, producing four pairs. Based on these interactive paired-conditions, we used the GLM linear model, which shows results in four models in Table 6.

First, universities moderate the FDI flow to the ICT sector in the city development, and prestige path affects the FDI capital comparative more than FDI firms and vice versa. Based on the complementary analysis, we analysed alternative combinations and confirmed that the proposed paths outperform the alternative paths. Second, the university prestige mediates state enterprises, and the diversity path mediates private enterprises in the domestic setting. The GLM linear analysis in Model 2 supports these alternative hypotheses. Third, prestige moderates codified intellectual capital and diversity path moderates tacit intellectual capital attributed to personnel. Last, the prestige path supports managerial capital and diversity path supports ordinary human capital. Based on these findings, a contextualised interpretation amplifies the theoretical and empirical relevance.

Insert Table 6 about here

DISCUSSION

In regional studies and economic geography, several scholars have drawn attention to the role of universities in the city's innovation and development. From the city's perspective, the

current research links knowledge flow to the city for social-technical development ([Wu, 2000](#)), and from the university's perspective, scholars explore whether and how universities contribute to the innovation of their cities. A third perspective combines the two perspectives into university-industry interaction and regional development. The mediating role of universities between the resource flow and ICT sector innovation in the city integrate two types of resources (explorative and exploitative) with two types of universities (high-rank and diversity). The study uses an institutional approach to delimit the focus on types of resources, university and sectoral innovation.

We focus on FDI, domestic enterprises, knowledge and human capital. Each of the four types further divides into two comparable categories because of the duality of universities. We divided them into prestigious and diverse categories. The prestigious universities refer to high-ranking institutions, which attract the explorative dimension of the resources. The diverse universities refer to distinct types of institutions, which attract exploitative dimensions of resources. The prior research addresses this issue and focuses on the ICT system because the ICT development plays an enabling role in the socio-economic development in the region. Hence, the integrated framework justified by its delimitation for the university-city link design produced empirical results from 351 universities in China across multiple cities.

We show that the explorative path of prestigious universities and exploitative path of intensity of universities in the city in the ICT sectoral innovation. In mobilising FDI, the prestige path attracts foreign invested capital, and the different path attracts foreign businesses entries to the city. In mobilising domestic enterprises, the prestige path attracts state enterprise, and the different path attracts private enterprises. In mobilising knowledge type, the prestige path attracts patented knowledge, and the diverse path attracts tacit knowledge of R&D personnel. Lastly, in mobilising the human capital, the prestige path attracts managerial human capital, and diverse path attracts ordinary human capital associated with the skilled workforce in the city. These four enabling paths show alternative mobilising paths in the comparative advantage of one or the other path.

In similar perspectives on the universities prestigious and the purpose, several studies have addressed the university's role in regional development. Some literature supports our findings, some others compete it, and some offer mixtures. For instance, the university quality enhances university-industry, making a bridge for the knowledge transfer from

external and internal sources to the city development. Some researchers demonstrate that organisational prestige plays a role in the ICT sector development in the city ([Hong and Fu, 2011](#)). For instance, universities' entrepreneurial roles play essential functions in city development ([OECD, 2009](#)). For instance, universities integrate producers and users of knowledge in the city, and in so doing, they transform their environment ([Addie, 2016](#)). These views show the direct and indirect roles of universities and cities development.

From the secondary role of universities, the literature identifies mediating or moderating factors between the university and city development through innovation. [Boucher et al. \(2003\)](#) introduced three mediating factors. Following these lines of arguments, several - specific studies have addressed questions directed to the university as a moderator/mediator in regional innovation and development. Some touch on foreign firms access to the universities' R&D in China ([Young and Lan, 1997](#)). Others see foreign direct investment (FDI) and regional development in China ([Zhao and Zhang, 2007](#)). For instance, the FDI seems to be a direct contributor to the R&D spill-over in the city, leading to innovation and city development ([Wang et al., 2016](#)). In line with this argument, globalising the city argument suggests the development from the FDI perspective ([Wei and Lu, 2009](#); [Bathelt and Li, 2008](#)). The FDA perspective that the supply side of the knowledge, capital and activities contributes to the regional development faces the demands side of the regional development. More recently, university-industry Collocation in regional development, directly and indirectly, implies the role of resources and technology transfer ([Wu, 2000](#); [Shi et al., 2018](#)).

The demand side of the argument trails several dispersed views on the city's absorptive capability. For instance, one group argues that state-own and private enterprises contribute to the regional development that counters the Western assumptions of R&D patterns ([Malik and Huo, 2019](#)). The absorptive capability followers argue that Chinese regions lack internal capability; therefore, the external flow of innovation should be responsible for the existing development. Without internal skills, the city lags to transform external knowledge flow to the region. Because of these capacities and internal skills, the developed and large cities have comparative advantages in capturing the knowledge spill-over effects from the foreign technology flow ([Huang et al., 2012](#)). Some in the claim that the city absorptive capability creates a backwash effect by taking out the resources from other cities ([Crescenzi et al., 2012](#)). In a particular case of the information and communication technology sector, the absorptive capability matters in the innovation development of the location ([Sun et al., 2013](#)). These challenging variances in avows and veracities triggered the call for attention to the

university's contribution to the city development ([Harrison and Turok, 2017](#)), by combining these perspectives rather explicitly. We took this position in this paper and confirmed that universities moderate the effects of the FDI, firms' type, education level in the city, knowledge type and human resource type. Thus, universities contribute to the ICT sector in city development.

The study contextualises its findings from three theoretical perspectives. One perspective draws attention to the relationships between universities, firms and the state ([Malik and Huo, 2019](#)). From the university's position, it advances the position of the diversity measured as the population of the institutions of higher education. According to this position, it contributes to the view that diversity enhances absorptive capability through diversity. The population of different universities develop the city through the ICT sector more than the ranking of the university in China. Here, the findings counter two existing views. Asian cultures support ranking prestige of universities, and Chinese audiences strongly favour high-ranking institutions. The evidence suggests that comparatively, diversity technically contributes more to city development. From the firm's perspective, it implies that foreign and domestic enterprises respond to the knowledge resources and absorptive capability related to the needs of those firms. From the state's perspectives, although high-ranking universities dominate in some areas because the state funds their prestigious position, the diversity fosters better condition for the city's absorptive capability. This interaction between university, industry and state often refers an institutional innovation system ([Nelson, 2005](#)).

The other perspective compatible with this study refers to the national innovation system and its multiple versions. The national innovation system suggests that national innovation development depends on internal and external factors of interaction between organs of national institutions ([Nelson, 2005](#)). These interactions among national institutions apply to regional innovation system as much as it does to national innovation systems ([Nelson, 2005](#)). In particular, universities contribute to the national and regional innovation system in the frontiers of science and technology ([Hong and Fu, 2011](#); [Nepelski and De Prato, 2015](#); [Wu, 2000](#); [Shi et al., 2018](#)). We think that universities contribute to the absorptive capability of the city, making the city an adaptive, assimilative, and developmental entity in innovative technologies. Thus, this study extends the national innovation system at the city level of innovation system by linking the macro and micro contexts of innovation.

The third contribution of this study aligns with the sector level of the innovation system. ICT plays a dual role in city development by providing direct technology and attracting indirect resources ([Hong and Fu, 2011](#)). For instance, on the one hand, the ICT contributes information and knowledge resource to the absorptive capability of the city through learning, governance, and functional efficiencies. As an enabling technology, ICT also contributes to other fields in social and industrial development in the city. For instance, the absorptive capacity of the city pulls the FDI into the ICT sector on the one hand, and it transforms resources of FDI, enterprises, tacit knowledge, and human capital into the city's capability building. Overall, the university's contribution as an input node, bring between other sources and the city, and transformative mechanism shows positive contribution.

From the practical perspective, we suggest that the city planners should not overemphasise the role of prestigious universities in their ranks. Instead, the diversity of universities offers an ecology conducive to other sectors. For instance, FDI flow, state-owned enterprises, managerial resources and scientific personnel make up the capability of the city. in the ICT sector ([Hong and Fu, 2011](#)), this study offers a clear guide to understand when and where the university's prestige matters more than the university's diversity (ecology). In the Chinese context, our study avoids the conformance view proposed by most studies that support each other and the norms in the country. Instead, it offers fact-based suggestions so that development follows meaningful paths mother than mimicking patterns.

Some limitations come to the fore. First, unlike a panel data analysis that improves the quality of the theory, the static analysis of a cross-section data gives a snapshot picture. Second, the current study draws on the ICT sector, using explorative and exploitative resources as proxies. Third, the current study relies on data from China. Other countries may differ from the current focus; therefore, generalisation comes into question. Fourth, at the methodological level, histories of cities and specific policies leave some issues in assessing regional development.

REFERENCE

- Abel JR and Deitz R. (2012) Do colleges and universities increase their region's human capital? *Journal of Economic Geography* 12: 667–691.
- Addie J-PD. (2016) From the urban university to universities in urban society. *Regional Studies* 51: 1089-1099.
- Altenburg T, Schmitz H and Stamm A. (2007) Breakthrough? China's and India's Transition from Production to Innovation. *World Development* 36: 325-344.
- Ambos B. (2005) Foreign direct investment in industrial research and development: a study of German MNCs. *Research Policy* 34: 395–410.
- Asuyama Y. (2012) Skill Distribution and Comparative Advantage: A Comparison of China and India. *World Development* 45: 956-969.
- Bathelt H and Li P-F. (2008) Global cluster networks—foreign direct investment flows from Canada to China. *Journal of Economic Geography* 14: 45–71.
- Bessen J and Meurer M. (2008) *Patent Failure: How Judges, Bureaucrats, and Lawyers put Innovators at Risk* Princeton, NJ: Princeton University Press.
- Boucher G, Conway C and Van Der Meer E. (2003) Tiers of Engagement by Universities in their Region's Development. *Regional Studies* 37: 887–897.
- Constantinides P and Barrett M. (2015) Information Infrastructure Development and Governance as Collective Action. *Information System Research* 26: 1-24.
- Crescenzi R, Rodríguez-Pose A and Storper M. (2012) The territorial dynamics of innovation in China and India *Journal of Economic Geography* 12: 1055–1085.
- Eesley C, Li JB and Yang D. (2016) Does Institutional Change in Universities Influence High-Tech Entrepreneurship? Evidence from China's Project 985. *Information System Research* 27: 233-504.
- Harrison J and Turok I. (2017) Universities, knowledge and regional development. *Regional Studies* 51: 977-981.

- Hong J and Fu S. (2011) Information and Communication Technologies and the Geographical Concentration of Manufacturing Industries: Evidence from China. *Urban Studies* 48: 2339-2354.
- Huang L, Liu X and Xu. (2012) Regional Innovation and Spillover Effects of Foreign Direct Investment in China: A Threshold Approach. *Regional Studies* 46: 583-596.
- Jacobs J. (1969) *The economy of cities* New York: Vintage.
- Kloosterman RC and Lambregts B. (2001) Clustering of Economic Activities in Polycentric Urban Regions: The Case of the Randstad. *Urban Studies* 38: 717-732.
- Lee O-KD, Sambamurthy V, Lim KH, et al. (2015) How Does IT Ambidexterity Impact Organizational Agility? *Information System Research* 26: 243-472.
- Malik TH and Huo C. (2019) Entrepreneurial State vs Liberal Market: Chinese Comparative Advantage in the Transformation of National Science to Technology Artefacts. *Chinese Management Studies* doi.org/10.1108/CMS-07-2018-0600.
- March JG. (1999) *The Pursuit of Organizational Intelligence*, Oxford, Malden: Blackwell Business.
- Maurseth PB and Frank B. (2009) The German Information and Communication Technology (ICT) Industry: Spatial Growth and Innovation Patterns. *Regional Studies* 43: 605-624.
- Nelson R. (2005) *Technology, Institutions and Economic Growth*, Cambridge, Mass.: Harvard University Press.
- Nepelski D and De Prato G. (2015) Corporate control, location and complexity of ICT R&D: A network analysis at the city level. *Urban Studies* 52: 721-737.
- OECD. (2009) *Science, Technology and Industry Score Board*, Paris, Paris: OECD.
- Polanyi M. (1967) *The tacit dimension*, London: Routledge & Kegan Paul.
- Ponds R, van Oort F and Frenken K. (2010) Innovation, spillovers and university–industry collaboration: an extended knowledge production function approach. *Journal of Economic Geography* 10: 231–255.
- Santangelo GD. (2002) The Regional Geography of Corporate Patenting in Information and Communications Technology (ICT): Domestic and Foreign Dimensions. *Regional Studies* 36: 495-514.

Shi S, Wall R and Pain K. (2018) Exploring the significance of domestic investment for foreign direct investment in China: A city-network approach. *Urban Studies*
<https://doi.org/10.1177/0042098018795977>.

Sine WD, Shane S and Di Gregorio D. (2003) The Halo Effect and Technology Licensing: The Influence of Institutional Prestige on the Licensing of University Inventions. *Management Science* 49: 478-496.

Sun Y. (2000) Spatial Distribution of Patents in China. *Regional Studies* 34: 441-454.

Sun Y, Zhou Y, Lin GCS, et al. (2013) Subcontracting and Supplier Innovativeness in a Developing Economy: Evidence from China's Information and Communication Technology Industry *Regional Studies* 47: 1766-1784

Van Winden W. (2001) The End of Social Exclusion? On Information Technology Policy as a Key to Social Inclusion in Large European Cities. *Regional Studies* 35: 861-877.

Wang CC and Lin GCS. (2013) Dynamics of innovation in a globalizing China: regional environment, inter-firm relations and firm attributes. *Journal of Economic Geography* 13: 397-418.

Wang Y, Ning L, Li J, et al. (2016) Foreign Direct Investment Spillovers and the Geography of Innovation in Chinese Regions: The Role of Regional Industrial Specialization and Diversity. *Regional Studies* 50: 805-822.

Wei YHD and Lu YC, Wen (2009) Globalizing Regional Development in Sunan, China: Does Suzhou Industrial Park Fit a Neo-Marshallian District Model? *Regional Studies* 42: 409-427.

Wu F. (2000) Modelling Intrametropolitan Location of Foreign Investment Firms in a Chinese City. *Urban Studies* 37: 2441-2464.

Wu W. (2007) Cultivating Research Universities and Industrial Linkages in China: The Case of Shanghai. *World Development* 35: 1075-1093.

Young S and Lan P. (1997) Technology Transfer to China through Foreign Direct Investment. *Regional Studies* 31: 669-679.

Zhao SXB and Zhang L. (2007) Foreign Direct Investment and the Formation of Global City-Regions in China. *Regional Studies* 41: 979-994

Table 1: University-ICT sector interaction in cities

<i>University type</i>	FDI	Structure	Intellectual	Human
<i>Prestige</i> <i>(risk-taker)</i>	Foreign capital dollar	State-owned (SOE)	Patented technology	Managerial (strategy)
	<i>Equity investment</i>	<i>Long-term orientation</i>	<i>Costly patents, exclusivity</i>	<i>Position salience, discretion</i>
<i>Diversity</i> <i>(risk-avoider)</i>	FDI (Contracts)	Private-owned (POE)	Tacit knowledge (personnel)	General (practice)
				Emulation

Table 2: Variables defined

<i>Variables</i>	<i>Flow to the city</i>	<i>Measure</i>
Dependent variable	Factorised ICT development	Continuous
(1) FDI capital US\$	Foreign amount invested	Continuous
(2) FDI firms	Foreign enterprises entered	Count
(3) SOEs	State-owned enterprises	Count
(4) POEs	Private-owned enterprises	Count
(5) Codified knowledge capital	Patents applications	Count
(6) Tacit knowledge capital	R&D personnel	Count
(7) Managerial human capital	Senior managers	Count
(8) Normal human capital	Non-managerial skilled workforce	Count
University prestige (P)	Reputation ranking	Ordinal
University diversity (D)	Multiple universities	Count
<i><u>Interaction variables</u></i>		
Explorative FDI	(P)x(1)	Continuous
Exploitative FDI	(D)x(2)	Count
Explorative SOE	(P)x(3)	Count
Exploitative POE	(D)x(4)	Count
Explorative codified	(P)x(5)	Count
Exploitative tacit	(D)x(6)	Count
Explorative managerial	(P)x(7)	Count
Exploitative personnel	(D)x(8)	Count

Table 3: Summary statistics

Variables	Mean	Std. Dev.	Min	Max
Factorised (7 dimensions)	2.00	1.00	0.30	4.23
FDI firms	4.15	0.50	2.37	5.08
FDI firm's capital	2.60	0.60	0.28	3.61
Private-owned enterprises	5.65	0.35	3.84	6.19
State-owned enterprises	4.08	0.19	2.99	4.34
Scientific personnel	4.91	0.48	2.32	5.66
Patent issued (domestic)	5.01	0.47	2.85	5.71
Employees skill resource	5.01	0.40	3.47	5.71
Managerial resource	4.13	0.27	2.57	4.67
University (institutional) diversity	1.99	0.18	0.85	2.22
University (institutional) ranking	0.33	0.15	0.10	0.71
Undergraduates level knowledge	1.78	0.21	0.38	2.03
Graduates level knowledge	1.44	0.24	-0.04	1.77
Population of the location	4.59	0.25	3.45	4.96

N = 391; log of variables

Table 4: Inter-variable correlations

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
City ICT sector	1												
FDI Firms	0.20*	1											
FDI capital	0.21*	0.05*	1										
SOEs	0.22*	0.20*	0.21*	1									
POEs	0.20*	0.23*	0.20*	0.12*	1								
Graduates	0.49*	0.47*	0.62*	0.37*	0.44*	1							
Undergrad	0.44*	0.53*	0.50*	0.24*	0.39*	0.07*	1						
Patents	0.06*	0.16*	0.14*	0.21*	0.15*	0.47*	0.43*	1					
Sci-Personnel	0.17*	0.21*	0.19*	0.20*	0.15*	0.33*	0.31*	0.12*	1				
Managers	0.20*	0.11*	0.16*	0.17*	0.28*	0.68*	0.52*	0.19*	0.31*	1			
Univ. rank	0.80*	0.32*	0.16*	0.11*	0.11*	0.00	0.03	0.19*	0.12*	0.21**	1		
Univ. diversity	0.38*	0.51*	0.46*	0.20*	0.28*	0.07*	0.03*	0.03*	0.19*	0.49**	0.04	1	
Employees	0.13*	0.18*	0.22*	0.31*	0.24*	0.68*	0.63*	0.15*	0.03*	0.21**	0.19*	0.45**	1
Population	0.52*	0.41*	0.30*	0.45*	0.50*	0.05*	0.13*	0.53*	0.35*	0.24**	-0.03	0.33**	0.28**

City ICT sector = Factorised from seven dimensions

Variables = normalised by log

Table 5: GLM loglinear & GLM linear analysis

Variables	Odd ratio	Coefficient
	GLM loglinear	GLM linear
Constant	.7(.03)***	-20.4(1.3)***
Graduate level education	.9(.02)***	-7.4(.69)***
Undergraduate level education	1.3(.02)***	3.8(.78)***
Population in the city log	.3(.01)***	4.2(.36)***
FDI Firms in the city	1.5(.00)***	-0.8(.17)***
FDI Firms capital in the city	.6(.00)***	1.2(.14)***
State-owned enterprises	.8(.01)***	0.9(.43)*
Private-owned enterprises	6.3(.00)***	0.3(20)
Patents (domestic approved)	1.2(.00)***	2.1(.15)***
Scientific/technical Personnel	1.4(.00)***	-0.4(.170)**
Managers in the city	1.2(.01)***	-0.4(.26)
University count in the location	5.7(.02)***	-1.3(.67)*
University rank score	1.0(.00)***	0.2(.13)
Employees in the city log	.9(.00)***	-0.4(.13)**
Loglikelihood	4711566	743
DOF	13	13
Link function	Log	Identity
Dependent variable	ICT firms count	ICT sector development (factorised)

DOF = 15; N=391 (100%)

***p<.001

**p<.01

*p<.05

Table 6: Parameter Estimates

	Model 1	Model 2	Model 3	Model 4
	3.5(1.9)	9.6(2.5)***	.84(1.9)	9.1(2.4)***
s in the city	-4.6(.29)***	-0.5(.14)***	-.39(.14)**	-.45(.14)***
s capital in the city	0.5(.13)***	0.7(.12)***	.65(.12)***	.75(.12)***
ed enterprises	-0.3(.35)	-0.7(.42)	-.32(.37)	.39(.35)
owned enterprises	-0.1(.16)	-4.1(.40)***	.02(.17)	-.03(.17)
level education	-3.9(.60)***	-5.1(.61)***	-4.68(.61)***	-4.48(.61)***
duate level education	1.6(.64)**	2.4(.66)***	2.01(.660)***	1.84(.65)***
/technical Personnel	0.0(.140)	-0.2(.14)	-3.08(.25)***	-.10(.14)
domestic approved)	1.5(.12)***	1.7(.13)***	1.35(.15)***	1.59(.13)***
es in the city log	-0.1(.11)	-0.2(.11)	-.28(.11)**	-5.27(.37)***
in the city	0.6(.22)**	0.3(.23)	.489.23)*	.05(.27)
y diversity	-1.5(.50)***	-11.0(.970)***	-4.80(1.30)***	-4.12(1.8)*
y rank score	-7.5(.68)***	-10.5(2.6)***	-6.10(.67)***	-11.46(.93)***
n in the city log	1.9(.32)***	2.6(.33)***	2.19(.34)***	2.28(.33)***
firms)*(diversity)	2.2(.15)***			
capital)*(ranking)	0.6(.18)***			
owned enterprises)(diversity)		2.1(0.2)***		
ed enterprises)(ranking)		2.6(0.6)***		
c personnel)(diversity)			1.6(.12)***	
n city)(ranking)			.96(.26)***	
es in sector)(diversity)				2.6(0.2)***
s in city)(ranking)				1.0(0.4)**
hood	920***	884***	889***	901***

Dependent Variable: Factorised (7 dimensions; function=identity, normal distribution); error term in parentheses;

DOF = 15; N=391 (100%); ***p<.001; **p<.01; *p<.05

Steps Towards Innovation – Forces that Pushed the University-Industry Collaboration in Georgia

Teona Zhuzhunadze, Ilia State University, Georgia

Type: This paper is based on practical experience analysis. The main data for the paper is taken from the National Center for Educational Quality Enhancement in Georgia.

New authorization standards set new requirements for the HEIs in Georgia. The following paper presents the analysis of the practices of how they responded to the changes and reforms related to the setting ground for collaboration with the industry. This is one of the requirements of the standards. During this process experts' panel produces the reports. The reports are publicly available. Therefore, they will be used as the main data for this paper.

Introduction

Georgia has been in the process of transformation towards liberal democracy since the collapse of Soviet Union (Jibladze & Glonti, 2018). During last decade various reforms has been implemented in order to build a comprehensive system which enables country to develop politically, economically and culturally (Jibladze & Glonti, 2018). The policy developments such as Association Agreement (AA) signed in 2014 together with the Deep and Comprehensive Free Trade Area (DVFTA) Agreement builds a foundation for Georgia to fasten the development. R&D including research, innovation, higher education, intellectual property, etc. are the goals to be accomplished by Georgia according to international agreements (Shatberashvili, 2018). Thus, implementing innovation systems as one way to build strong economy on knowledge-based innovative activities (Lundvall, 2007) is main area of development for the country today. Georgia belongs to the Global Innovation Index (GII) lower-middle-income economies group. Chaminade and Moskovko in their article “Radical Institutional Change: Enabling the Transformation of Georgia’s Innovation System” (Chaminade & Moskovko, 2015) claim, that Georgia has been outperforming its lower-middle-income group peers in terms of institutions, human capital and

research, market sophistication and knowledge and technological outputs. The authors refer to Georgia as the country with an emerging innovation system. However, the article also expresses the need in complementing institutional change with efforts in other, less-developed aspects such as human capital, research capabilities, infrastructure and so on (Chaminade & Moskovko, 2015).

Higher Education Institutions (HEIs) are one of the important elements of innovation system creating the base for knowledge which can be translated into economic development (Etzkowitz, 2001). Changes and reforms are the part of the higher education in Georgia as well. One of the main forces that gave push to the HEI-industry collaboration is the implementation of new standards of quality assurance. In 2018 NCEQE of Georgia introduced the new accreditation and authorization standards (Order N99/N of the Minister of Education and Science of Georgia).

Purpose

New standards put extra attention to the HEIs collaboration with economic agents, industries and commercialization of research. Standards - 1st, 6th and 7th require from the HEIs to institutionalize “third mission” of the organization, to allocate relevant resources for the development of the research and to collaborate with economic agents too (www.eqe.ge). The 6th standard on research clearly states that the cooperating with economic agents is very important for the higher education institution in order to enhance research performance of its academic staff and encourage the process of commercialization of the research outcomes.

Since the introduction of the new standards, 28 higher educational institutions have been evaluated according to the new authorization standards in Georgia.

How HEIs respond to the reforms and try to institutionalize the “third mission” is the main aim of this paper.

Approach

For this article authorization experts panel reports have been taken as the data. In fact, these are the secondary data. The panel reviews are publicly available on the agency’s website.

The paper envisages the review of all 28 reviews in order to identify how HEIs responded to the governmental changes which pushed universities to think about the new ways to collaborate with the economic agents and fulfill the third mission.

The main approach is to see how the innovation is reflected in the mission and strategies of the HEIs.

The main model used in the paper will be Triple Helix in particular the model developed by Yuzhuo Cai where the Triple Helix combined with the insights of institutional logics (Cai, 2014). This model will be used as the tool to analyze how third mission of the universities have been introduced in Georgia and how it is institutionalized.

Findings or expected outcomes

The paper is not finished yet, so the main expected outcomes are foreseen to be the following:

- In Georgia the institutionalization of the Triple Helix model is far behind the ideal model. But the data shows that the first steps have been already taken.

Limitation/implications

The data taken for the paper is the secondary and the paper lack's people's voices.

Practical and/or Social implications

Despite the popularity of Triple Helix model, it has some bottlenecks related to less attention to the national contexts and other social settings. Therefore, according to the Yuzhuo Cai's article *"Implementing the Triple Helix model in a non-Western context: an institutional logics perspective"* (Cai, 2014), the Triple Helix model can hardly provide appropriate rationales in order to systematically study different empirical cases, in particular different national and cultural contexts (Cai, 2014). Thus, Cai suggested to enhance the context sensitivity of the Triple Helix by using insights of institutional logics (Cai, 2014). However, this model has not been tested in many non-western contexts except China. This is one of the reasons why this paper tries to imply the model different to the original one to study the non-Western context especially the one where the innovation systems are at the very beginning level of development.

Originality/Value

Triple Helix model in developing countries. In Georgia it the first study that examines the innovation systems from the point of view of the HEIs. Also, the study gives chance to test the impact of the QA new standards.

Keywords: Innovation systems; Georgia; Triple Helix; QA Standards

¹ <https://eqe.ge/res/docs/2019091213120399N.pdf> (Order N99/N of the Minister of Education and Science of Georgia)

References

Cai, Y., 2014. Implementing the Triple Helix Model in a Non-Western Context: An Institutional Logics Perspective. Triple Helix, Volume 1(1).

Chaminade, C. & Moskovko, M., 2015. Radical Institutional Change: Enabling the Transformation of Georgia's Innovation System. In: C. University, ed. Global Innovation Index Report. s.l.:World Intellectual Property Organization.

Etzkowitz, H., 2001. The Second Academic Revolution and the Rise of Entrepreneurial Science. IEEE Technology and Society Magazine, Volume 20 (2), pp. 18-29.

Jibladze, E. & Glonti, L., 2018. Higher Education Systems and Institutions, Georgia. Encyclopedia of International Higher Education Systems and Institutions, pp. 1-9.

Lundvall, B.-A., 2007. National Innovation Systems - Analytical Concept and Development Tool. Industry and Innovation, Volume 14 (1), pp. 95-119.

Shatberashvili, O., 2018. Reforms of Research and Innovation Systems in EAP Countries: 25 Years of Experiments in Georgia. ERENET PROFILE, XIII(No. 3), pp. 59-72.

[An overarching compendium on the determinants of University Students' Entrepreneurial Spirit in Italy](#)

Dr. Carlo Giglio, University of Calabria; Mediterranean University of Reggio Calabria

Type: Research design for studies in-progress

Purpose

This paper aims at investigating a comprehensive set of determinants of the students' entrepreneurial spirit within the Italian academic system. In detail, this study is geared to identify those factors impacting on the entrepreneurial spirit of university students as well as to rank them accordingly. This way, academics and policy-makers are provided with an insightful understanding of strengths and weaknesses of the entrepreneurial university in Italy, and policy gaps may be filled by means of ad hoc measures to be designed and implemented.

Design/Methodology/Approach

Data come from the survey carried out under the Global University Entrepreneurial Spirit Students' Survey (GUESSS) in 2016. It is an international project involving more than 50 countries and more than 1,000 universities globally. The questionnaire is administered online and a multi-level coordination structure exists in order to ensure methodological homogeneity and data reliability during the data collection process. The survey conducted in Italy provides a unique dataset including 4,446 valid responses from students enrolled in 39 Italian universities. Therefore, the sample utilized in this study covers 3.6% of the total population interviewed globally.

An overarching set of factors and variables is considered including (but not limited to): country- and cultural-level variables (e.g. nationality, birth country, living country); legal aspects and norms; study and academic career (e.g. study field, study seniority, study level, closeness to completion); societal environment (e.g. family environment, friends, fellow students, social environment); readiness to start a new business (e.g. timing of entry, new business as the main occupation, closeness to start); objectives and motivation for the new business; ownership level and commitment; co-founders solidarity with student-entrepreneurs; idea source; appeal of and interest in parental business; subjective norms (e.g. opinion of parents, relatives other family members, friends, acquaintance); tolerance to (entrepreneurial) risk; soft skills etc..

Data are analyzed through a Structural Equation Model (SEM), after performing an Exploratory Factor Analysis (EFA) and a Confirmatory Factor Analysis (CFA).

Findings or expected outcomes

The expected outcomes of this study are mainly geared to identify those factors significantly affecting the entrepreneurial spirit of university students within the Italian academic context.

Moreover, a ranking of the determinants of the entrepreneurial spirit will be provided in order to identify possible policy gaps. This way, academia and policy makers will be endowed with insightful guidelines on the design and implementation of ad hoc measures aimed at nurturing the entrepreneurial spirit of university students in Italy.

Limitations/implications

Despite the set of possible determinants considered in this study is wider than in other individual contributions in extant literature, still some factors or variables may remain uncovered. Moreover, possible moderating/mediating effects may remain unexplored. Finally, despite findings are related to a wide dataset – i.e. 4,446 valid responses –, attention should be paid if they are generalized and applied to other (non-Italian) contexts. Hence, this work paves the way for future research efforts on the entrepreneurial spirit of university students with a broader spectrum than the one adopted in extant literature.

Practical and/or Social Implications

The main implications of this work affect both the academia and policy makers.

On the academic side, universities (especially those operating in the Italian context) are provided with the identification of strengths and weaknesses related to the entrepreneurial spirit of their students. In detail, a sort of gap analysis is performed that identifies both areas of potential improvements as well as areas of excellence. As a consequence, each university may design and implement specific measures in order to foster the entrepreneurial spirit of university students.

On the policy making side, this study identifies possible areas of intervention that would need some reforms and/or investments in order to allow a whole country to achieve better performances in terms of fostering the entrepreneurial spirit of university students. Moreover, policy makers are provided with a prioritization of such areas and the corresponding policy reforms and investments.

Originality/Value

This work claims a twofold originality. First, it is based on a unique dataset that covers a very representative sample of the university students in Italy. Therefore, the corresponding findings are reliable and provide an insightful understanding of the investigated context. Second, to the best of our knowledge, the broad-spectrum structural equation model provides a more comprehensive study

than those in extant literature. In fact, it is composed of factors and variables that are thoroughly identified by building on an in-depth literature review.

Keywords: Entrepreneurship; Entrepreneurial University; Entrepreneurial Spirit; University Students; Structural Equation Modeling.

References

- Ramos-Rodríguez, A.R., Medina-Garrido, J.A., and Ruiz-Navarro (2019). 'Why not now? Intended timing in entrepreneurial intentions'. *International Entrepreneurship and Management Journal*.
- Bergmann H., Geissler M., Hundt C., and Grave B. (2018). 'The climate for entrepreneurship at higher education institutions'. *Research Policy*.
- Brändle L., Berger E.S.C., Golla S., and Kuckertz A. (2017). 'I am what I am – How nascent entrepreneurs' social identity affects their entrepreneurial self-efficacy'. *Journal of Business Venturing Insight*, Vol.9, 17–23.
- Laskovaia A., Shirokova G., and Morris M. (2017). 'National culture, effectuation, and new venture performance: global evidence from student entrepreneurs'. *Small Business Economics*.
- García-Rodríguez, F. J, Gil Soto, E, Ruiz-Rosa, I, and Gutiérrez-Taño, D (2017). 'Entrepreneurial process in peripheral regions: the role of motivation and culture'. *European Planning Studies*, Vol.25(11), pp.2037–2056.
- Campopiano, G., Minola, T., and Sainaghi, R. (2016). 'Students climbing the entrepreneurial ladder: family social capital and environment-related motives in hospitality and tourism'. *International Journal of Contemporary Hospitality Management*, vol.28(6).
- Minola, T., Donina, D., and Meoli, M. (2016). 'Students climbing the entrepreneurial ladder: does university internationalization pay off?'. *Small Business Economics*, vol.47(3), p.565-587.
- Sieger P., Gruber M., Fauchart E., and Zellweger T. (2016). 'Measuring the Social Identity of Entrepreneurs: Scale Development and International Validation'. *Journal of Business Venturing*, 31(5), 542-572.
- Maresch, D., Harms, R., Kailer, N., and Wimmer-Wurm, B. (2015). 'The impact of entrepreneurship education on the entrepreneurial intentions of students in science and engineering versus business studies university programs'. *Technological Forecasting & Social Change*.

The Impact of University-Industry Collaboration on Absorptive Capacity in Moroccan Context: A Macro Level Perspective

Rabii Outamha, Faculty of Law Economic and Social Sciences, University of Hassan II,
Casablanca, Morocco

Abstract

The role of university-industry collaboration in economic development is becoming. Universities play an enormous role in the knowledge production system, and industrial organisations exploit the outcomes the most. Consequently, both parties have to be connected to generate synergy using collaborative mechanisms. Literature is rich discussing several aspects of university-industry collaboration such as the outcomes. Both parties can benefit from collaboration and the process could result in a significant improvement in the innovative capacity, in competitiveness as well as in technological and professional development. However, the effect on absorptive capacity is not much investigated and little is known about the relationship of the two concepts. Firms should pay attention to the evolution of their environment and update their knowledge regarding all the aspects that would allow them to maintain their competitive advantage, which requires a high level of absorptive capacity. Universities should do the same in order to update their strategy regarding research and education to have a greater impact on absorptive capacity of graduates. Our research is exploratory aiming to build a conceptual understanding of the relationship between the two concepts, and find out empirically whether there is a linear relationship between university-industry collaboration and absorptive capacity in Morocco at the macroeconomic level using proxies. We have opted for a correlational research design with a longitudinal dimension based on secondary data extracted from the Global Innovation Index reports. We have studied the change of indicators related to our research question since 2011 in order to have an idea about the state of the art of each variable. Then, we have analysed the collected data to determine if there is a correlation between the two variables through simple linear regression. Results have shown a positive correlation between the two variables which confirmed our assumption about the impact of university-industry

collaboration on absorptive capacity. We got an idea about the current situation of these phenomena, and we have explored their evolution from 2011. Results could be beneficial for university as well as industry in order to bridge the gap and take in concern absorptive capacity as a crucial element for their development. Despite the insights that this research has offered for a better understanding of these concepts in the Moroccan context, our research manifests many limits and paves the way for several research perspectives.

Keywords: University-industry collaboration; Absorptive capacity; The Global Innovation Index.

University-Industry Relationship through Knowledge Transfer Organizations in developing countries: Evidence from an Argentinian Local Innovation Ecosystem

PhD candidate Ian Hülskamp, Universitat Oberta de Catalunya (UOC), Argentina

Type: Research design

Abstract

As knowledge has become a fundamental asset to enlarge productive capabilities and boost economic productivity, the interaction between Public Research Organizations (PROs) and firms has also multiplied its relevance. Given their innovative competences, these institutions have been increasingly pressured to strengthen their collaboration. Even if existing results are not conclusive, in developed countries diverse studies and programs were implemented and assessed, suggesting positive outcomes under certain conditions. In spite of this, available evaluations have not yet reached the specificity of developing countries. Therefore, from a systemic perspective, which considers geographical and institutional arrangements, this paper explores University-Industry Relationships (UIR) within the Local Innovation Ecosystem around the Argentinian city of San Carlos de Bariloche. The analysis concerns complementary sources of data, which were structured around a set of interviews performed with the managers of Knowledge Transfer Organizations (KTOs). Results suggest an unarticulated system, concentrated on capturing funds and affected by normative national structures. Plausible policy recommendations and future research prospects are also included.

Keywords: university-industry relationship, innovation ecosystems, developing countries

Extended abstract

The importance of knowledge as a productive factor has been growing fast during the last decades, and this trend is expected to continue (Adler, 2001; Benkler, 2006; Jaffe and Trajtenberg, 2002). Due to the complexity that the production of knowledge has acquired, it has become a collective process with emerging properties, which is not determined by brilliant individuals but by interdependent systems of exchange, transmission and recombination of diverse bits of specialized knowledge (Hausmann et al., 2014; Nielsen, 2011). How this knowledge is transformed into productive capabilities, innovation or technological change has been largely discussed with conflicting views, however it necessarily implies a process of transmission and subsequent diffusion (Dosi, 1982; Hodgson, 1998; Rogers, 2010).

Processes of knowledge production and exploitation are embedded within systems of institutions and individuals, concerning various geographical levels. As a consequence of a multiplicity of factors, including externalities derived from the same qualities of knowledge, these institutions tend to geographically agglomerate, situating close to each other (Cooke, 2001). This closeness favors the interaction between agents, allowing the expansion of the system's productive frontiers by diffusing existing capabilities and producing new knowledge (Hardy et al., 2003; Mowery et al., 1996; Powell et al., 1996). A region loaded with intensively interacting knowledge-based organizations can also improve its position within a global competitive environment.

Two main institutional players stand out within these innovative ecosystems. On the one hand, firms are the main exploiters of knowledge which are therefore in charge of translating it into economic value (Nelson, 1993). On the other hand, Public Research Organizations (PROs), including both universities and public research institutes, are the main producers and diffusers of knowledge inside the whole institutional setting (Etzkowitz and Leydesdorff, 2000). Concerning their characteristics, the interaction between these sectors has been studied and encouraged in order to foster regions' innovative capabilities. Promoting their collaboration is however a sensitive issue since achieving mutual understanding implies deconstructing deep-rooted traditions (Sábato and Botana, 1968). Culture, language and other specific barriers emerge throughout the interaction

process given that both parties hold, in many respects, conflicting viewpoints (Boisot, 1998; Carayannis and Campbell, 2009).

Assessing this interaction and its impacts is then a complex assignment, with ambiguous results (Perkmann et al., 2013). Most of the existent evidence is concentrated in commercial channels, even though both parties have reported other mechanisms to be more relevant (Agrawal and Henderson, 2002; Cohen et al., 2002). Furthermore, the available evidence characterizes collaboration within innovation ecosystems of developed countries neglecting the specificity of developing-economic environments, where interaction appears to be more limited and reporting different features (Albuquerque et al., 2015; Filippetti and Savona, 2017). A contribution to filling jointly these gaps is analyzing the behavior of Knowledge Transfer Organizations. These are intermediary institutions which act as a bridge between the two parties (Geuna and Muscio, 2009), being widespread in developing countries and managing concurrently different interaction channels (Arza and Carattoli, 2017).

Following these observations, the analysis presented here concerns the role of intermediary organizations inside a Local Innovation System of a developing economy. The focus is on academic-industry relations in the Argentinian city of San Carlos de Bariloche, which are framed inside the national context and studied through semi-structured interviews conducted with the managers of local Knowledge Transfer Organizations. The major features of the National Innovation System are considered in order to capture their influence on the local level (Chudnovsky, 1999; Kantis et al., 2005). This made it possible to identify critical systemic features, such as the legal definition of a particular type of intermediate organization, Technology Liaison Units (TLUs), and their role on managing large public funds. In order to evaluate knowledge characteristics as an agglomeration factor and ‘proximity’ effects, it is also necessary to consider reduced geographical units. The city itself, characterized by a relatively-developed system of science and technology but with a limited impact on its productive structure (Lugones and Lugones, 2004), presents several traits of the national structure and an unarticulated system based on personal relationships.

References

- Adler, P.S., 2001. Market, Hierarchy, and Trust: The Knowledge Economy and the Future of Capitalism. *Organization Science* 12, 215–234. <https://doi.org/10.1287/orsc.12.2.215.10117>
- Agrawal, A., Henderson, R., 2002. Putting Patents in Context: Exploring Knowledge Transfer from MIT. *Management Science* 48, 44–60. <https://doi.org/10.1287/mnsc.48.1.44.14279>
- Albuquerque, E., Suzigan, W., Kruss, G., Lee, K., 2015. *Developing National Systems of Innovation: University-Industry Interactions in the Global South*. Edward Elgar Publishing.
- Arza, V., Carattoli, M., 2017. Personal ties in university-industry linkages: a case-study from Argentina. *J Technol Transf* 42, 814–840. <https://doi.org/10.1007/s10961-016-9544-x>
- Benkler, Y., 2006. *The Wealth of Networks: How Social Production Transforms Markets and Freedom*. Yale University Press.
- Boisot, M.H., 1998. *Knowledge assets: Securing competitive advantage in the information economy*. OUP Oxford.
- Carayannis, E.G., Campbell, D.F., 2009. “Mode 3’and’Quadruple Helix”: toward a 21st century fractal innovation ecosystem. *International journal of technology management* 46, 201–234.
- Chudnovsky, D., 1999. *Políticas de ciencia y tecnología y el Sistema Nacional de Innovación en la Argentina*.
- Cohen, W.M., Nelson, R.R., Walsh, J.P., 2002. Links and Impacts: The Influence of Public Research on Industrial R&D. *Management Science* 48, 1–23. <https://doi.org/10.1287/mnsc.48.1.1.14273>
- Cooke, P., 2001. Regional Innovation Systems, Clusters, and the Knowledge Economy. *Ind Corp Change* 10, 945–974. <https://doi.org/10.1093/icc/10.4.945>
- Dosi, G., 1982. Technological paradigms and technological trajectories: A suggested interpretation of the determinants and directions of technical change. *Research Policy* 11, 147–162. [https://doi.org/10.1016/0048-7333\(82\)90016-6](https://doi.org/10.1016/0048-7333(82)90016-6)

- Etzkowitz, H., Leydesdorff, L., 2000. The dynamics of innovation: from National Systems and “Mode 2” to a Triple Helix of university–industry–government relations. *Research Policy* 29, 109–123. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)
- Filippetti, A., Savona, M., 2017. University–industry linkages and academic engagements: individual behaviours and firms’ barriers. Introduction to the special section. *The Journal of Technology Transfer* 42, 719–729. <https://doi.org/10.1007/s10961-017-9576-x>
- Geuna, A., Muscio, A., 2009. The Governance of University Knowledge Transfer: A Critical Review of the Literature. *Minerva* 47, 93–114. <https://doi.org/10.1007/s11024-009-9118-2>
- Hardy, C., Phillips, N., Lawrence, T.B., 2003. Resources, Knowledge and Influence: The Organizational Effects of Interorganizational Collaboration*. *Journal of Management Studies* 40, 321–347. <https://doi.org/10.1111/1467-6486.00342>
- Hausmann, R., Hidalgo, C.A., Bustos, S., Coscia, M., Simoes, A., Yildirim, M.A., 2014. The atlas of economic complexity: Mapping paths to prosperity. Mit Press.
- Hodgson, G.M., 1998. Evolutionary and competence-based theories of the firm. *Journal of Economic Studies* 25, 25–56.
- Jaffe, A.B., Trajtenberg, M., 2002. Patents, Citations, and Innovations: A Window on the Knowledge Economy. MIT Press.
- Kantis, H., Federico, J., Drucaroff, S., Martinez, A.C., 2005. Clusters y nuevos polos emprendedores intensivos en conocimiento en Argentina. Buenos Aires, septiembre.
- Lugones, G., Lugones, M., 2004. Bariloche y su grupo de empresas intensivas en conocimiento: Realidades y Perspectivas. Documento de trabajo.
- Mowery, D.C., Oxley, J.E., Silverman, B.S., 1996. Strategic alliances and interfirm knowledge transfer. *Strategic Management Journal* 17, 77–91. <https://doi.org/10.1002/smj.4250171108>
- Nelson, R.R., 1993. National innovation systems: a comparative analysis. Oxford University Press on Demand.
- Nielsen, M., 2011. Reinventing discovery: the new era of networked science. Princeton University Press.

- Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., Fini, R., Geuna, A., Grimaldi, R., Hughes, A., Krabel, S., Kitson, M., Llerena, P., Lissoni, F., Salter, A., Sobrero, M., 2013. Academic engagement and commercialisation: A review of the literature on university–industry relations. *Research Policy* 42, 423–442. <https://doi.org/10.1016/j.respol.2012.09.007>
- Powell, W.W., Koput, K.W., Smith-Doerr, L., 1996. Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology. *Administrative Science Quarterly* 41, 116–145. <https://doi.org/10.2307/2393988>
- Rogers, E.M., 2010. *Diffusion of Innovations*, 4th Edition. Simon and Schuster.
- Sábato, J., Botana, N., 1968. La Ciencia y la Tecnología en el desarrollo futuro de América Latina. Estudio Prospectivo sobre América Latina y el Orden Mundial en la Década del 1990, in: *Presentado En The World Order Models Conference*, Bellagio, Italia.
-

European researchers in Chinese Academia: What are their motivations, satisfactions and career trajectories?

Andrea Střelcová, Research associate, EU-Asia Institute, ESSCA School of Management and International Affairs, andrea.strel@gmail.com

Wei Shen, Associate Pro Vice-Chancellor (International Relations), DEAKIN University, Melbourne, Australia, wei.shen@deakin.edu.au

Yuzhuo Cai, Senior Lecturer, Adjunct Professor, Faculty of Management and Business, Tampere University, yuzhuo.cai@tuni.fi

Abstract

This paper unfolds a ‘black box’ concerning European researchers immigrating to China, which, as an emerging phenomenon, is both an outcome of and a challenge for European and Chinese research policies on the international dimension. China’s rapid economic growth has created abundant career opportunities in research and innovation, pulling in mainly returning Chinese, but also some non-Chinese researchers. The individual experiences of this group of skilled migrants have largely gone overlooked. The article uses qualitative data from 47 interviews of European researchers and experts to uncover their motivation, experience and retention prospects in mainland China. The study develops an analytical framework combining Bourdieu’s economic and social capital accumulation/conversion with geographical migration. Our study identified four groups of European researches in China in terms of their career trajectories. We also found that given the

precarity in terms of long-term career development in Chinese academia, Europeans are likely to work elsewhere by converting the capital that they accumulated in China out of China.

Keywords: China, Europe, academic mobility, science cooperation, capital accumulation and conversion

Track 6. Governance and public policy in shaping future innovative society

Chair: Mika Raunio

An Analysis of Turkish Innovation Policy From a Gender Perspective

PhD student Demet Demirez, Tampere University, Finland

This research paper aims to analyze the Turkish innovation policy from a gender perspective in the context of the economic (business sector), scientific (academic), and political (government) environment. The theoretical framework of this study is based on "doing gender" approach. The doing gender perspective conceptualizes gender as a dynamic process, as emergent and shifting, as a learned action, and as a practice. As a social phenomenon, gender is created and recreated in ongoing processes of development of meaning and social interaction. The creation is grounded in the economy, division of labor, politics, policies, and education. In that sense, this study is guided by the following research questions;

- How gender is created in the innovation strategies and policies in Turkey?
- Which sectors of the economy are considered important to build innovation and competitiveness?

- Who is seen as an important actor in the processes of creating innovations?

Enhancing and supporting innovation is one of the key approaches within regional and economic development policies to improve economic growth. Innovation policies often stress the creation of new products involving actors like universities and public agencies, besides firms. Research on innovation policy in a gender perspective has revealed that gender is created in these policy contexts. The under-representation of women in certain areas of science, technology, and innovation (STI) has long been a concern. Several studies show that, regardless of country, women's participation rate in science, technology, and innovation sectors is lower than their overall participation in the workforce. While acknowledging that most countries have included gender diversity and gender equity as one of the key objectives in their national STI plans, still gender segregation and stereotypes minimize the role of women in an STI. Some studies and reports have stressed the problem of women's under-representation in science in the business enterprise sector. While women represent over 35% of all researchers in the higher education and government sectors of most European countries, this is not the case for the business sector (She Figures, 2018). A similar pattern of gender gap can be observed in Turkey. While the percentage of female researchers is 43,3 % in the universities, this ratio is decreasing to 25, 5 % in the private sector (Eurostat, 2017).

Therefore, in recent years, there has been increased criticism towards the innovation system concept that has developed in analysis and policy. As in the literature, Triple Helix innovation systems tend to emphasize and sustain traditional masculine notions of entrepreneurship and innovation (Lindberg et al. 2014). This situation is an important question. Because, as mentioned by Pettersson (2007:9), if innovation policies do not take into account the gendering of society and social relations, there is a risk of the promotion of men and male as the policy norm. Also, there is a risk that only certain people, for example, highly educated men in technical sciences, or men entrepreneurs, are supported by innovation policies. This risk can lead to other people not being seen as important for the development of innovations, the economy, and society – nor as essential to support. Thus a gender perspective becomes vital in contributing to innovation and sustainable growth.

Methodology and data

Studying policies on innovation is not an easy task since there is a massive amount of research and policy documents on this subject. Another reason for the difficulty of investigating innovation policies is that this policy area is in constant change – new policies and reports keep coming out at a persistent pace. For this study, I have searched ministries' and governmental agencies' home pages on the Internet to reach the policy documents. In these policy documents, I have searched the words gender, equality, woman, women and female. I performed close readings and interpretations of the passages in the policies where these words are mentioned. I have examined the Scientific and Technological Research Council of Turkey, Strategic Plan 2018-2022, Government Annual Plan 2019, Women's Empowerment Strategy Document and Action Plan 2018-2023 (Ministry of Labour and Social Security), Education Vision 2023 (Ministry of Education) and National Employment Strategy 2014-2023. The following factors influence the choice of these texts: all of the official documents are the latest published national strategies, and they are referred to in other policy documents. Therefore, I analyze policies in different titles to find answers to my research questions.

Main Findings

The analysis made in this study concludes that gender equality is not mainstreamed in innovation policies in Turkey, and gender issues are not seen as part of the context of growth and innovation policy, but rather of other contexts. The policies made on gender issues do not refer to the latest innovation policies. Also, not all sectors of the economy are seen as equally important to build innovation and competitiveness in the innovation strategies. What is seen as so-called strong sectors are very much related to the representations of certain knowledge – technical and scientific. Accordingly, analysis has shown that what we regard as innovation is often a technological innovation within specific sectors of industry, and there is no emphasis on the gender dimension concerning innovation policy while continuing to take men as the norm. In that sense, the results of my study show that there is a need to an inclusive approach to innovation systems to increase the number of women researchers in the innovative sector and my study guides political agents who are interested in supporting an equal environment for innovative women entrepreneurs in future innovation policy programs.

Keywords: National innovation policies, Turkey, gender gap, Triple Helix innovation system model.

References

European Commission. (2018). *She Figures 2018: Gender in Research and Innovation: Statistics and Indicators*. Publications Office of the European Union.

Lindberg, Malin, Lindberg, Monica & Packendorff, Johann 2014: Quadruple Helix as a Way to Bridge the Gender Gap in Entrepreneurship: The Case of an Innovation System Project in the Baltic Sea Region. *Journal of Knowledge Economy* 5: 94–113.

Pettersson, K., 2007. Men and male as the norm?: a gender perspective on innovation policies in Denmark, Finland and Sweden. Nordregio.

Policymaking in Innovation Systems – Measuring Synergy in Innovation Systems at the Local, Regional, and National Level with the Triple Helix Indicator

Henriette Ruhrmann and Loet Leydesdorff, Technische Universität Berlin

Type: Original Research

This study contributes to the growing field of research on innovation systems at the national, regional, and local level with a quantitative assessment of the synergy produced in innovation systems. The analysis leverages a complete set of firm-level data for over 3 million active companies in Germany, and the results allow us to draw conclusions around the most effective level of governance for policymakers to actively participate in innovation systems.

Purpose

Studies of innovation systems have increasingly pivoted their focus from national to regional systems of innovation over the past decades (Cooke, Gomez Uranga & Etxebarria 1997), with a particular interest in regional diversity and context-specific policy solutions. However, to allow policymakers to tailor innovation policy solutions to contextual needs it is necessary to analyze at which level of governance innovation systems are most cohesive, i.e. generate the most synergy. Focusing engagement in innovation processes on the most effective level of governance allows policymakers to maximize the impact of their active participation through strategic knowledge

exchange and tailored policy frameworks. In Germany in particular, given its federal architecture and still-present economic repercussions of the historical divide, regional diversity is a key concern. In 2018, the Federal Government for the first time included regional inequality as a major societal challenge and committed to promoting equitable regional structural development in its principal science, technology, and innovation policy strategy—the High-Tech Strategy 2025 (Bundesregierung 2018). For a tailored policy response to context-specific innovation activity in line with the High-Tech Strategy 2025, a quantitative measure of innovation system cohesion at different levels of government in Germany is necessary.

Design and Methodology

The research design is rooted in information theory and evolutionary economics and leverages the Triple Helix Indicator developed as a measure of synergy generated in innovation ecosystems (e.g., (Leydesdorff & Meyer 2013). It also reproduces a previous study about Germany (Leydesdorff & Fritsch, 2006), but on the basis of a much larger data set and with more detail. The Triple Helix Indicator analyzes mutual information in the three social coordination mechanisms operating on innovation ecosystems - market dynamics, scientific exploration, and political control - operationalized as the size, sectoral, and geographical distribution of firms. Following up on studies that employ the Triple Helix Indicator to assess innovation ecosystems in several European countries, as well as the United States (Leydesdorff & Cucco 2019; Leydesdorff et al. 2019; Leydesdorff & Porto Gomez 2017; Lengyel & Leydesdorff 2015; Ivanova, Strand & Leydesdorff 2014; Leydesdorff & Strand 2012), the present study contributes an analysis of the German case based on current firm-level data. The analysis employs the comprehensive dataset of over 3 million active companies in Germany compiled in Bureau van Dijk's ORBIS database (November 2019). For partial analyses, the dataset is divided based on the European Nomenclature of Territorial Units for Statistics (NUTS) into 16 federal states (Bundesländer - NUTS1), 41 regional administrative districts (Regierungsbezirke – NUTS2), and 440 local administrative districts (Kreisfreie Städte and Landkreise – NUTS3). Moreover, the analysis selectively focuses on the sectors of high-tech manufacturing, medium-high-tech manufacturing, knowledge intensive services, and high-tech knowledge intensive services based on the firms' Nomenclature statistique des activités économiques dans la Communauté européenne (NACE) codes.

Findings or expected outcomes

Preliminary findings suggest that relative to other country studies, Germany functions less as a unified innovation system but is instead decentralized into regional innovation systems (at NUTS1 level, the between-state synergy is only 4% of the total national synergy). The federal states contributing most to total national synergy are North Rhine-Westphalia (19.4%), Bavaria (18.3%), and Baden-Wurttemberg (14.03%) – all other federal states contribute less than 10% to the total national synergy. Bavaria and Baden-Wurttemberg are also the only states for which the percentage contribution to total national synergy is greater than the percentage of firms located in the states. Interestingly, there is no longer a substantial divide between formerly East and West German states in their contribution to total national synergy when controlling for the number of firms in the state. In a similar study of Germany almost 15 years ago, Leydesdorff & Fritsch (2006) found a persistent East-West divide at the state level. Furthermore, between-region synergy as a percentage of total national synergy increases at NUTS2 level (7.87%) and NUTS3 level (30.77%). Certain regions at NUTS2 level particularly stand out in their contribution to total synergy at national and at state level, namely Oberbayern (Bavaria – 6.7% of total national synergy), Düsseldorf (North Rhine-Westphalia – 5.8%), and Stuttgart (Baden Wurttemberg – 4.96%). Findings pertaining to the sectoral decomposition based on technological classes will follow. The analytical results are dependent on the quality of the available data. The ORBIS dataset employed provides the most comprehensive data on firms in Germany, however, missing or inaccurately reported data remains a problem in a dataset at such scale.

Practical and/or Social Implications

The preliminary analytical results imply that in Germany, innovation system cohesiveness is highest at the local and regional level. The findings provide helpful insights for innovation policy strategy, which should leverage the wealth of knowledge at the regional and local level and promote exchange between policymakers and other innovation ecosystem stakeholders at sub-national level. Moreover, at the national level, resources can be directed towards regions which contribute relatively little to total national synergy, in particular relative to their number of firms, to determine context-specific challenges and tailor policy solutions.

Originality and Value

The present study contributes to the landscape of country studies of innovation system cohesiveness and adds an up-to-date quantitative assessment on innovation systems in one of the European

Union's strongest economies. Especially in the context of Leydesdorff & Fritsch's (2006) study of innovation systems in Germany, which captures the innovation landscape before the first iteration of the Federal Government's High-Tech Strategy, it adds a current perspective on change over the past 15 years of strategic science, technology, and innovation policymaking.

Keywords: Triple helix, innovation ecosystems, regional innovation systems, innovation policy, synergy

References

Bundesregierung 2018, Forschung und Innovation für die Menschen - Die Hightech-Strategie 2025, Berlin. Available from: <https://www.hightech-strategie.de/files/HTS2025.pdf>.

Cooke, P, Gomez Uranga, M & Etzebarria, G 1997, 'Regional innovation systems: Institutional and organisational dimensions', *Research Policy*, vol. 26, 4-5, pp. 475–491.

Lengyel, B & Leydesdorff, L 2015, 'The Effects of FDI on Innovation Systems in Hungarian Regions: Where is the Synergy Generated?', *Regional Statistics*, vol. 5, no. 1, pp. 3–24.

Leydesdorff, L & Cucco, I 2019, 'Regions, innovation systems, and the North-South divide in Italy', *El Profesional de la Información*, vol. 28, no. 2.

Leydesdorff, L & Fritsch, M 2006, 'Measuring the knowledge base of regional innovation systems in Germany in terms of a Triple Helix dynamics', *Research Policy*, vol. 35, no. 10, pp. 1538–1553.

Leydesdorff, L & Meyer, M 2013, Technology Transfer and the End of the Bayh-Dole Effect: Patents as an Analytical Lens on University-Industry-Government Relations. Available from: <http://arxiv.org/pdf/1302.4864v1>.

Leydesdorff, L & Porto-Gomez, I 2019. 'Measuring the expected synergy in Spanish regional and national systems of innovation', *The Journal of Technology Transfer*, vol. 44, no. 1, pp. 189–209.

Leydesdorff, L & Strand, Ø 2012, The Swedish System of Innovation: Regional Synergies in a Knowledge-Based Economy. Available from: <http://arxiv.org/pdf/1210.4396v2>.

Leydesdorff, L, Wagner, CS, Porto-Gomez, I, Comins, JA & Phillips, F 2019, 'Synergy in the knowledge base of U.S. innovation systems at national, state, and regional levels: The contributions of high-tech manufacturing and knowledge-intensive services', *Journal of the Association for Information Science and Technology*, vol. 70, no. 10, pp. 1108–1123.

Triple Helix actors communication: assessing the institutional affiliation of communication formats

L.Kobzeva, National Research Tomsk State University; E.Gribov, National Research Tomsk State University; V.Raevskaya, National Research Tomsk State University

Type: practical experience analysis

The Triple Helix model contains the fundamental importance of communication between representatives of various institutional spheres. It can be considered in two perspectives. The first perspective is the circulation of information and knowledge within and between institutional areas. Government, academia and industry have different sources of capitalization of knowledge and rules of communication and dissemination of information. “In the Triple Helix model, each spiral, when interacting with the other two, creates a “superimposition of communication links, networks and organizations” (Etzkowitz, Henry. The Dynamics of Innovation: From National Systems and 'Mode 2' to a Triple Helix of University-Industry-Government Relations / Henry Etzkowitz and Loet Leydesdorff // Research Policy. - 2000. - Vol. 29. - Pp. 109–123.). The intensity of communication both within the institutional sphere and between them is a condition for social mobility, the transfer of knowledge and information. It contributes to the emergence of new formats of cooperation, as well as hybrid organizations.

The second perspective is the transition from a linear model of innovation to a non-linear one, based on the network and the needs of society. A number of authors also note that the linear model of innovation and non-linear model have a different communication structure, in particular, the latter is characterized by greater interactivity. The transition from one model to another creates the need for the research of communication and practices of knowledge distribution (e.g., discursive knowledge) and information distribution.

At present, communication is structured in various formats - meeting, conference, forum, meet-up, hackathon, etc. According to various estimates, the entire volume of communication in the world

today is determined by no more than 100 formats. The format of the event is certain rules and stages of communication, the observation of which allows leading the participants to the expected result.

The space of hypotheses, around two perspectives, can be formed regarding communication formats and their connection with the institutional affiliation of the organizers and participants of communication. The authors take part in the implementation of a pilot project in Russia, which is focused on the development of communication of the Triple Helix actors in the orientation on innovation-based economic growth.

An experiment in the field of communication in the innovation sphere has been launched in Russia. A unique network of co-working spaces, named “Boiling Point”, has been created. Today, 40 of the 85 regions of Russia have created such spaces. The mission of the “Boiling point” network is to stimulate communication between representatives of universities, business and government to create a new economy and social practices. These venues accumulate a huge number of entrepreneurs, civil servants, representatives of science and civil society. The basic format of the “Boiling Points” network is the holding of activities on the agenda of development. Each event and its participants are registered on a special digital platform, which today unites nearly 900 thousand users from different regions of Russia and institutional spheres. The digital platform allows you to create user profiles, record visits to events based on their subject and format.

Over the past 10 years, the set of tools has improved significantly to assess the level and quality of interaction of the Triple Helix actors. These tools include data analysis methods. The digital platform of the “Boiling Points” network allows you to record a “digital footprint” after each event (topic and description of the event, format of the event, number of participants, professional affiliation of participants, institutional affiliation of participants).

The development of the “Boiling Point” network is based on five principles. The first principle is the Concentration of communities, which provides the consolidation of communications and links between community members. The second principle is the Singularity, reflecting the high speed of community scaling (growth in the number of participants). The third principle is Serendipity, reflecting the manifestation of unexpected positive effects. The fourth principle is Synergy, which implies mutual reinforcement by the experience and competencies of community members. The fifth principle is Stigmergy, which reflects the formation of self-regulatory network structures that leave a digital footprint.

The digital platform allows you to track activity in the “Boiling Points” network and help you “catch” emerging network effects. And also evaluate the effectiveness of the communication of the Triple Helix actors.

Purpose

The purpose of the research is to test the hypothesis about the dependence of communication formats on the institutional affiliation of event organizers:

- business, government and universities choose different communication formats to solve their tasks;
- to evaluate the communication of the Triple Helix actors and its thematic landscape through the evaluation of event formats;
- the number of participants and the professional diversity of participants depends on the chosen communication format and the institutional affiliation of the event organizer;
- communication formats allow you to establish relationships between representatives of different institutional areas;
- different participants in events of different formats are involved in communication differently.

Design/Methodology/Approach

The authors of the article analyzed data on almost 19 thousand events that took place over 3.5 years (from January 2016 to May 2019) in 23 different formats. The data set is based on data on the activities of 38 “Boiling Points” in more than 40 regions of Russia (total - 85 regions).

Findings or expected outcomes

1. The agenda in the “Boiling Point” network is set by industry, as it leads in the number of events organized. Industry is a clear leader and holds 31.3% of events. In second place are universities with 21.3% of events. A sixth of the activities are carried out by voluntary civic associations - 16.3%. Authorities organize 6.81% of events.

Business leads in organizing events in such communication formats as a round table, Task Force meeting, lecture, strategic session, meeting, forum, conference, training, acceleration program.

Universities lead only in the organization of one format - a workshop, which indicates increased communication in the field of R&D and the creation of new technologies.

2. To assess the thematic landscape, a frequency analysis of topics from all 19 thousand events was carried out. Connections between events of different communication types based on four groups of words have been established: activity words (design, develop, etc.); words reflecting the "genome" of the Network (National Technology Initiative, ecosystem, CDO, etc.); words reflecting the sphere (education, science, etc.); words reflecting technology (machine learning, artificial intelligence, etc.).

The round table, meeting, task force meeting, strategic session, conference and forum are most closely related, which means high thematic proximity with the agenda of events in these communication types.

The second cluster of thematically similar formats is formed by such formats as a lecture, training.

A separate communication type is the acceleration program, the thematic focus of which is unique due to solving specific problems in the field of business and technology.

It is also important to emphasize that the workshop is also not related thematically to the previously listed formats, including the acceleration program, since it reflects the solving of specific technological problems.

Outside the institutional affiliation of the event organizers in a specific format, it should be noted that the “centers” that aggregate the diversity of topics are 5 formats: a seminar / training, a lecture, a meeting, a round table, and a working group meeting. Project and competitive formats (acceleration program, hackathon, project session, meet-up, pitch session, workshop) were not directly connected. These formats are used by organizers to work with specialized topics.

3. An important indicator is the professional diversity of the composition of the participants in the events. Events organized by business are characterized by both a small professional diversity (for example, a meeting of a working group – from 3 to 10 professional positions) and a high number of professional diversity (forum - from 11 to 42 professions, a conference - from 7 to 32 professions, an acceleration program - from 7 up to 23 professions, etc.). There are more communication types of events with a high variety of professional positions.

4. Most often, “weak” relations between participants appear after participating in events of such formats as the acceleration program and foresight session, which are associated with the creation of a new business and the formation of a joint vision of the future.

The most popular format in the “Boiling Point” network is training seminar, which indicates a high demand for skills development for the new economy.

5. In general, the participants in events of various formats are dominated by managers and representatives of education and science. Technological specializations are less covered by communication than managerial ones. This means that despite the growth of open platforms, a common license, the exchange of experience, open repositories of codes and other open collaboration tools, a significant amount of communication in the field of creating new products and technologies is still carried out in isolation inside companies and specialized R&D centers without leaving to public venues.

Limitations/implications: The results of this analysis will be used to create a digital service that allows Triple Helix actors to choose the appropriate communication format for solving a specific task and improve the quality of communication, the exchange of knowledge and information.

Practical and/or Social Implications: The assessment of event formats allows us to develop recommendations for supporting communication in the innovation sphere. Three main principles of such policy can be distinguished, which should be shared by all Triple Helix actors:

- to maintain the purity of event formats and their observance. The quality and effectiveness of the communication of the Triple Helix actors depends on following the format.
- to support the formation of a thematic landscape of communication focused on innovation-based economic growth;
- use communication formats that provide a cross-institutional composition of participants and a professional mix to support the exchange of knowledge and information.

Originality/Value

The importance of this work lies in the availability tools for analyzing the communication of the Triple Helix actors, which takes place daily in more than 40 regions of Russia. The “Boiling Points” project allows you to bring communication from an isolated internal format to a public open area.

The digital “Boiling Point” network platform allows you to track and evaluate the quality of communication of the Triple Helix actors.

Keywords: Triple Helix actors communication, communication formats, knowledge exchange

The Many Roles of Change Agency in the Game of Green Path Development: Seeing Inside Triple Helix Constellations

Markku Sotarauta¹, Nina Suvinen¹, Suyash Jolly² and Teis Hansen^{2, 3}

¹ Urban and Regional Studies Group, Tampere University Tampere, Finland Email: Markku.Sotarauta@tuni.fi; Nina.Suvinen@tuni.fi

²Department of Human Geography, Lund University, Email: Suyash.jolly@keg.lu.se; Teis.Hansen@keg.lu.se

³Department of Technology Management, SINTEF

Universities have increasingly been seen as the core instruments of local, regional and national economic development. This may be a result of the observation that, as many traditional industries have been hollowing out, and as many local economies have been losing their leading firms, the university often emerges as one of the few solid and locally rooted resources to draw upon. It is one of the cores in the dynamic interaction between ‘the three institutional spheres’, universities, industries and government, fostering entrepreneurship, innovation and economic growth (Etzkowitz and Leydesdorff 1997; Etzkowitz 2008). Cai and Cui (2015) maintain that the Triple Helix model has not been free of problems. It is criticised for remaining at an abstract level, lacking solid theoretical basis at a microlevel, not adequately addressing the issues emerging when actors adopt each other’s roles and lacking the contextual sensitivity across countries and social settings (Cai and Cui 2015). Additionally, in spite of the fact that agency is strongly linked to the Triple Helix literature, it has not gained adequate attention.

Consequently, in this paper, we argue for the need to focus more explicitly on the roles that various actors play in the evolution of regional economies. The assumed roles of many actors have been highlighted but not specified further in the triple helix and path development literatures. We argue that there is a need to reach beyond the generic definitions and general descriptions of policy

organizations, higher education institutions and firms, and explore whether similar actors take on different roles in different regions and whether different actors may assume similar roles in different regions.

The main objective of the paper is to compare the roles different actors play when enhancing green path development. The following are the main research questions: (a) Which are the core organizations in green path development in Nordic regions; (b) what their main roles in relation to other actors are; and (c) what the differences and similarities in agency in the case regions are. We scrutinize these questions in the context of green path development in six Nordic regions in three countries: Tampere Region and Central Finland (Finland); Scania and Värmland (Sweden); North Jutland and Southern Denmark (Denmark). Empirical analysis is based on 79 interviews with key actors as well as the analysis of secondary data consisting of all the main policy documents.

Drawing on our empirical analysis, we argue that institutional leadership, institutional entrepreneurship and innovative entrepreneurship are at the core of change agency in path development across the triple helix constellations, and that all the other roles, in their own ways, support the core. Our analysis shows that institutional entrepreneurship is neither about cultural foolishness nor heroic actions of individual super organisations, or superior human beings. In green path development in the Nordic case regions, risk is shared among the many rather than the few (though not equally). In all our cases, we were able to identify several actors who work, one way or another, to change institutional arrangements for green path development and related innovations. The actors involved ranged from national-, regional- and local-level public authorities to leading corporations as well as other firms and research organisations. Consequently, institutional entrepreneurship may be best understood through the combined influence of the actor roles, in particular institutional leaders and innovative entrepreneurs.

The core of change agency calls for other forms of agency to support their change efforts either directly or indirectly – we label such forms of supportive agency as the Props. For example, change efforts call for visionaries imaging new games. Our interview data suggests that visions for green path development (not for individual products or services) are not unique as such but reflect the general understanding of the need for green economies. In regional path development, instead of imagining totally new games, more important are the ways that generic visions in global/national circulation are being made sense of and translated into collective contemplation and action. Indeed, our analysis suggests that visionaries in the case regions are more brokers of generic visions from

wider circulation than actual visionaries; they are localisers of generic visions to fit in the economic and social fabric of a place in question. From this perspective, at a regional level, vision brokers may even be more important in path development than the actual visionaries. The vision brokers transmit ideas and future imaginaries, which is a role close to that of a mentor. Mentors are the ones who coach and advise other actors, especially institutional entrepreneurs and innovative entrepreneurs, but are themselves not directly involved in the change processes. We were able to identify actors playing this role in every case region. In addition to the roles briefly introduced above, each case has received support from a variety of public agencies in terms of funding, building new infrastructure and navigating through regulations. Moreover, also critics play a crucial role in innovation and path development as they force the other actors to re-examine their assumptions and to hold them against other criteria. Critics challenge the advocates of a specific path development to learn about potential negative consequence by questioning the assumptions behind specific actions.

Our illustrative empirical data from the six Nordic regions does not allow us to dig deep enough to flesh out the intuitive side of the agency or the practices related to the various roles. But what we are able to suggest is that shared institutional entrepreneurship is defined by the roles that various actors play – across organisational and institutional boundaries - to pave the way for green path development in their regions for selected industries, products or other commercial entities. It is not a single actor that is in search of new visions and works to direct the key processes related to green path development but many that are interdependent, and both directly and indirectly aligned to support each other. Collective institutional entrepreneurship does not determine the unfolding of a new path but frames the actions of influential actors in multiple ways.

This paper adds to the literature on triple helix, path development and related agency by specifically focusing on the roles that various actors play in enhancing green growth. We show how different actors contribute to path development by seeing beyond their formal positions. The paper introduces a first take of a stylised conceptual framework to study role-based agency in path development and related fields of interest. Our view differs from the usual approach in policy related studies, which focuses on policy contents, contexts and processes as well as on the impacts of a selected policy or a mix of them. Our aim is to see beyond public policies and corporate strategies in order to flesh out the ways that various actors are connected to path development and to each other's activities – what roles each of them plays in the game of green development.

We acknowledge the importance of triple helix but suggest that actors may take differing roles from place to place, from country to country and in different development paths; however, there also are similarities in their roles. Based on our analysis, we argue that institutional entrepreneurship is the core of change agency in conjunction with innovative entrepreneurship and institutional (place-based) leadership. The other four roles together support the path development efforts. We also suggest that a well-functioning shared institutional entrepreneurship may have a chance to change institutions for green path development.

Kairos in Innovation Policy

Theoretical Foundations and Practical Implications for the Triple Helix

Dr. Michael Rothgang, RWI-Leibniz-Institute for Economic Research, Germany

Type: Original research

Purpose

Our paper takes up a question which is implicitly present in the triple helix literature and many other innovation policy studies, but is usually not openly addressed in the research literature. Government interventions in technology development and innovation have better prospects of success if they take place under favourable conditions. Greek mythology offers a figure of thought for the problem to be discussed: the god *kairos* embodied a unique favourable opportunity for the actor(s) to achieve a goal. When *kairos* appears, the actor has to recognize the situation quickly and grab it in time before the opportunity has elapsed and the opening *window of opportunity* is closed again.

Even though the innovation policy discourse is quite familiar with the idea of windows of opportunity, the concept has only been taken up sporadically in research contexts (e.g. Boschma 1997). While the triple helix literature has sensitized innovation research for the growing importance of the cooperation between firms, academic institutions and public agencies which engage in a joint endeavour to meet technological challenges (Etzkowitz, Zhou 2018), evolutionary

economics have delivered essential building blocks for a theoretical analysis of *kairos* constellations in innovation policy such as the role of path dependency (David 2015) and the mechanisms of economic development and technical progress (Nelson, Winter 1982).

Design/Methodology/Approach

Starting from the discussion of relevant analyses in the research literature, we develop a theoretical model of *kairos* constellations in innovation policy in which public agencies, private firms and research organizations as participants are involved. Characteristics that constitute the core of such *kairos* constellations are the given economic and technological structures and especially their inherent development dynamics including existing path dependencies. These are driven by factors such as network effects and cumulative knowledge accumulation at firm, industry/market or cluster level. Other major constituents of *kairos* constellations are (i) the actors involved in the situation, (ii) the rules of action in force that all actors must follow; (iii) the sum of contingencies that produce an extraordinary chance of action for the policy actors, and, last not least, (iv) the time window in which this chance exists. These constellations refer to opportunities of political action which are characterised at the same time by high risks and strong uncertainty (Mazzucato 2015; Edler, Fagerberg 2017). In these cases, the state intervention inevitably contains an entrepreneurial component. Under favourable constellations of the relevant factors, the intervention opens chances for an accelerated technology and market development as well as the dynamics of firms or regional clusters, but can in no way guarantee final success.

Practical implications of the theoretical analysis are presented in the second part of the paper where we apply the theoretical model on cluster policy. The examples are taken from German technology-oriented cluster policy projects. While the combination of favourable starting conditions is less significant for infrastructural cluster policy measures which aim at the creation of cluster initiatives and the strengthening of infrastructures for cluster development, *kairos* always comes into play if cluster policy contains a strong entrepreneurial component. For these cases, a strong current in the cluster policy research literature tends to underline the importance of cluster life cycles whereby certain stages of cluster life cycles make government supporting interventions more promising and others less promising, if not useless. We show that this approach needs a qualification: Uncertainty, risks of losses and in return the prospects for triggered prosperity gains are higher in early stages of technology and cluster development. But the empirical evidence shows that interventions might also be useful in later stages of cluster development depending on the particularities of market and

technology dynamics. Thus *kairos* is not uniquely bound to life cycles of clusters and technology, but is the result of the complex interaction of many factors.

Findings/expected outcomes

We identify the factors that make up *kairos* constellation in innovation policy,

- (1) analyse links between the risks/uncertainty connected with innovation policy decisions and the time structure of the relevant developments,
- (2) discuss implications for the analyses of the policy processes and policy practice.

Implications/limitations

The time factor that is inherent in any innovation policy decision deserves more attention than it has found in research works so far. Beyond cluster politics, the analysis is also relevant for other areas of innovation policy.

A limitation is that no clear easy to implement rules can be derived from the discussion because of the heterogeneity and complexity of the political decision-making situations.

Practical and/or social implications

The analysis is useful for a deeper understanding of the logics of action that are effective in the development of triple helix relationships. The practical example of cluster policies shows the potentials, but also the limitations of finding the right time for policy interventions.

Originality/Value

The paper deals with a problem which is implicitly present in the triple helix and innovation system literature as well as practical innovation policy, but has not been systematically scrutinized.

Keywords: Policy action, policy timing, path dependency, uncertainty, cluster policy

References

Boschma, R. (1997). New Industries and Windows of Locational Opportunity. A long-term analysis of Belgium. *Erdkunde – Archive of Scientific Geography* 51, 12-22.

David, P. (2006) [2005]. Path dependence in economic processes: implications for policy analysis in dynamical systems contexts. In: K. Dopfer (ed.). *The Evolutionary Foundations of Economics*. Reprint. Cambridge: Cambridge University Press, 151-194.

Edler, J. and J. Fagerberg (2017). Innovation policy: what, why, and how. *Oxford Review of Economic Policy* 33(1): 2-23.

Etzkowitz, H. and C. Zhou (2018) [2008]. *The Triple Helix. University-Industry-Government Innovation and Entrepreneurship*. Second edition. London and New York: Routledge.

Mazzucato, M. (2014) [2013]. *The Entrepreneurial State. Debunking Public vs. Private Sector Myths*. Revised edition. London, New York Delhi: Anthem Press,

Nelson, R.R. and S.G. Winter (1996) [1982]. *An Evolutionary Theory of Economic Change*. Sixth Printing. Cambridge, Mass., and London, England: The Belknap Press of Harvard University Press.

Rebalancing Society in an Age of Digital Transformation: Revisiting Mintzberg's Thesis and Four Sociological Lenses for Consideration

dr.(Habil.) T. Bartosz, Kalinowski, Faculty of Management, University of Lodz, Poland

Introduction

The last decade has seen rapid transformation of societies and in particular to the emergence of today's digital economy. At the same time, the perceived divisions and effects of digital transformation on political economies, in particular between the "have and have nots", is of increasing public concern and debate (See World Economic Forum Reports, 2019).

Mintzberg (2015) shares similar public concern about the future of societies in his recent treatise stating that: "A healthy society balances a public sector of respected governments, a private sector of responsible businesses, and a plural sector of robust communities" (back cover). More specifically, Mintzberg (2015) seeks to answer three critical questions: 1) to what extent are capitalistic systems sustainable in the private sector by trying to control and exploit resources?; 2)

to what degree can public sectors maintain democratic representation and access to resources as a public good?; and 3) how can we better leverage the plural sector (communities and non-profits) that can help balance out the misgivings or the gaps found in public and private sectors?

Extending upon the work of Mintzberg (2015), the purpose of this paper is thus to analyze Mintzberg's thesis for a renewal of societies but specifically in light of the global digital transformation of societies, as well as in light of country-differences in sociological views. We specifically extend upon his hypotheses as identified to three general effects of digital transformation economy as noted by Hanna's (2016; 2017); they include 1) how digital transformation frames interdependency; 2) how leadership and institutional capabilities are affected and need to implement digital transformation strategies; and 3) how the demands of digital transformation impact organizational capabilities, innovation and general learning. As Hanna (2016; 2017) argues, a more "holistic view" toward understanding the impact of digital transformation is necessary. At the same time before we can answer those challenges, a better framework is needed to understand these implications following Mintzberg's thesis but through greater detail via four traditional lenses in sociology. The theoretical contribution of this paper provides an extended body of knowledge on how digital transformation of societies, together with their sociological view could support, or not support Mintzberg's framework for renewal of societies (2015).

Methodology

The paper is thus conceptual by nature. The authors' research began in 2018 with an initial focus on 'redesigning marketplace governance in the age of digital transformation'. This paper was published by Academy of Management in 2019 (Jackson and Steiber, 2019). This paper includes the findings in Jackson and Steiber (2019), together with new data from several literature reviews focused on frameworks for renewal of societies, as well as impact on society due to new digital technologies (the age of digital transformation). In those literature reviews, Mintzberg's framework was selected for renewal of society and Hanna's identified impacts from a digital transformation of societies were chosen as an analytical framework, together with four traditional lenses in sociology. Further, the authors followed an abductive approach (Dubois & Gadde, 2002).

Theoretical framework

Mintzberg (2015) centers on the assertion that societies must move away from debates about exploitation of resources toward where they become resourceful in their policies to effect societal

change. He specifically posits that much of the inherent framing of capitalist societies has not fully considered the role and impact of externalities and whether it justifies privatization of resources (economic interests). Similarly, the public sector (political interests) may not fully represent all interest groups, and may not be able to drive renewal alone. To compensate for this, Mintzberg refers to the increased need for a 'plural sector' (associations of people, owned by members of none). He states that in the light of new digital technologies, individuals are increasingly isolated, which hurts their social engagement.

However, to shift between these paradoxes in today's economy will rest upon how digital transformation technologies (DT) are framed around interconnectedness, leadership and institutional capabilities, as well as organizational capabilities to newer levels of learning (i.e., Hanna 2016;2017) but as we argue this must be audited with greater specificity via four sociological traditions.

Discussion/Expected outcomes of Discussion

We argue that four sociological traditions from Collins (1994) must be considered in analyzing digital transformations effects on Mintzberg's framework for renewal of society. The sociological traditions are:

- The Marxist approach
- The Functional-Utilitarian approach
- The Micro-Interactionist approach
- The Durkheimian approach

Digital transformations affect key components of Mintzberg's suggested model for renewal of society. However, they must be considered in the macro-policy context reflective of sociological tradition and specifically to what extent a society is able to leverage DT resources and which reflect levels of risk tolerance around 1) financial, 2) socio-capital, and as combined with 3) technological risk. More public-based societies may take more predominately a Marxist approach, less open to financial risks around DT as opposed to private based societies, taking a more functional-utilitarian approach. At the same time both cultural and micro-interactionist traditions around social capital that would affect organization of the third plural sector must be considered.

Implications/Limitations

The theoretical implication is the further analysis of Mintzberg's framework (2015) in the light of DT, affected by different countries sociological views. The limitation is the focus on Mintzberg's framework.

Key words: Rebalancing, Societal challenges, Digital transformation

References

Collins, R. 1994. *The Four Sociological Traditions*. Oxford University Press: UK

Dubois, A and LE Gadde (2002), Systematic combining: an abductive approach to case research. *Journal of Business Research*, 55(7), pp: 553-560.

Hanna, N.K, 2017. How can developing countries make the most of the digital revolution? Accessed from <http://blogs.worldbank.org/digital-development/how-can-developing-countries-make-most-digital-revolution>

Hanna, N.K. 2016. Mastering Digital Transformation: Towards a Smarter Society, Economy, City and Nation. Emerald Group: UK.

Jackson and Steiber (2019), Redesigning marketplace governance in the age of digital transformation: key strategic risk considerations for established and newer economies and their regulators, Academy of Management Global Proceedings, Vol. Slovenia, No. 2019.

World Economic Forum (2019). Understanding the impact of digitalization on society. Accessed from <http://reports.weforum.org/digital-transformation/understanding-the-impact-of-digitalization-on-society/>

A study on the characteristics and operation model of small world network for university-industry knowledge transfer

Han Zhang, School of Marxism, Communication University of China, 100024

Knowledge Transfer from university to industry is the process that various actors with the different benefits participated and created the complex social network. Based on the Actor-network theory (ANT) perspective, the study analyzes how different actors across the organizational boundaries and relate to each other through the process of enrollment, mobilization and transformation and so forth. The connections between the nodes constitute a systematic network structure, and showing the characteristics of ‘small-world network’. Using the small-world network model, the study makes an empirical analysis towards the innovation cooperation of the university-enterprises and the university with the local government in China. Taking the network attribute as the analysis variable, exploring the influence of the network’s scale, density, and the core nodes’ distribution on the efficiency and depth of knowledge transfer, then to construct the structural equation relationship between each analysis variables, so as to obtain the direct effect analysis of the influence of each variable on the knowledge transfer activities. From a micro perspective to explore the structural characteristics of knowledge transfer network and its evolution mechanism, furthermore, to put forwards the optimization knowledge transfer networks for the cooperation of university-industry, this empirical study will provides suggestions for policy makers to the industry-university-research cooperation.

Triple-Helix and migration management of highly skilled in the regions without science-university – case Seinäjoki, Finland

Senior Researcher Mika Raunio, Migration Institute of Finland

Type: original research

Paper focuses on the relation of triple-helix activities and the migration of human capital in the region without the science-university. The main question is, how the middle-sized town is able to attract sufficient amount of academics to the region to foster TH-activities without the science university. Secondary question are; what are the implications of migration based human capital to

the academic community in the region, and for the TH activities on the region? Finally, paper also discusses the impact of university center model on the migration patterns of the region. Science-university refers to HEIs providing masters' and doctoral degrees, and with strong academic research, to distinct them more practical oriented Universities of Applied sciences, in case of Finland.

Study is part of the three-year research project in Seinäjoki-region (Finland) by Migration Institute of Finland. For this specific paper the questionnaires targeted to return migrants, out-migrants and in-migrants and HEI students (n=712 in total), as well as interviews to these groups are utilized. Approach is thus mixed method study, and both quantitative and qualitative methods will be deployed.

Findings or expected outcomes include the more detailed understanding of the relation between the migration based human capital and development of local TH activities. Place attractiveness and migration management capabilities for the regions that aim to foster TH activities without science-university are discussed as well. If academics and other highly skilled individuals who are relevant for the TH activities needs frequently to be attracted from outside of the region, they are long-distance commuters or stay only a short period of time, these may have impact on their local networks, and maybe engagement patterns to the local activities. Migration patterns are also likely to include long-distance commuting. For these academics who are working for the satellite unit of their university in the local university center (based on various affiliations), the role of academic activities and linkages at main campuses at their home cities and universities, also creates a different assets. In sum, various mobility patterns may have impact on development of often long-term and personal commitments that TH activities among industry, academia and government require

However, model is also opportunity to create local job market for academics, for those who commit also to the region. Findings are expected to increase the understanding about the role of migration patterns and "talent management" in the development of TH activities in case of non-university towns.

Limitations of the study are clearly on its case study nature, and consequently low generalization of the results. However, this is a common problem in qualitative studies and aim is to provide a new knowledge to be part of the discussion on the matter, rather than self-sufficient results as such.

Practical implications provide data and tools to manage migration in the context of regional university and innovation centers without Science universities.

Keywords: Migration of highly-skilled, University center, regional economic development

Triple Helix governance for sustainability: cases from the European Green Capital Award

Michele Coletti - Grenoble Ecole de Management and Benedetta Trivellato - University of Milano Bicocca

The Triple Helix theory affirms that conditions for innovation in a knowledge-based society are improved by university-industry-government interaction (Etzkowitz, 2003). This model has been applied to many industries and levels, included regional innovations systems. However, its validity has been questioned because of its lack of co-creational arrangements involving the civil society (McAdam & Debackere, 2018). Attempts to improve it it have been carried out by many authors, proposing new helices to include new stakeholders in global challenges such as sustainability (Carayannis et al., 2012) or adding new dimensions such as knowledge and learning to explain how complex systems such as smart cities can institutionalize their governance.

There is no doubt that sustainable development is becoming a priority for governments and firms. Also the academic world is taking note with an increasing number of courses and programs on the subject, and nowadays many classes contain references to the UN Sustainable Development Goals (SDGs). In particular the SDG 17 aims to strengthen the means of implementation and revitalize the global partnership for sustainable development, and its target 17.17 is “Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships”¹.

Private-public partnerships and collaborations between public administrations, private business and research institutions are key to address global challenges such as climate change. These interactions often take place in formal and informal networks, that in order to perform, have to be managed.

Network management is the intentional use of managerial practices to govern processes in, of and at the boundaries of the network (Cristofoli et al., 2019). Collaboration is not the most likely outcome, but there are contextual conditions that make it easier (Coletti and Landoni, 2018).

An endeavor where all these dimensions interplay is the EU Green Capital Award “which recognizes and rewards local efforts to improve the environment, the economy and the quality of life in cities. The EGCA is given each year to a city, which is leading the way in environmentally friendly urban living and which can thus act as a role-model to inspire other cities”²

The EU Green Capital Award relies among others on the Reference Framework for Sustainable Cities, which explicitly mentions the need to strengthen the governance in partnerships.³

However, there are many ways to govern the sustainability transition and manage the network of stakeholders. Aim of our paper is to explore types of governance approaches by analyzing how stakeholders are involved and orchestrated in a number of cases of recent finalist cities to the EU Green Capital Award. We may find that the sustainable transition requires city governments being more or less directly involved in designing and managing this kind of initiatives (Visnjic et. al, 2016), but public administrators will benefit from having a clear view on the available paths. Moreover, the triple helix framework will be strengthened by these new insights.

¹ <https://sustainabledevelopment.un.org/sdg17> Retrieved 23rd Dec 2019

² <https://ec.europa.eu/environment/europeangreencapital/about-the-award/policy-guidance/> Retrieved 23 Dec 2019

³ <http://rfsc.eu/european-framework/> Retrieved 23r

References

- Carayannis, E. G., Barth, T. D., & Campbell, D. F. (2012). The Quintuple Helix innovation model: global warming as a challenge and driver for innovation. *Journal of Innovation and Entrepreneurship*, 1(1), 2. <https://doi.org/10.1186/2192-5372-1-2>
- Coletti, M., & Landoni, P. (2018). Collaborations for innovation: a meta-study of relevant typologies, governance and policies. *Economics of Innovation and New Technology*, 27(5–6), 493–509. <https://doi.org/10.1080/10438599.2017.1376166>

Cristofoli, D., Trivellato, B., & Verzillo, S. (2019). Network management as a contingent activity. A configurational analysis of managerial behaviors in different network settings. *Public Management Review*, 21(12). <https://doi.org/10.1080/14719037.2019.1577905>

Etzkowitz, H. (2003), 'Innovation in Innovation: The Triple Helix of University-Industry-Government Relations', *Social Science Information*, 42: 3 (Autumn), pp. 293-338.

Kourtiti, K., Deakin, M., and Caragliu A. (2014) An advanced triple helix network framework for smart cities performance. In Deakin, M. (Ed.) *Smart Cities*. London: Routledge, <https://doi.org/10.4324/9780203076224>

McAdam, M., & Debackere, K. (2018). Beyond 'triple helix' toward 'quadruple helix' models in regional innovation systems: implications for theory and practice. *R and D Management*, 48(1), 3–6.

Visnjic, I., Neely, A., Cennamo, C., & Visnjic, N. (2016). Governing the City: unleashing value from the business ecosystem. *California Management Review*, 59(1), 109–140. <https://doi.org/10.1177/0008125616683955>

Track 7. Individuals' role in Triple/Quadruple Helix or future innovation

Chair: Tiina Brandt

Leading organizations in information exchange: University – industry collaboration interfaces

MBA, PhD Fellow Dorian ALIU, Canakkale Onsekiz Mart University, Turkey & Asst. Prof. Dr.
Email: dorianaliu@gmail.com

Asst. Prof. Dr. Armando ALIU, University of Cambridge, UK, Hasan Kalyoncu University, Turkey, Email: armando.aliu@alumni.uni-heidelberg.de

Abstract

The purpose of this study is to highlight the influences of the information exchange approach brought by the innovative and institutional structures to the collaboration environment in the prominent countries. The coordinated interactions and operations of the Technology Development Zones (TDZs), Technology Transfer Offices (TTOs), Research and Development (R&D) Center and Research Institutes which are perceived as featured interface structures were put forward in many literature studies that these interface structures strengthen the collaboration between university and industry sector by focusing on its internal and external stakeholders' relations. The objective of this study is to examine the interface structures at three levels. Initially, the research reflects the attributes of successful interface structures operating within universities at regional level. Secondly, the research offers a new business model to the university – industry collaboration ecosystem by locating the embedded position and enhancing the effectiveness of the interface structures within the scope of R&D and Innovation and universal success factors accepted at the national level. Thirdly, the research indicates internationally successful examples of how the interface structures attained certain standards through various international organizations and platforms where these structures are organized at the international level. The originality of this investigation is that the manager profiles and actors taking part in the management of the university – industry collaboration interface organizations were analyzed by taking into account the impact factors; such as, personal experiences, leadership characteristics, teamwork co-operations and communication with stakeholders.

In this study, a mixed method approach, interviewing, case study and observation techniques were used in the framework of qualitative methods during the examination of interface structures at regional level. The data were obtained through a survey application to the sample selected from the members of the Association of University Technology Managers (AUTM) and other AUTM member organizations at national and international levels. The data gathered from 127 survey participants were analyzed by means of using various qualitative and quantitative data analysis softwares (e.g. NVivo, SPSS).

Experimenting citizen science in South Ostrobothnia, Finland

Dr. Jari Kolehmainen, Tampere University, Finland

Type: practical experience analysis

Purpose

The purpose of this paper is to describe and reflect practical experiences related to the citizen science in the context of South Ostrobothnia, Finland. It is based on a development project conducted by Tampere University. The aim of that project was to examine the possibilities and limitations of citizen science in South Ostrobothnia. Citizen science (CS) is still a developing phenomenon, although it has long been used in certain fields of research (e.g. biology, geology and ethnology). Recent trends in the transparency of science and research have increased also interest in citizen science.

Background and context

CS is already an old phenomenon, but only quite recently it has really taken off due to the technical development and digitalization (Sahlman 2015). It is also institutionalizing as a field of science (see e.g. Bonney, Cooper & Ballard 2016). EU has been promoting the openness and transparency of science. CS can be seen as a part of this development. For example, EU has published *Green Paper on Citizen Science* in 2013. It defines CS as follows: *"Citizen science refers to the general public engagement in scientific research activities when citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools and resources."*

South Ostrobothnia is a semi-rural region whose most important industrial cluster is related to food industry. Seinäjoki University of Applied Sciences is the biggest higher education institution in the region with 350 staff members, but there is also University Consortium of Seinäjoki (UCS) which was established in 2004 to strengthen the collaboration and provide common services to the universities having permanent operations in the region. (see more Kolehmainen&Alarinta, 2009; Kolehmainen et al, 2016).

The aim of the above mentioned project was to open up the possibilities of citizen engagement also in research contexts where citizens have not typically been involved. At the same time, the aim was to engage with the development processes of the region's business life. From the regional higher education policy point of view, facilitating and boosting the citizen science activities was a mean to increase the volume and variety of scientific research conducted in the region.

Approach

The basic idea of the project was to examine the possibilities and limitations of citizen science through two concrete and agile pilots:

Experiment 1, Food Enthusiasts and Weak Signals: The experiment, together with food bloggers and enthusiasts, sought to identify, collect, analyse and interpret various "weak signals" in the food industry that could be used, for example, in formulating research related to the food industry and in product and service development.

Experiment 2, Game Developers in Support of Research: The experiment, together with local game developers' association (Sepeli ry), tried to find new ways to increase gamification in business-oriented research tools and in research itself. The core of the experiment was a programming hackathon resulting in 3-4 different game ideas.

Findings and value

The goal of the project was to explore citizen science as a modern phenomenon and implement two practical experiments. Key participants of the project become familiar with the phenomenon and the experiments contributed towards a large dissemination of the citizen science's principals. Specific results and general learning can now be utilized in various studies and development projects where and when the principles of citizen science do apply.

Citizen science is such a new phenomenon that it was not generally recognized among the members of the local research community. Among general public the term citizen science was even less known and that could have contributed to the somewhat low interest to participate in the experiments.

Although several local and regional organizations linked to food were asked to participate in the weak signal experiment, a great majority of the participants represented the research community. Subsequently, during the experiment it became evident that far into the future required way of

thinking proved to be difficult even for the professionals. Still, participants considered the approach for recognizing weak signal useful and fun. The core of participants in the gaming experiment were member of Sepeli r.y., an association of ICT-professionals, and thus there were plenty of competence.

The actual value and benefits of the project are hard to measure but implementing it is expected to lower potential barriers of change and encourage the research community as well as other organizations to consider citizen science as an option in their future endeavors.

Limitations and implications

Citizen Science is a historic phenomenon that is getting a growing momentum in various contexts due to the Internet and other digital applications. The described project could only stretch the surface of the many opportunities CS enables. As such CS is a useful “method” for small, agile organizations such as the University Consortium of Seinäjoki to implement even longitudinal studies with limited resources. Still, in order to get utilized CS needs to be promoted, tested and further scrutinized. Moreover, when citizen science is utilized in any research it has to follow the same rules and criteria as any other scientific research.

Key words: citizen science, higher education policy, experiment

References

Bonney, R., Cooper, C. and Ballard, H., 2016. The Theory and Practice of Citizen Science: Launching a New Journal. *Citizen Science: Theory and Practice*, 1(1), p.1.

Green Paper on Citizen Science. Citizen Science for Europe Towards a better society of empowered citizens and enhanced research. 2013. European Commission. Available at:

<https://ec.europa.eu/digital-single-market/en/news/green-paper-citizen-science-europe-towards-society-empowered-citizens-and-enhanced-research>. Accessed: 15th January 2020.

Kolehmainen, J. & Alarinta, J. (2009). University Consortium of Seinäjoki, Finland: Bringing South Ostrobothnia to the Knowledge Economy. *Regions* (273), 17-19.

Kolehmainen, J., Irvine, J., Stewart, L., Karacsonyi, Z., Szabó, T., Alarinta, J. & Norberg, A. 2016. Quadruple Helix, Innovation and the Knowledge-Based Development: Lessons from Remote, Rural

and Less-Favoured Regions. *Journal of the Knowledge Economy*. [DOI 10.1007/s13132-015-0289-9]

Sahlman, E. 2015. Kansalaistiede meni nettiin, Tapaustutkimus verkkosivuista: Citizen Science Center, SciStarter and Zooniverse. University of Helsinki, Communication. Available at: <http://urn.fi/URN:NBN:fi:hulib-201703273285>. Accessed: 15th January 2020.

The business actions and practices in strengthening the Quadruple and Quintuple Helices: A study with Structural Equation Modeling

Dr. Andréa Mineiro, UNIFEI, Brazil

Type: original research – either conceptual or empirical.

Purpose

To analyze the practices and relationships of companies installed in Science and Technology Parks (STPs) as drivers of the Quadruple and Quintuple Helix (QQH) and determinants for the alignment to the future vision of the STP.

Design/Methodology/Approach

This research has an exploratory, descriptive and quantitative nature. The study method used was the field survey. Companies associated with the Consolidated STPs, chosen based on the following criteria, are the object of this study: (i) has been operating for more than ten years; (ii) is among the consolidated STPs of Anprotec; (iii) circulation of more than five thousand people in its surroundings; and (iv) accessibility to the environment. In this sense, the population studied was composed of companies installed at Tecnopuc (150); Tecnosinos (76); Zenit (51); Porto Digital (328) and Parque Tecnológico de São José dos Campos (78), totaling 683 target companies in Brazil. The data were collected through semi-structured surveys, which were obtained from the contact of the researcher. To validate the research instrument, specialists and pre-test were used. The entrepreneurs were contacted via e-mail, telephone and WhatsApp®, obtaining 175 responses,

which represents 49.15% of the sample accessed. The answers were analyzed and 48 were eliminated for the following reasons: (i) 35 were incomplete; (ii) 3 did not go through the control questions; (iii) 1 respondent did not meet the job requirement; and (iv) 9 companies were not installed in STPs. After the exclusions, there were 127 valid responses, which represents 35.67% of the sample accessed. For data analysis, descriptive statistics were used for the sample studied and the Structural Equations Model (SEM), which allows the researcher to examine, simultaneously, multiple relationships of dependence and independence among latent variables, through observable variables (Hair Jr. et al., 2014).

Findings or expected outcomes

The results emphasized the positive relationship between the Quadruple Helix (QH) and the Future Vision of the STPs, as well as the importance of the collectives as QH representatives. Furthermore, the relationship between the companies and the QH actors was not aligned with the future vision of the STPs, and the collectives did not demonstrate influence in this relationship. Also the positive relationship of both the Quintuple Helix (5H) and the future vision of the STPs was evident, as well as the moderation of the collectives in this relationship. Thus, the research advances by emphasizing the relationship of companies as driving agents of QQH in innovation environments, reinforcing the ascendant and distinct role of collectives in the relations with the STPs.

Limitations/implications

Among the limitations of this research is the limit of the research in consolidated STPs, being necessary caution for inference in other innovation environments, such as incubators or accelerators. In addition, collectives are a recent phenomenon and require longitudinal studies of their performance in innovation environments. Finally, new research can investigate other companies inserted in STPs under implementation and operation, or incubators and accelerators, in order to identify the possible differences between the environments.

Practical and/or Social Implications

With the advent of the diffusion of technologies associated with the concept of industry 4.0, the socioeconomic and business dynamics faces changes (Schwab, 2019). Aside from business dynamics, regional innovation models and policies have faced several changes with current technological trends. The traditional metaphor of the Triple Helix (TH) has been strengthened and

incorporated new models of innovation generation, including society (QH) and the environment (5H), as important helixes in the innovation dynamics, specifically in this context of technological transformations. The new relations between society, innovation and environment can be seen more clearly in Science and Technology Parks (STPs). In recent years the concept of STPs has evolved, they are considered part of innovation areas, inserted in the city with constant interaction with the region, they are non-uniform environments, with high level of collaboration and flexibility, which aims at improving the quality of life of society (Audy & Piqué, 2016). In this perspective of the quality of life of the surroundings, social impact businesses stand out, which have been a topic of interest in the public and private sphere for enabling a more effective relationship between society and businesses (Mahfuz, Razzaque, Liaw, Ray, & Hasan, 2018). The social impact businesses integrate several institutional logics and provide the articulation of social and commercial missions in a single business model (Spieth, Schneider, Clauß & Eichenberg, 2018, Mahfuz et al., 2018). In addition, the vision of impact businesses is aligned with the future proposition of the STPs, to be an environment beyond their walls and to be increasingly connected to bring benefits to their region (Mineiro, Amaral & Castro, 2019). It is worth noting that companies play an important role in this innovation dynamic, and there are theoretical gaps for the understanding of its function for the strengthening of the Quadruple and Quintuple Helix (QQH).

Originality/Value

The relevance of the new actors (Quadruple and Quintuple Helix) in the innovation dynamics, specifically in innovation environments such as the STPs, is highlighted. It is pertinent to consider the role of collectives in the alignment to the future vision of the STPs. Collectives reflect people's vision, helping to ensure that the STP is not just a walled environment and overflows its operations, but also plays a key role in connecting innovation environments. Thus, it was verified that in practices related to sustainability the collectives are promising, contributing to the STPs with their ability to mobilize the ecosystem as well as in sustainable issues. In addition, the companies that are part of such movements consider that it represents the actors of the Quadruple Helix. In addition, it is noteworthy that the connection with society (QH) can also happen through business.

Keywords: Quadruple Helix; Collective; Quintuple Helix; Future Vision of Science and Technology Parks; Impact Businesses.

Triple Helix as gendered innovation environment

Oili-Helena Ylijoki, University of Tampere, Finland & Tiina Suopajarvi, University of Turku, Finland & Minna Salminen Karlsson, University of Uppsala, Sweden

Types: original research

Purpose

Triple Helix model has been criticized for supporting “traditional masculine notions of entrepreneurship and innovation—not least since publicly supported Triple Helix initiatives also tend to be situated within the male-dominated settings of networks and industries” (Lindberg et al. 2014, 95). In this presentation, we unpack the gendered notions and implicit understandings of the relationships and networks among the Triple Helix partners. Our starting point is that innovation takes place in environments where geographic proximity, specialised knowledge, and networks are decisive. In addition, the history and value hierarchies of this environment affect what kinds of innovations are considered regionally important. (Lindberg et al. 2014; Alsos et al. 2013.) Based on this, we focus on one academic field at two innovation environments: bio- and health technology at Tampere region in Finland and Uppsala region in Sweden. The two environments have different research and innovation histories and profiles. Tampere has been strong in the area of ICT research and innovation while Uppsala has been strong in biotechnology. These disciplinary fields differ from each other in their gender composition as well as in the characteristics and temporalities of innovation processes, thereby creating different kinds of spaces for university-industry-government relationships. Drawing upon these specific contexts, we how different partners of the Triple Helix perceive the possibilities and challenges in their local research and innovation situation, especially its gender aspects.

Design/Methodology/Approach

We scrutinize gender in strategic research and innovation discourses in relation to women researchers’ lived experiences. In order to reach an in-depth, context-sensitive understanding, we rely on a qualitative study, encompassing two kinds of focused interviews. First, we have carried out expert interviews with Triple Helix partners who work in strategic positions to enhance regional

R&I, such as regional and local authorities, higher education leaders, universities' innovation officials, and managers of private companies. This data, combined with research and innovation strategies and other key documents, allow us to investigate how the regional and local innovation environment is perceived and understood by various stakeholders. Second, we have interviewed women with doctoral degrees in bio- and health technology who work in universities, in other research institutes, in industry or as start-up entrepreneurs. Studying simultaneously these two data sets allows us to explore the lived experiences of female researchers and academic entrepreneurs in their wider social, economic and material contexts and to uncover their dynamic and complex relations.

Findings or expected outcomes

In both of our study regions, innovation and entrepreneurial processes take place in the gendered interplay between Triple Helix partners. The results show how the differences of research and innovation history in Uppsala and Tampere shape women researchers' understandings of and possibilities for entrepreneurship and commercialization processes of their research work. This is interlinked with their imagined career trajectories and goal settings. The role, scope and gender composition of networks is of crucial importance in both places. The results contribute to a deeper understanding of the gendered relations and power hierarchies of research and innovation and in this way increase awareness of hidden and invisible dimensions involved in the notion of Triple Helix.

Limitations/Implications

Based on a small-scale qualitative study, the results cannot be generalised to all kinds of disciplinary fields, industries, regional and national contexts. The results suggest context-sensitive ways to support female researchers' and entrepreneurs' innovation activities and career paths in R&I.

Originality/Value

So far, Triple Helix has been mainly studied as a model or a strategy that has social consequences, like gender or other segregation (Lindberg et al. 2014). We look at it as a context formed in regional economy that affects researchers' career trajectories and therefore their life-choices. In this way, we relate the notion of Triple Helix to everyday practices and their gendered dimensions.

Keywords: gender, bio- and health technology, networks, region

References

Alsos, Gry Agnete, Ljunggren, Elisabet & Hytti, Ulla 2013: Gender and innovation: state of the art and a research agenda. *International Journal of Gender and Entrepreneurship* 5(3): 236–256.

Lindberg, Malin, Lindberg, Monica & Packendorff, Johann 2014: Quadruple Helix as a Way to Bridge the Gender Gap in Entrepreneurship: The Case of an Innovation System Project in the Baltic Sea Region. *Journal of Knowledge Economy* 5: 94–113.

The traveling startup scene: Student-steered field landing and the quadruple helix in Turku, Finland

Päivi Oinas, Sidath Alwis & Jarmo Nikander, University of Turku, Finland

paivi.oinas@utu.fi; sidath.h.alwis@utu.fi; jarmo.nikander@utu.fi

Type: Original research

Background & aims

In the contemporary knowledge-based economy, universities are increasingly considered as key collaborators in knowledge-creation processes. It is debatable whether, to what extent, and how university research should be supporting the interests of external, often private, parties (e.g., Kaidesoja & Kauppinen 2018; Suominen 2018) but there is ample international evidence that existing business communities, and new entrepreneurial ecosystems benefit from ties to nearby universities (e.g., Ensley and Hmieleski 2005; George et al. 2002). Some environments are more conducive to university-linked business and startup activities than others (cf., Di Gregorio & Shane 2003). Similarly, cities, regions or countries are commonly described as either “entrepreneurial” or “non-entrepreneurial”, and this is typically taken to be a characteristic that is inherent in given institutional environments, including the propensity of local universities to engage in startup emergence and entrepreneurial processes. When change to a prevailing situation is

desired, top-down policy initiatives come in demand, and draw scholarly attention respectively. However, the institutional agency of individuals and organizations from within emerging ecosystems is often overlooked.

This paper analyses the innovative startup ecosystem emergence based on the Finnish experience in the past 10 years (cf. Nikander 2019; Nikander & Oinas 2019a) and the developments that have taken place in the former capital city of Turku in particular. It aims to understand (1) how independent student activity was able to spur the emergence of the startup ecosystem in Turku, and (2) how it has developed into a legitimate feature of the local economy.

Methodology

Since the study intends to understand delicate processes of emergence through the interscalar interactions of individuals, organisations, and institutions, a qualitative research approach is chosen. Ethnography is partly involved but data is mainly collected via semi-structured interviews with actors of the quadruple helix (startup entrepreneurs and incumbent firms academics, city as well as university administrators, and students running a local entrepreneurship society), as well as from media coverage and a range of reports and internet sources. Primary interview data is transcribed and analysed using NVivo software based on categories provided in the conceptual framework developed for the study.

Findings

The data enables us to look back to the recent developments in Finland that were kick-started largely by the 2008 financial crisis and the concurrent fall of the Nokia mobile division. These events i.a. gave rise to significant student-powered movement that effectively imported and established the startup-scene in Finland. This experience presents a case in “landing” of an evolving institutional field with its logics, artefacts and culture that is *the startup scene*. This field with its active members, evolving practices, and internationally renowned events, especially under the brand ‘Slush’ (the flashy student organized non-profit startup conference) continues to shape the face of contemporary startup entrepreneurship in many cities in the country (Nikander 2019; Nikander & Oinas 2019a,b).

There is a long-standing tradition to regard entrepreneurship as the object for cultural influence (Tornikoski and Newbert 2007; Newbert and Tornikoski 2012). Culture is not only a

static force affecting entrepreneurship, but also a dynamic one which is also affected in part by entrepreneurship (Spigel 2013): the institutional work put in by students not only contributed to legitimizing growth oriented student entrepreneurship but also to changing attitudes towards entrepreneurial aspirations. Our analysis of the Turku case indicates that it has been the internationally extended institutional fields of the relevant stakeholders with students at the forefront that have played a key triggering role in the startup ecosystem emergence.

Theoretical Implications

The paper contributes to the understanding of the formative processes of entrepreneurial ecosystems (e.g., Alvedalen and Boschma 2017; Thompson et al. 2018; Spigel and Harrison 2018; Goswami et al. 2018). It presents a case of the local emergence of a startup ecosystem as an institutional phenomenon which is generally discussed in terms of place-based (innovation and) entrepreneurial ecosystems (Spigel 2015; Spigel & Stam 2017; Alvedalen & Boschma 2017). We show that is actually part and parcel of a wider, even global institutional frame dubbed as “the startup scene”. The analysis builds on a conceptualisation of the startup scene as an institutional field (cf. Nikander 2019; Nikander & Oinas 2019a,b) that has the capacity to “travel” across space, and after localisation (or translation and legitimisation), “land” in different institutional environments to generate institutional and structural change in favour of entrepreneurship in those environments.

Practical implications

Thus, the startup scene is an institutional field that is a similarly (internationally) “traveling” phenomenon as many other mobile practices, such as policies (Peck and Theodore 2010, 2012), planning concepts (Healey & Upton 2010; Healey 2013; Gómez & Oinas 2018), or managerial practices (Djelic & Quack 2003; Battilana & Boxenbaum 2009; Powell & Sandholtz 2012). The results suggest the landing of the scene as a student-powered process can have long-lasting consequences on regional startup development and related policies, provided it is supported by the “traditional” triple helix.

Originality

The study shows that the fourth “helix” has been vehemently occupied by entrepreneurially motivated students whose independent introduction of the international startup field has been a key vigorous change agency in the Turku startup scene. Accordingly, the paper builds a novel

framework for understanding the ecosystem emergence phenomenon. The framework builds on the “quadruple helix” model (e.g., Leydesdorff 2012) applied in analyses of knowledge production, open innovation, and university-industry interaction. It extends the model by proposing that the standard approach focusing on a given scale of analysis is only part of the broader setting. Drawing on institutional theory, we propose that we need to study the role of spatially extended institutional fields of the relevant stakeholders in startup ecosystem emergence.

Keywords: startup entrepreneurship, quadruple helix, institutional field

Upgrading along Value Chains: Strategies for Thailand’s Functional Milk Industry

Ms.Panisa Harnpathananun, Office of National Higher Education Science Research and Innovation Policy Council (NXPO), Thailand

Abstract

This paper is “Practical Experience Analysis” which aims to analyze critical obstacles hampering the growth of the functional milk industry and suggest recommendations to overcome those obstacles. Using the Sectoral Innovation System (SIS) along value chain analysis, it is found that restriction in regulation of milk disinfection process, difficulty of dairy entrepreneurs for health claim approval of functional food & beverage and lack of intermediary between entrepreneurs and certified units for certification of functional foods and milk are major causes that needed to be resolved. Consequently, policy recommendations are proposed to tackle the problems occurring throughout the value chain. For the upstream, a collaborative platform using the quadruple helix model is proposed in a pattern of effective dairy cooperatives. For the midstream, regulation issue of new process, extended shelf life (ESL) milk or prolonged milk are necessary which can be extended the global market opportunity. For the downstream, mechanism of intermediary between entrepreneurs and certified units can be assisted in certified process of functional milk, especially a process of “Health claim” approval.

Key Words: Thailand; functional foods; functional milk; supply chain; Quadruple helix; Extended shelf-life (ESL) Milk; intermediary

Introduction

Food industry is considered one of the crucial industries for high economic growth in Thailand. It accounts for 22.22% of the country's GDP in 2018. At the present, Thailand is the 2nd ranked of Asia for food exporters of US\$ 16.7 billion¹. According to disruptive change in the world, the role of food has also been not more than only nutrition, but also affected to health benefits to bodies. This type of food is well-known as "Functional Food". The global market of functional food was initially approximately US\$ 43.27 billion in 2013 and is projected to reach US\$ 275.77 billion by 2025 according to a report². Milk is one kind that contain many nutrients with useful human health. In a case of Thailand, functional food has a potential growth in Thai food industry owing to more population in eldery society, lifestyle of working people and desires of disease prevention. In 2018, functional food market in Thailand is about US\$ 2,250 million and expect to gradually grow 4% a year in 2018 – 2022³. Trends of functional food have become significantly influenced to dairy industry. They have the powerful effect through the dairy value chain. Enhancement for farmers' quality of life and higher incomes from agricultural sectors could be occurred.

Purpose

This paper is aimed to study actual situation of functional milk and dairy industry in Thailand based on "Sectoral Innovation System: SIS" along the value chain. The analysis of happening gaps, players' need, and obstacles is led to the policy recommendation to enhance the competitiveness of Thailand's functional milk and dairy industry in global market

Methodological Approach

This paper is studied, implemented and divided into 3 parts, following to:

Part 1: Literature review of food industry and trend, future food, functional food, functional milk and dairy product industry.

Part 2: "Analytical Framework" setting-up by using concept of Sectoral Innovation System (SIS) approach via gathering practical data and analyzing relevant information

Part 3: Policy recommendation designing and recommendation

Functional Food and functional milk in Thailand

In Thailand, “Functional food” is accountable for newcomer of healthy food innovation and has gradually grown in Thai food industry. People have behaviors to be more interested in health, less spending time to exercise. Hence, the market value of Thai market of healthy foods can be demonstrated a trend as below. The Compound Annual Growth Rate (CAGR) is calculated a 6.7% in 2011 – 2016. The tendency is gradually increasing.

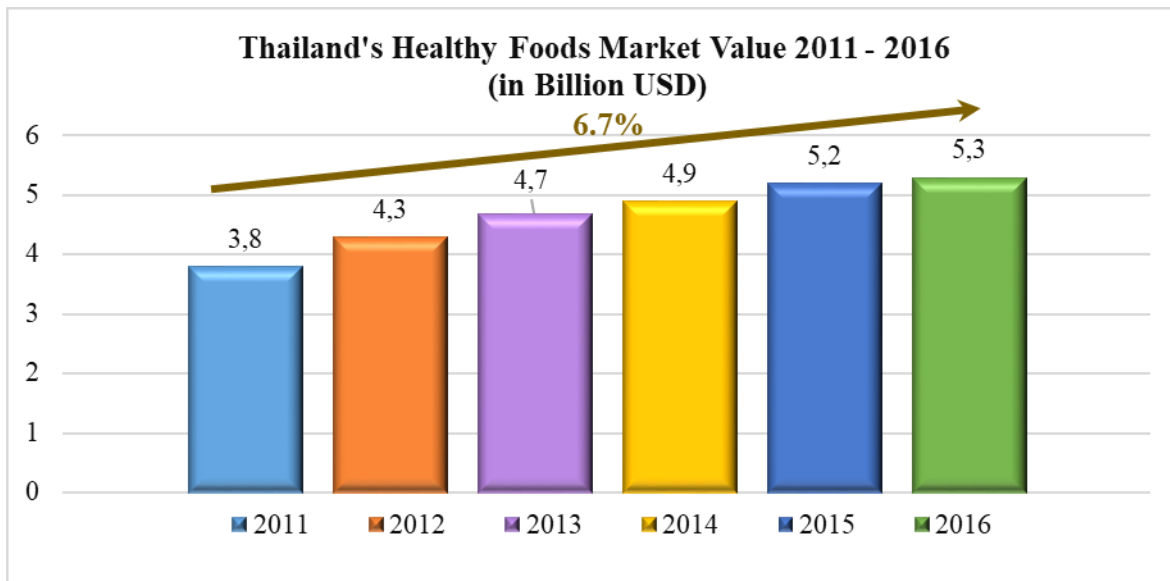


Figure 1 Thailand's Healthy Foods Market Value 2011 - 2016 (in US\$ billion)⁴

As a result of Food Focus Thailand in 2018, healthy and ready meals are the most export value is milk and dairy products that have the growth rate 10%. Trend of functional milk in Thailand is also raised because Thai people concern to own health through nutrients intaking inside food and more exercises. Thai dairy entrepreneurs can produce this milk in many processed formats, for examples, specific nutrient enriched milk, milk from special cow husbandry management, etc.

The report⁵ is mentioned that functional food and functional milk can enhance the trade opportunities for Small and Medium enterprises (SME) who are the most amounts of business entrepreneurs in Thailand. Owing to functional food and functional milk can add more value in food, resulting to rise in revenues for dairy farmers and entrepreneurs. The comparison of price for each type of commercial milk in actual market can be demonstrated below.

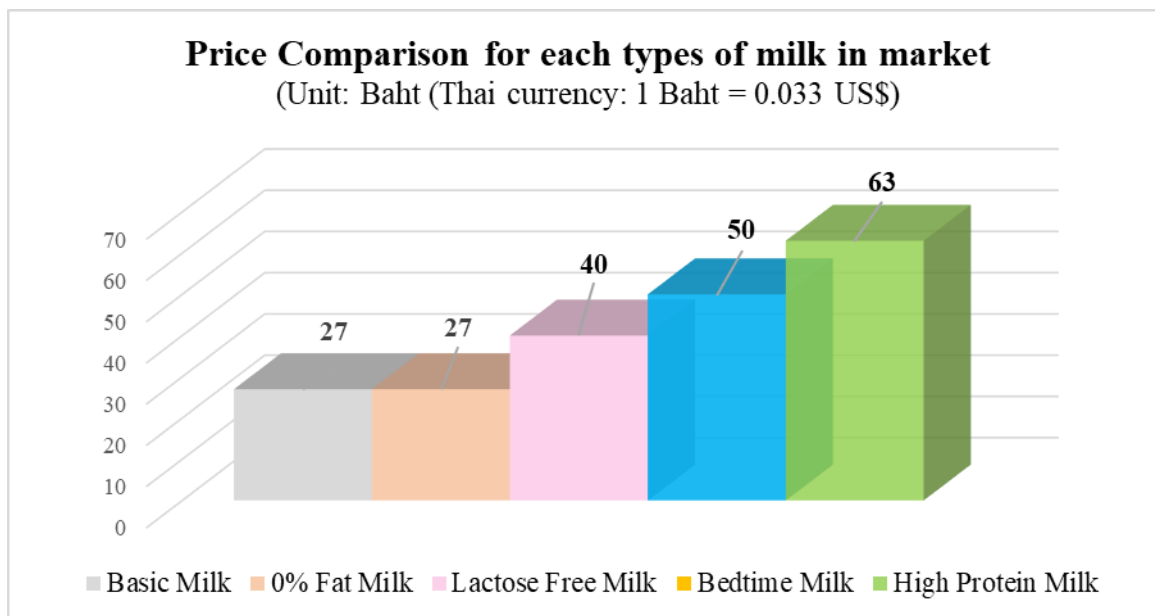


Figure 3 Price Comparison for each types of milk in market (applied from a report of Krungthai Macro Research 2019)

However, Thai industry of functional milk and dairy products has been begun recently. Hence, production, market and other economic information cannot be found, studied and analyzed as expected.

Analytical Framework Approach

This paper is to apply a tool of “Sectoral Innovation System: SIS”⁶ to be analyzed the aggregated system for innovation interactions for various industrial sectors. The terminology of SIS can be defined as “an integrated structure made up of interactions among agents/ actors in market and non-market who are inclined to develop products into a market. These components consist of agents, knowledge and learning processes, basic and applied technologies, inputs or demands, mechanisms of agent’s interaction, marketing processes of competition and selection and institutions.

Value Chain of Dairy Production

Dairy Production Value Chain could be considered and divided into 3 parts: upstream, midstream and downstream. An upstream of dairy industry is focused on genes, Deoxyribonucleic acid (DNA) and process of breeding for specific cow species. Midstream of dairy industry is stated

since milk transportation from farm to milk collection shell which should be treated quality of milk before milk processing system. Eventually, upstream is product standardization and distribution on shelf to markets and customers. Functional Milk is obviously involved with health claim for functional effects in human being.

Fact Findings and Limitations

The study in actual situation of functional milk production in Thailand could be found “Limitations” along the value chain and led into development of policy recommendation as below:

Upstream: Weak dairy cooperatives are affected to the quantity of milk which has been transmitted to milk processing factories. Poor quality of milk collection system and milk treatment facility to convert in primary process. The results are not enough amounts ready-to-eat milk for consumers in a country.

Mid-Stream: Lack of new announcement of new milk quality treatment. Most kinds of functional milk are treated by “Pasteurization” process which is treated milk with high temperature in appropriate period. At the present, there is new method of milk quality treatment, known as “Extended Shelf Life (ESL)” which is treat milk with 120 – 135 oC for 1 - 4 seconds⁷. New milk process could be extended the milk shelf life, particularly, functional milk from 10 days to 30 days and over). This is to enhance the great opportunities of product export in more countries. Nevertheless, this method has not been yet approved and announced by the authority of Thailand.

Downstream: Nowadays, functional milk produced by Thai entrepreneurs is not approved in a case of “Functional food” or “Novel food” which is complied with “Health claim” in human beings. The main causes are Thai entrepreneurs cannot declare and express any documentation about proof of efficacy based on efficacy to be controlled animal studies, as well as no validation especially in one human clinical trial with suitable design and statistical accepted outcomes.

Policy Recommendations and Conclusion

This paper is to study and review the value chain of milk and dairy products in Thailand, focused on functional milk which is one special kind of milk that has characteristics usefully affected to healthy conditions in human beings. The sectoral innovation system of milk and dairy product industry has been recognized. Therefore, recommendation for upgrading along value chain for functional milk in Thailand can be concluded as below:

- Strengthening the roles of **Dairy Cooperatives** to be “Effective and Practical **Quadruple Helix**”

The main aim of cooperative is to increase members involvement and promote rural development, effecting to the development of rural economies, also upgrading the standard of living for rural people. The power of collective members is to overcome by acting in the product markets. The need of cooperatives is to ensure in actual secure markets. The successful dairy producers’ cooperatives are in Japan, the Republic of Korea and New Zealand⁸. Complete functions of dairy cooperatives should be exactly implemented, for instances, knowledge sharing and management, financing assistance, trade negotiation empowering, higher qualified operation/ manufacturing. Their governments are also progressively to support development through technical assistance, financial schemes and standard and regulations. Perfectly strong linkage of all players along value chain since dairy farmers, dairy cooperatives, entrepreneurs/ milk manufactures, researchers in universities and research institutes until to actual markets as “**Quadruple Helix Linkage**” is the excellent mechanism to drive Thailand functional milk industry to be the leader in global market

- **Improving and developing regulations and institutions**

Thailand government should be adopted new knowledge and disruption which can be suddenly changed. The flexible and modern institutions are extremely required. Thai entrepreneurs mostly require the announcement of Ministry of Health about new milk quality process. The government should issue and support both infrastructure and expertise as useful tools to enhance the production efficiency of local milk manufacturers.

- **Forming “Intermediary” who can facilitate the reaching procedure to be approve Thai branded food and beverage to be “Functional food” or “Novel food”.**

Complicated and new procedures could be crucially obstacles to Thai entrepreneurs to develop and produce new products and services can be commercial in both local and international markets. The role of intermediary is “Practical assistant” who helps and supports in each method and coordinate with experts such as researchers in universities and research institutes, included with relative government agencies such as standard certification units: Food and Drug Administration (FDA), Ministry of Health, etc.

References

1. Thailand Board of Investment: BOI. (2017). Thailand: Food Industry [Online] Available at: <http://www.boi.go.th> (Accessed 5 May 2019)

2. Grand View Research (2019) Functional Foods Market Size, Share & Trends Analysis Report by Ingredient (Carotenoids, Prebiotics & Probiotics, Fatty Acids, Dietary Fibers), By Product, By Application, And Segment Forecasts, 2019 – 2025 [Online]. Available at: <https://www.grandviewresearch.com> (Accessed: 10 October 2019)
3. Krunghthai Macro Research (2019) Functional Foods, [Online]. Available at: <https://www.ktb.co.th> (Accessed: 5 May 2019)
4. Shahbandeh, M. (2019) Revenue generated by the functional food market worldwide from 2019 to 2025 [Online]. Available at: <https://www.statista.com> (Accessed: 1 December 2019)
5. Market Intellica (2019) Global Functional Food Ingredients Market Report 2019 [Online]. Available at: <https://www.marketintellica.com> (Accessed: 24 November 2019)
6. Phi. D. X. (2017) Dairy Production and Trade in Thailand. Kasetsart University.
7. Malerba F. (2002) ‘Sectoral systems of innovation and production’, Research Policy 31, pp.247–264.
8. Kapadiya D. B., Prajapati J.P., Pinto S.V. (2017) ‘Extended Shelf Life Milk’ Technical Articles, pp.143-146.
9. Uotila M., Dhanapala S.B. Dairy development through cooperative structure, [Online] Available at: <http://www.fao.org> (Accessed: 20 November 2019)

¹ Thailand Board of Investment: BOI. (2017). *Thailand: Food Industry* [Online] Available at: <http://www.boi.go.th> (Accessed 5 May 2019)

² Grand View Research (2019) Functional Foods Market Size, Share & Trends Analysis Report by Ingredient (Carotenoids, Prebiotics & Probiotics, Fatty Acids, Dietary Fibers), By Product, By Application, And Segment Forecasts, 2019 – 2025 [Online]. Available at: <https://www.grandviewresearch.com> (Accessed: 10 October 2019)

³ Krunghthai Macro Research (2019) Functional Foods, [Online]. Available at: <https://www.ktb.co.th> (Accessed: 5 May 2019)

⁴ Thailand Board of Investment: BOI. (2017). *Thailand: Food Industry* [Online] Available at: <http://www.boi.go.th> (Accessed 5 May 2019)

⁵ Krunghthai Macro Research (2019) *Functional Foods*, [Online]. Available at: <https://www.ktb.co.th> (Accessed: 5 May 2019)

⁶ Malerba F. (2002) 'Sectoral systems of innovation and production', *Research Policy* 31, pp.247–264.

⁷ Kapadiya D. B., Prajapati J.P., Pinto S.V. (2017) 'Extended Shelf Life Milk' *Technical Articles*, pp.143-146.

⁸ Uotila M., Dhanapala S.B. Dairy development through cooperative structure, [Online] Available at: <http://www.fao.org> (Accessed: 20 November 2019)

Examining the role of universities within UIG collaboration of the clothing, textiles, leather, and footwear industry of South Africa

Sipho Mbatha*, orcid.org/0000-0002-0284-3349, siphombatha247@gmail.com, +2781 448 5385
Department of Design Studies, Tshwane University of Technology, South Africa,

Anne Mastamet-Mason, orcid.org/0000-0003-1423-2075, masonA@tut.ac.za, +27123826074,
Department of Design Studies, Tshwane University of Technology, South Africa,

Owen Seda orcid.org/0000-0001-9056-2979, owenseda@mindbuzz.net, +2712 382 6197
Department of Drama and Film, Tshwane University of Technology, South Africa

Vincent Maduna, madunaV@tut.ac.za, Department of Statistical support, Tshwane University of Technology, South Africa

Purpose

The Clothing, Textiles, Leather and Footwear (CTLF) industry is an important industry because of its employment and socio-economic development prospects in developed and developing economies. The inclusion of the CTLF industry of South Africa amongst priority industries to drive socio-economic development and the transition into a knowledge economy underpins the importance of this industry. While this is the case, limited studies have been conducted in developed and developing economic focusing on the role of universities within UIG collaborations. When university is involved in UIG collaborations, it tends to contribute to economic growth, competitive advantage, and pioneer new products, markets and industries. Previous studies focused on the status quo of UIG collaborations in the CTLF industry and forms of UIG collaborations that academic staff from universities with clothing related educational programmes. This highlights a gap for studies that focus on the role of universities with fashion design educational programmes within UIG collaborations of the CTLF industry of South Africa. Through the survey of literature, key roles of university were sourced and applied in this study to examine the role of universities

with fashion design educational programmes within UIG collaborations of the CTLF industry of South Africa. While this study will contribute to the literature on UIG collaborations from a developing country's perspective, it will also contribute to improving UIG collaborations within the CTLF industry of South Africa. Lastly, the paper may also contribute to the SGDs and Africa Agenda 2063.

Design/Methodology/Approach

A case study approach was employed to unearth the roles of universities with fashion design educational programmes within UIG collaborations of the CTLF industry of South Africa. Mixed methods were also employed as a methodology of the paper to cancel disadvantage of qualitative and qualitative methodologies. Twelve interview were conducted with five universities with fashion design educational programmes, three government directors that deal with trade, collaborations and innovation policies, two CTLF industry consulting firms, one CTLF firm and one CTLF association. Twenty-two structured interviews were correctly completed from CTLF industry dominant regions of South Africa. The qualitative data was thematically analysed. Quantitative data was analysed through SPSS using method of analysis. Cronbach Alpha analysis indicated that quantitative data's reliability was acceptable with Cronbach Alpha score of over 0.70. Trustworthiness tests were conducted and confirmed that the qualitative data meets the acceptable standards. The paper enjoys ethical approval from Tshwane University of Technology.

Findings

The findings indicated that universities with fashion design educational programmes perform the roles of human capital provider, they provide progress reports on UIG collaborations and have up to Ph.D educational programmes. The findings highlighted that universities with fashion design educational programmes did not perform the roles of co-capital providers, Linkage support staff, and did not have incentives for UIG collaborations. The study could not find conclusive evidence to support that universities with fashion design educational programmes perform the roles of conducting relevant CTLF industry research and improve their curricular. It is worth noting that the quantitative data largely indicated that the CTLF industry firms did not have UIG collaborations with universities with fashion design educational programmes and government.

Practical and/or social implications

Thanks to this paper, universities with fashion design educational programmes will better understand their roles in UIG collaborations of the CTLF industry of South. Government will also understand the role that universities with fashion design educational programmes play through UIG collaborations to assist government to achieve its trade, UIG collaboration and innovation policies. The CTLF industry will also gain a better understanding of the role of universities with fashion design educational programmes in its efforts to develop and sustain competitive advantage within South Africa. This paper shows that universities with fashion design educational programmes may need to improve on their roles in UIG collaboration within the CTLF industry of South in order to contribute to the achievement of the SGDs and Africa agenda 2063. This paper seeks to inspire institutional sphere actors to improve on their roles in efforts to strengthen UIG collaborations in the CTLF industry of South Africa.

Originality

In light of limited studies in UIG collaborations focusing on the CTLF industry from the developed and developing perspective, this paper makes novel contribution to the body of knowledge on UIG collaborations from the perspective of a developing country. This study also fills an existing gap on the developing literature on UIG collaborations in the CTLF industry of South Africa by focusing on the role of universities with fashion design educational programmes since the above-mentioned studies did not cover this perspective. This study also provides insights into the role of universities with fashion design educational programmes in contributing to SGDs and Africa Agenda 2063.

Keywords: Clothing and textiles industry, Triple Helix, SDGs, Africa Agenda 2063, role of university

Flows of academics

Helin, J., Koerselman, K., Nokkala, T. & Siekkinen, T. Finnish Institute for Educational Research, University of Jyväskylä. Corresponding author: Taru Siekkinen, taru.siekkinen@jyu.fi

Type: Original research

Purpose

Knowledge transfer between sectors is important regarding the societal impact of university research and future innovations. The knowledge transfers through human interaction, thus mobility of high-skilled people is important in the knowledge-based societies. Consultancy among PhDs has become popular and it is one important way of transferring knowledge. In universities, it is supported by the flexible working arrangements of PhDs working in universities. The purpose of this paper is to describe the intersectoral flows of PhDs inside Finland, i.e. mobility of doctoral degree holders between sectors. In addition, our focus is on those PhDs who have parallel working contracts in different sectors.

Methodology

Our study is based on a long, full population panel drawn from Statistics Finland's linked employer-employee data, which includes information on individuals' educational careers and labor market status. We use these data to study both the intersectoral labor market mobility and the contemporary intersectoral labor market links of Finnish PhDs during the years 2007–2015.

Findings

We find that mobility between universities and employers in other sectors is relatively low on a year-to-year basis. The majority of university entry and exit consists of new PhDs entering and old employees retiring. Cumulative intersectoral labor flows are however large during the period studied. We furthermore use detailed information on job spells to show that many PhDs have multiple simultaneous employment relationships with employers in different sectors, and that this phenomenon seems to be voluntary, driven by the employees' professional networks, and not by a lack of employment opportunities.

Social Implications

Our paper fills the knowledge gap that exists in Finnish higher education research; are those PhDs who work in universities, moving from sector to another. In addition, we describe how many of them have parallel working contracts as they are working in universities.

Keywords: Universities, PhDs' mobility, knowledge transfer, intersectoral mobility

Innovation orientation and entrepreneurial intentions of business students in Finland and USA

Dr. Tiina Brandt, Haaga-Helia University of Applied Sciences, Finland

Type: Original research

Purpose

The organizing principle of Triple Helix is the expectation that the university will play a greater role in society as an entrepreneur. The entrepreneurial university retains the traditional academic roles of social reproduction and extension of certified knowledge, but places them in a broader context as part of its new role in promoting innovation (Etzkowitz, 2003). Innovation begins to take on a new meaning as the spirals of the Triple Helix intertwine, cooperating from a position of relative autonomy to enhance each other's performance of their traditional roles (see Etzkowitz and Leydesdorff, 1997; Leydesdorff and Etzkowitz, 2002). The increased interaction among university, industry, and government as relatively equal partners, and the new developments in innovation strategies and practices that arise from this cooperation, are the core of the Triple Helix model of economic and social development. For this model to be effective, different aspects of innovation have to be supported and nurtured in each of the three parts.

In countries such as the US, the government plays a more interventionist role in innovation as an extension of the basic research-funding process. For example, the Small Business Innovation Research Program in the US makes grants to researchers and small firms to develop new technologies into businesses (Etzkowitz et al., 2001). The US Small Business Administration is a full agency mandated to support entrepreneurs. Similarly, the Business Finland is giving grants to university-industry co-operation and besides innovations it facilitates the international marketing of Finnish enterprises. However, the level of innovation in Finnish universities is rather low. College business students are often not taken into account during innovation processes and courses do not include enough subject matter on innovation. The purpose of this study is to compare the students from US and Finland to understand the differences between the innovation attitude and entrepreneurial intentions in order to learn from each other.

Earlier studies of innovative individuals show that individuals with proactive personality seize new opportunities and use novel ways of doing things even if they entail some risk (Crant and Bateman, 2000). Kim et al. (2020) indicated that proactive employees demonstrate creativity in their jobs. With these innovative individuals new things are created, innovative enterprises established and new kind of possibilities of innovative networks formed.

Methodology

Sample included international business students from Finland and USA. The two-part questionnaire consisted of an innovation orientation and entrepreneurial intentions-part. The innovation part consisted of 20 items, focusing on respondents' innovation qualities. Factor analyses (Varimax) produced four dimensions. Those dimensions were: a) Innovating & Involving, b) Creative Mind, c) Improving & Exploring and d) Finding Knowledge. The questionnaire of entrepreneurial intentions included dimensions of risk-taking and growth-orientation and also measured behaviors or qualities that respondent thought they needed in order to start a business.

Expected outcomes

Expected outcomes based on the preliminary results (with the sample of 60 students) are that students with high qualities of Innovating & Involving, Creative Mind and Improving & Exploring will be more likely to start their own business. Additionally, results will reflect cultural differences, and different behavior respondents would need to become successful entrepreneur.

Limitations

The sample size is rather small and results will be based on self-appraisals. Further multimethod studies should be done.

Practical Implications

This study indicates that innovation is in many aspects an important quality and is strongly connected to entrepreneurial intentions. Practical implications are discussed in the context of entrepreneurial education, innovative and entrepreneurial universities, and international student exchange programs.

Originality/value

The originality of this study is based on comparison of US and Finnish culture in regard of innovation tendencies and entrepreneurial intentions of the business students. To our knowledge, no such study has been conducted in the past.

Discussion: This study is the first part of longitudinal studies in our research program. We shall be able to understand how innovative people choose their careers in different cultural contexts and relevant interventions towards the path of entrepreneurship.

The results of the research explain why fostering innovation could help individuals when they build innovative organizations, enterprises or innovation networks. Based on the results, culturally specific programs to enhance entrepreneurial universities' innovation strategies are discussed.

Our findings emphasize that entrepreneurial education should focus upon increasing creative thinking in various ways. Training divergent thinking is an avenue for fostering anticipatory entrepreneurial cognitions, and stimulating this kind of thinking could lead to higher levels of entrepreneurial intentions. It is important to understand, and support those innovative individuals, during their formative years in business schools.

Keywords: Innovation orientation, entrepreneurship intention, business students, Finnish culture, US culture

References

- Crant, J.M., & Bateman, T.S. (2000). Charismatic leadership viewed from above: The impact of proactive personality. *Journal of Organizational Behavior*, 21 (1), 63-75.
- Etzkowitz, H. (2003). Innovation in innovation: The Triple Helix of university-industry-government relations. *Social Science Information*, 42(3), 293-337.
- Etzkowitz, H., Gulbrandsen, M. and Levitt, J. (2001). *Public Venture Capital: Sources of Government Funding for Technology Entrepreneurs*, 2nd edn. New York: Aspen/Kluwer.
- Etzkowitz, H. and Leydesdorff, L., eds (1997) *The University in the Global Knowledge Economy*. London: Pinter
- Kim, T.Y., Hon, A.H., & Lee, D.R. (2010). Proactive personality and employee creativity: The effects of job creativity requirement and supervisor support for creativity. *Creativity Research Journal*, 22 (1), 37-45.

Leydesdorff, L. and Etzkowitz, H. (2002) ``The Transformation of University-Industry-Government Networks", *Electronic Journal of Sociology April*. (Available at: www.sociology.org/content/vol1005.004/th.htm)

Track 8. Other topics related to the theme of the Conference

Chairs: Malgorzata Runiewicz-Wardyn / Juha Tuuniainen

Regional Innovation Ecosystems supporting Business Development of Growth Oriented Microenterprises

Manninen, A., Doctoral Programme in Management, Estonian Business School, Tallinn, Estonia, anneli.manninen@laurea.fi

Meristö, T., FuturesLAB CoFi, Laurea University of Applied Sciences, Lohja, Finland, tarja.meristo@laurea.fi

Type: a. original research

Purpose

Microenterprises often lack the resources needed for growth and new business development. Individual entrepreneurs are struggling alone with their ideas and need support for the innovation process as well.

Our aim is to support micro-entrepreneurs to develop their business for the future success and growth. As background for the work is our project Radar, which is financed by European Regional Development Fund and coordinated by Laurea University of Applied Sciences (UAS). Within the project, a training programme has been designed for the regional micro-entrepreneurs in three different regions in Southern Finland. Project Radar will run three years starting autumn 2018. The

framework is multisectoral and includes the triple helix actors in the regions from the microenterprise perspective. One major goal of the project is to formulate a permanent cooperation action model for the future.

Three regions surrounding the capital of Finland are taking part in the development process to build up the model to support microenterprises. Their Regional Development Companies governed by municipalities have recruited more than 40 companies to take part in the process. Training programme built by Laurea UAS is engaging staff and students in the process as well.

The purpose of this study is to describe and clarify the importance of different elements needed for enhancing microenterprises' development as well as to give indication of the benefits of different regional approaches including possible cluster or network development.

Approach and methodology

This study approaches the development of microenterprises through the lenses of entrepreneurial orientation. It has been conducted qualitatively by interviewing the Enterprise Developers engaged in the development project from the three regions. They have been working in close co-operation with the companies, taking part in the training programme and evaluating the results together with the enterprises. The benefits were approached qualitatively by estimating changes in three dimensions of entrepreneurial orientation: proactiveness, innovativeness and risk taking.

Data was collected by recorded theme interviews and analyzed to find similarities and differences between the regions. The Enterprise Developers are the main source of data as they are the bridge between municipalities, enterprises and Laurea UAS. They viewed different actors and actions in the light of development of entrepreneurial orientation of the microenterprises. The dimensions used were innovativeness, proactiveness and risk-taking capabilities (Jantunen et al., 2005). The development of was viewed through different development actions as well as regional actors. Open comments from the evaluation of the training modules and the data from final interviews of the enterprises reflect the voice of microenterprises. They also bring out the potential gaps in the regional ecosystem model.

The basic methodology is case study. In this study, municipal authorities represent government. UAS have a regional development assignment designated by law in Finland.

Findings

Three different regional approaches and ecosystems with their benefits and disadvantages has been described. One of the regions took a clear cluster approach where the governmental role was essential. In the second region enterprises clearly benefitted from the close combining of the development efforts by the Enterprise Developer and UAS. The third region mainly had benefits of the training and the governmental engagement was weak.

Evaluating the changes in the entrepreneurial orientation was clearly difficult. As a whole, the training provided the micro-entrepreneurs better awareness and tools to be proactive. The entrepreneurs also found regional networks and benchmark possibilities to meet the challenges towards growth. One of the regions took best advantage of the student engagement and the enterprises ability to innovate was estimated to have improved. Whether the risk-taking dimension was improved was unclear.

This study aimed to give voice to microenterprises and their needs in regional innovation ecosystems. According to its findings, it is important that municipal authorities engage themselves in regional ecosystem and set priorities for cluster development. It is also crucial the UAS is supporting the development of entrepreneurial orientation by quite a practical training process. The development process should not end too soon and should give more possibilities for networking including fields of interest of the enterprises. Financing possibilities should be more clearly present in the ecosystem.

The regions involved the process, as well as the actors from municipalities, universities and development companies still need more clearly to recognize their roles and opportunities in the ecosystem.

Limitations and implications

The study is a qualitative case study intended to increase understanding of the elements of regional innovation system through the lenses of microenterprises. Understanding microenterprises' needs to exploit the regional ecosystem increases as well. Regions and policies vary, thus direct applicability to other regions is restricted. However, indications of the importance of different actions and actors in development of regional innovation ecosystem might be useful.

Entrepreneurial orientation and its effects to growth has primarily been studied quantitatively. Other variables such as intraorganizational orientation, regional, environmental and cultural aspects,

network capability, learning orientation, managerial competence and demographic variables have also been used. Qualitative studies in this context are rare.

Practical Implications

Building a model for a long-term use for a UAS to support microenterprises benefits regional development and economic growth. Permanent model instead of changing variety of projects and schemes can be much more efficient and flexible. Future needs may be anticipated together with municipalities and regional Development Companies and the training needs adjusted to meet the needs of the companies. Moreover, partner roles will be clearer in the innovation ecosystem.

Value

Enhancing growth of small and medium sized enterprises has been on research agenda for a long time. However, it remains partly an unsolved dilemma. One reason might be that it has mainly been studied quantitatively. Understanding and recognizing the elements of supporting innovation and growth of microenterprises has rarely been the focus of research in the context of regional innovation ecosystem. This study aims to give new insight into growth problematics of these enterprises and their regional support system as well.

Cooperation model built for flexible matching both the enterprises' developmental needs and educational needs of UASs will benefit all parties involved in the regional innovation ecosystem.

Keywords: Clusters, education, entrepreneurial orientation, microenterprises, regional innovation ecosystem

References

Jantunen, A., Puumalainen, K., Saarenketo, S. & Kyläheiko, K. 2005. Entrepreneurial Orientation, Dynamic Capabilities and International Performance. *Journal of International Entrepreneurship*, 3(3), pp. 223-243.

Abstract

This article explores the potential of Information Technology (IT) industry in Armenia. IT industry is considered one of major forces behind economic development and growth. This article also provides an overview of the IT industry in Armenia as well as spreads light on major elements behind its development. Nowadays, many young Armenians choose this discipline due to the high income, mobility and the multitude of job opportunities it offers. Over 17,000 specialists or 2.5% of the total employed work in this sector with an average annual salary of about 12,000 USD. Due to infrastructure development, the number of IT companies has grown in other parts of the country. Armenia-based IT companies specialize in software development, semiconductor design, multimedia and web design. The steady growth of the IT industry increasingly attracts new players. Investors acknowledge Armenia as a hotspot for high-quality IT product development and start-ups. However, some disadvantages still remain, including disintegrated regional ecosystem, lack of financing, and corruption.

Keywords: Economy, IT, start-ups, Armenia, development, growth forces

1. Introduction

Armenia is a landlocked country in the South Caucasus region that neighbours Azerbaijan, Georgia, Turkey and Iran. The country covers an area of 29,800 square kilometres. Three million Armenians live in the country and three times this number make the Armenian Diaspora with major populations living in the USA, France and Russia. Armenian economy grows at healthy level in spite of political upheavals. In fact, it is estimated that the economy will grow at a rate of 4.5% in 2019. Information Technology industry, hereafter IT industry, has high potential in the context of competitiveness enhancement, economic development and growth. It comprises 6.25% of GDP with over 650 companies which operate in this industry with an average annual growth rate of 20%. The majority of IT companies operate in the capital of Armenia. Over 17,000 specialists or 2.5% of the total employed work in this sector with an average annual salary of about 12,000 USD. Due to infrastructure development, the number of IT companies has grown in other parts of the country. Armenia-based IT companies specialize in software development, semiconductor design, multimedia and web design. The total export of IT products from Armenia amounted to 338 million

USD in 2017 [1]. The main export destinations are the USA and Canada (45%), European Union (25%), Russia (10%) and Asian countries (10%). The rest of the products are consumed by the former soviet republics, where 3d modelling, animation, game and mobile apps dominate. At an early stage of artificial intelligence, the market for technological solutions is limitless where Armenia, in spite of its small IT community, is equipped with the necessary resources to offer and export technological solutions. Its high potential for growth is influenced by the following factors:

- High-quality IT programs are set in universities as a result of university, IT Industry and State collaboration.
- Availability of highly skilled specialists with relevant educational background and knowledge of English language.
- Collaboration between local companies and diaspora creates synergistic effects.
- Availability of a competitive IT workforce and low operating costs.
- A large number of multinationals have set branches including CISCO, Synopsys, National Instruments, etc.

Foreign investors can benefit from the following advantages:

- IP protection regulations.
- Free economic zones (FEZs). Residents of FEZs are completely exempted from profit tax, VAT, property tax and customs duty. Services on behalf of the state bodies are delivered on “one stop shop” basis.
- Right of 100% property ownership.
- No restriction on staff recruitment.
- Duty free import of personal goods.
- Armenia is a member of the Eurasian Economic Union and enjoys Generalized Scheme of Preferences status with USA, Canada, Japan, Switzerland and Norway in addition to the European Union states. Armenia implements an open-door policy as a result of a positive attitude towards investments from overseas.

Table 1. Key economic indicators

	Economic growth measured as % change of GDP	Nominal GDP(USD bln.)	GDP per capita (Currency)	Inflation (CPI, annual variation in %)	Investment measured as % change from previous year	Unemployment measured as % of active population
2014	3.6	11.8	3,966	3.0	-2.2	17.8
2015	3.2	10.7	3,574	3.7	2.5	19.5
2016	0.2	10.7	3,569	-1.4	-11.4	17.1
2017	7.5	11.6	3,862	1.0	7.7	18.0

Source: Economic Outlook by FocusEconomics [2]

The economy grew by 7.5% in 2017 and reached approximately 11.60 billion USD, while the per capita GDP reached 3,862 USD. Stable high growth is positive in terms of attracting new investors who acknowledge the country as a hotspot for high-quality IT product development and start-ups. However, due to varying conditions, this is not always an attainable goal taking into consideration the volatility of the South Caucasus region.

2. IT Industry Development Ecosystem



2.1. Global Markets

The world has become smaller and life has become more comfortable due to improvements in different sectors of economies where the demand for technology is at an unprecedented level. The global IT industry is estimated at about 5 trillion USD in 2019 [3]. The share of US in global IT industry is 31%. China and the European Union respectively share 26% and 19%, Japan shares 7%, and Russia and the former soviet states share 3% of the global IT industry. Despite economic upsides and downs, including the recent financial and economic crisis, IT trade remains at a healthy level and makes consumers enjoy benefits of economic value creation. The increased demand for IT products will be sourced in areas such as IoT integration, machine learning and robotic process automation. Global businesses, jobs, and daily life are becoming increasingly digitized year by year which means there is a growth expectation for the IT industry. In 2019, the IT industry in Armenia is expected to grow at a rate of 25% compared to 4.0% global growth rate according to Export.gov.

2.2. Investors

Armenia has an open and favourable policy towards foreign investment. The government continually carries out reforms aimed at improving business and investment climate. According to the World Bank ‘Doing business 2019’ report, Armenia ranked 41st among 190 countries. As the former center of soviet states for software development, semiconductor and electronics production, and industrial computing, Armenia has managed to keep its capacity as a regional IT hub. The table below shows a comparison of several key indicators to consider before investing in Armenia.

Table 2. Key investment indicators

Indicator	Armenia	Europe and Central Asia	OECD
Time required for starting a business	4.5 days	10.1 days	8.6 days
Cost for starting a business as % of income per capita	0.9%	4.2%	3.2%
Time required for enforcing contracts	570 days	478 days	558 days
Cost for enforcing contracts as % of claim	16%	25.5%	22.2%
Total tax rate as % profit	18.5%	34.2%	40.7%

Source: EIF, STATE OF THE INDUSTRY REPORT [1]

A number of multinationals including Oracle, Microsoft, Cisco, Synopsis, National Instruments, D-Link, Mentor Graphics, and VMware have different levels of presence in Yerevan. In terms of skilled and affordable IT professionals, Yerevan competes with cities such as Kiev, Moscow, Tel Aviv, Chennai, Bangalore, Dublin and Montreal. Granatus Ventures, the first VC fund was established by sponsorship of Government in 2013. It provides investment, expertise and networks to start-ups which leverage Armenia's potential as an emerging IT hub. The government considers it extremely important to develop the infrastructure for IT development in different regions of Armenia. In this framework, it has recently signed MoU to establish a technological city as well as it has founded two technological centers outside Yerevan.

2.3. Innovation Centers

Innovation Centers are formed around intellectual and financial resources by Venture Capitalists, Corporations or States [4]. They attract individual entrepreneurs and start-ups for a number of reasons including mentorship, capital, technical assistance and workspace. Batavia Industrial Center was the first innovation center which was developed in a warehouse in New York in 1959. However, as functional idea they may date back to the 15th century when sculptors, painters, architects, engineers and others came together under one roof to work with each other in the Renaissance "bottegas" in Florence. "Bottegas" or workrooms, translated from Italian, brought together different types of talents to improve skills, often under supervision of a master teacher whose role was similar to that of a mentor. "Bottegas" encouraged interaction and helped participants turn ideas into reality which led to an overall higher level of creativity [5]. Innovation centers play important role in creating localized (town/city/region/state) ecosystems. Armenia is home to a number of well reputed innovation centers including Microsoft Innovation Center, IBM Center, Armenian National Engineering Laboratories, etc. They host more than 120 technological start-ups including globally successful Armenian start-ups such as Picsart, d'efekt, Sololearn, etc.

2.4. Talents, IT Products and Start-ups

Demand increasingly rises for IT workforce. Over the last decade, developed countries have faced talent shortages. This problem is even more severe in new markets such as AI, IoT and robotic automation processes where there is a high competition for qualified employees. Technology defines new vacancies rather than replaces humans. Some 10,000 students majoring in IT study at specialized universities, which are currently six in number: The State Engineering University of Armenia, Yerevan State University (YSU), American University of Armenia (AUA), European Regional Educational Academy and Russian-Armenian Slavonic University (RAU). Russian-Armenian Slavonic University and American University of Armenia provide degree programs in Russian and English languages, respectively. Developers in Armenia are still considered low-cost service providers, capable of producing IT products and services that meet international standards. They mainly specialize in software development, semiconductor production, systems integration, web design and multimedia. Demand for IT services is also growing in local markets from banks, enterprises, universities and other entities. Independent developers serve global markets through support organizations or through their own contacts. Armenia's start-up scene is fuelled by well-thought initiatives and tax-breaks aimed at boosting the industry. Over the last decade, the Armenian start-up ecosystem has flourished in terms of quality and quantity. Armenia is home to some 200 tech start-ups of which some of the successful technological start-ups include:

- Picsart – It is regarded as the number 1 photo and video editing app, powered by a community of 100M+ monthly active users.
- Sololearn – It is an app offering mobile code and programming tutorials, as well as specialized AI and machine learning content.
- ServiceTitan – It is a software platform, allowing home-service businesses to manage businesses and improve customer service.
- Teamable – It is an employee referral and diversity hiring platform transforming social networks into high-performance talent pools.
- SuperAnnotate AI- It is an early-stage start-up offering image annotation through patented AI algorithm that enables 10-20 times faster image annotation technology.
- Facehub- It is an AI application operating on machine learning algorithms that conveys users' facial expressions to different masks, including cartoons and emojis.

It is widely believed that the IT industry will be dominant player for the Armenian economy, which will create new wealth for generations to come.

2.5. Established IT Companies

Currently, 650 established IT companies operate in Armenia of which 202 are foreign owned [6]. The majority of the foreign owned companies are product development centers for head offices. A number of established IT companies have presence in Armenia including National Instruments, CISCO, SYNOPSIS, Inc. (NASDAQ: SNPS), VMware, Teamviewer and Oracle, among many other internationally reputed companies. In general, these companies serve global markets through export channels of parent companies.

2.6. Support Organizations

The Government of Armenia established **EIF**, one of the two state-promoted IT development organizations in 2002. The goal of this organization is to implement and co-ordinate public policy for IT development. The organization also functions as a bridge for a number of local start-ups, entrepreneurs, IT companies and global markets.

UITE is a membership-based business association which was established in 2000. The aim of this organization is to protect the interests of the IT sector as well as locally and globally promote IT services provided by member SMEs, start-ups and tech-entrepreneurs.

2.7. IT Industry, Academia and Government

According to Global Innovation Index, Armenia is ranked 61st with 32.80 scores among 126 countries. Armenia lags behind Georgia (35.00) and Russia (37.90) but is ahead of Kazakhstan (31.40) and Azerbaijan (30.20). Collaboration among IT industry, universities and the government creates synergy for students as well as employers. The concept of collaboration among these institutions resembles a triple-helix model viewing innovation and economic development in large role of University and harmonisation of elements from university, industry and government generating new social and institutional formats [7]. It is worth mentioning that Armenia is home to

six universities that provide IT education and host a number of development centers including Innovative Solutions and Technological Center, Samsung Learning Center, Microsoft Innovation Center, National Engineering Laboratories and Armenian-Indian Center for Excellence, among a number of other development centers.

2.8. Obstacles

A disintegrated regional ecosystem, lack of access to financing as well as corruption create obstacles for development of start-ups and IT companies in Armenia which is in large part due to regional conflicts and an inefficient economic system. However, the difficult environment does not prevent IT industry from growing. The number of IT companies, including start-ups, has increased 250 times since the independence of Armenia, growing to 800 companies with a total turnover of 730.2 million USD excluding turnovers generated by ISPs. In 2017, the IT industry grew 25%, making it 730.2 million USD or 6.25% of total GDP in Armenia.

3. Conclusion

This article provided a brief description of the Armenian IT industry where 2.5% of the total workforce is employed. IT industry is considered a priority by the Government of Armenia, which has taken effective steps to improve the quality of specialized education and develop infrastructure for local and foreign IT companies as well as start-ups. In order to support its IT industry, the government has defined 0% profit tax for 3 years of operation. Given the availability of high-quality workforce along with improvements in investment climate, this industry promises a high return for the development of other industries. The country exported IT products and services worth \$338 million to the USA, the EU, Russia and other countries in 2017. Armenian IT companies mainly specialize in software development, semiconductor design, multimedia and web design. In spite of being recognized as a lucrative place for development of IT products and services, a number of challenges still remain as a result of the country's location and geopolitics.

References

- [1] EIF, STATE OF THE INDUSTRY REPORT: INFORMATION AND TELECOMMUNICATION TECHNOLOGIES SECTOR IN ARMENIA, 2018.

- [2] FocusEconomics, "Armenia Economic Outlook".
 - [3] IDC Research Consultancy.
 - [4] A. P. Foertsch, "Workplace Innovation Today: The Coworking Center," 2013.
 - [5] Formica, "The Innovative Coworking Spaces of 15th-Century Italy," Harvard Business Review , 2016.
 - [6] Export.gov, "Armenia - Information Technology," 2019.
 - [7] H. Etkowitz, "Professor," in Triple Helix Conference, Daegu, Korea, 2017.
-

Crossing Triple Helix, Sociology, and Big Data Analysis: Accelerating and Expanding The Realm and Edges of Research

Jim Beddows, TDP Data Systems, University of Southern California,
Jim.beddows@decisionplatform.io

Type: Poster Discussion

The contribution of the poster to the conference is to present:

- the process and methodology that TDP Data Systems used to work with the THA COVID-19 Working Group initiative to enhance and further its research aims
- how this same process and methodology can be applied to other research areas of interest germane to THA, its members, and other research institutions and researchers across the Triple Helix
- and for possible collaborative research between THA and TDP, a list of TDP's areas of research interest based its library of innovation algorithms.

Intended outcomes/goals for the poster include i) sharing best practices on data-driven research, ii) accelerating the use of data-driven techniques in the fields of Sociology and the Triple Helix, and iii) generate a pipeline of future potential collaborative research projects between THA and TDP to build on the COVID-19 Working Group initiative in order to help advance innovation that could help create a more desirable society in the future.

The format to present the poster will be a twenty-minute presentation followed by ten minutes for Q&A.

Keywords: for the panel discussion include *innovation, incubation, university, science park, entrepreneurial, big data, AI, machine learning, enhanced decision making*

The Role of Intermediaries in the Evolution of Triple Helix Knowledge Networks. The Case of Life Sciences Industry

Prof. Malgorzata Runiewicz-Wardyn, Kozminski University, Poland

Type: Original empirical research

Abstract

The Triple Helix (TH) approach to ‘innovation systems’ has been widely accepted, especially in the public sector. Recently however, there has been an attempt to enrich this approach with the new concept of Quadruple Helix (QH), which is grounded on the idea that innovation is an outcome of interactive and trans-disciplinary process involving “all stakeholders as active players in creating and experimenting new ways of doing things and creating new services and products” (Etzkowitz & Dzisah, 2008; Etzkowitz 2008; European Commission, 2015). In both analytical models of TH and QH innovation networks derive from the integration of activities originating from horizontal industrial networks, vertical value chain networks and other supporting institutions from non-profit and public policy institutions (Nakwa, Zawdie & Intarakumnerd, 2012). The life sciences industry, including biotechnology, is advancing at an unprecedented rate, both driven by the global bio-pharmaceutical competition and ongoing process of technological convergence, which exposes firms and researcher to a wide range of institutional players with different organizational, technological, and cultural backgrounds. These differences may enhance cognitive distance and cause “structural holes” between various stakeholders (Runiewicz-Wardyn, 2019). By acting as brokers and boundary spanners, intermediaries enhance the learning process, converge diverse knowledge streams, connect internal and external structural holes, and thus contribute to greater

knowledge flows in the life sciences industry. In one example, Evald et al. (2006) evidenced the important role of social ties in bridging the existing gaps between biological and chemical sciences, which accelerated the dynamics in the life sciences. The following study aims to look into the roles of intermediaries in the evolution of innovation networks in life sciences, by bridging and closing ‘structural holes’ that disconnect actors in the Triple Helix networks (Burt, 2000, 2004). The study has an explorative character and method of analysis is essentially qualitative. Data collection for the study was conducted through interview based survey with intermediary organizations in five life sciences cluster locations - Bay Area (US), Cambridge (UK), Medicon Valley (Denmark/Sweden), Seattle (US), and Warsaw (Poland) during June 2018-September 2019 as a part of wider life sciences ecosystems study. The results of the study show that the key differences in the role that intermediaries play in the mentioned clusters ecosystems are explained by differences in the technology and cluster dynamics, cognitive distances and absorptive capacity between ecosystem players, as well as types of structural holes in the Triple Helix knowledge networks. In the Bay Area and Seattle life sciences industry, strong entrepreneurship culture, history and social capital promoted tight and dynamic networking, which resulted in very little or no external structural holes. The informal interpersonal networks and formal networks via intermediary brokerage were major sources of social capital and venture capital formation. The companies were linked to research institutions and venture capital firms in the initial stage of technology dynamics. In the mature stage, these links shifted toward more tight connections between companies themselves. The role of intermediaries was focused on the knowledge exploitation within these strong ties as well as providing basis for the further exploration of knowledge. Similar observations were made in the Cambridge and to some less extent Medicon Valley. Formal networks initiated by intermediaries were further on supported with informal social networks. In Cambridge, the leading role of initiators and intermediaries were played by the „scientist-entrepreneurs”. Furthermore, in the Medicon Valley and Cambridge companies had better links with research and government institutions at the early state of the technological dynamics (this was because public funds and EU funding schemes supported primary health care sector in their regions). In the growing stage the interlinkages between universities and venture capital firms intensified. The intermediaries played important role in building trust and optimising knowledge exchange between them.

Finally, in Poland, the life sciences university based innovation ecosystem is still at the emerging stage. It is characterised by the loose networks between industry and academia, little

interdisciplinary cooperation between departments and universities, high level of individualism and a low level of trust (Kozierkiewicz, 2020). This was reflected in huge external and internal ‘structural holes’ that hindered knowledge exchange and added extra transactions cost to the stakeholders budgets. Hence, the intervention of intermediaries was crucial. The study attempted to shed some light on the significance of Triple Helix knowledge networks evolution towards Triple (Quadruple) Helix innovation ecosystem in a comparative way. In particular, the results appear to confirm the effectiveness of the intermediaries with regards to increasing knowledge exchange and technology dynamics within the life sciences industry. One of the limitations in the qualitative method applied in the study is related to rather small and unequally distributed sample of life sciences ecosystems considered.

Keywords: social capital, Triple Helix, innovation, networks, life sciences

References

- Burt R, 2004, ‘The network structure of social capital’, *Research in Organizational Behavior*, 22, pp. 345-423.
- Burt R, 2004, ‘Structural holes and good ideas’, *American Journal of Sociology*, 110(2), pp. 349-399.
- Etzkowitz H, 2008, *The Triple Helix: University–Industry– Government Innovation In Action*, Routledge, London.
- Etzkowitz H, Dzisia J, 2008, ‘Rethinking development circulation in the triple helix’, *Technology Analysis & Strategic Management*, 20(6), pp. 653.
- European Commission 2015, *Open Innovation 2.0 Yearbook 2015*. Available from: <https://ec.europa.eu/digital-single-market/en/news/open-innovation-publications>
- Evald M, Klyver K, Svendsen S, 2006, ‘The Changing Importance of the Strength of Ties throughout the Entrepreneurial Process’, *Journal of Enterprising Culture*, 14, pp. 1-26.
- Kozierkiewicz B, (2020), ‘Life-science cluster in Poland: drivers , structure and challenges’, in, M.Runiewicz-Wardyn, (ed.) *Social capital in the university-based innovation ecosystems in the leading life sciences clusters. Implications for Poland*, Warsaw 2020 [forthcoming].

Nakwa K, Zawdie G, Intarakumnerd P, 2012, 'Role of Intermediaries in Accelerating the Transformation of Inter-Firm Networks into Triple Helix Networks: A Case Study of SME-based Industries in Thailand', *Social and Behavioral Sciences* 52, pp.52–61.

Runiewicz-Wardyn, M 2019, 'Technological convergence in the life-science sector and its impact on research, business and R&D policies'. *Perspectives of Innovations, Economics and Business*, 19(1), pp. 53-65

Assessing innovation environments in the state of Rio de Janeiro, Brasil – A multiple case studies on science and technology parks in design and operation stages

André Luiz Furtado da Hora, M.Sc., Marcelo Gonçalves do Amaral, D.Sc.* & Adriana Ferreira de Faria, D.Sc., Triple Helix Research Group Brazil, Fluminense Federal University, Rua Desembargador Ellis Hermydio Figueira, 783, building B, room 105, 27213-145, Volta Redonda, Brazil * marceloamaral@id.uff.br

Type: Original research

Purpose

In the current knowledge society, new arrangements and organizational structures emerge to meet the demands of market globalization and to meet the challenges arising from international competition. An organizational arrangement that joins physical structure, intellectual qualification, and generation and knowledge transfer are the science, technology, and innovation parks (STIP). These spaces are fruitful innovation environments for the emergence and development of technology-based companies and interactions among companies, universities, technology centers, and government institutions. STIPs are relevant, playing a bridge to the transfer of knowledge from academia to market, resulting in leverage of regional and national economic development.

In this sense, the objective of this research was to apply the Amaral's Model for Innovation Environment Management (AMIEM) in STIPs in operation and design stages at the State of Rio de Janeiro, Brazil, to assess their management. The AMIEM was developed by integrating the

characteristics of other models (Cabral-Dahab, CERNE, and Estrategigram) to provide a complete instrument for evaluating innovation environments. This model has been applied in various contexts in Brazil, the United States, and Europe, for academic studies and to offer insights to the managers.

Design/Methodology/Approach

This is an applied research project with mixed methods approaches. Four steps were performed to achieve the research goals. First, the literature review was done using bibliometrics analysis techniques on papers selected at indexed journal databases. The second step was the collection and document review from the six cases studied. The third step was the collection of primary data, based on interviews (following the AMIEM's eleven factors structure). The interviews were made from January/2018 to May/2019 with 21 managers and stakeholders from three STIPs in the operational stage (BioRio, Technological Park of Rio de Janeiro, and Serratec) and three projects in the design stage (Rio Sul Technological Park, Peninsula of Innovation, Norte-Fluminense Technological Park). The fourth step was the analysis and discussion of results based on content analysis. The AMIEM was applied after the content analysis.

The model takes account of eleven factors with an internal dynamic. Leadership and funding are catalysts of the whole process. The nine other elements are organized into two levels: "structure" and "content." In the "structure" level, four elements (governance and operational management; publicity/promotion/advertisement; physical space; good living and working environment) compose the management structure and infrastructure aspects. The set of four elements, named "content", are related to the attraction and actors' interaction. They introduce and validate the knowledge creation, use, and needs of the process (the environment has to stay connected to the local requirements to be a regional economic development project). The presence of the triad academia-industry-government composes the Triple Helix. With the addition of the local community/society, the Quadruple Helix linkages emerge, which means the project is anchored/connected to the local reality and needs. These elements work as a guideline to orient the collection of information, and a panel of each STIP studied can be done. In the sequence, it is possible to use this qualitative evaluation to give grades and weights and evaluate the maturity in the quadruple helix linkages inside the innovation environment (on a scale from 25 to 100).

Findings

The AMIEM application shows the STIPs in operation at two different levels. The Technological Park of Rio de Janeiro has an intermediary level of maturity among quadruple helix actors (62.5 points). It was a unique innovation environment with characteristics of the second and third-generation parks. BioRio and Serratec have a low level of maturity (51.09 and 49.21 points) and a evident first generation strategy. These STIPs have 17, 31, and 20 years of operation, respectively. The three STIPs in the design stage show an intermediary level of maturity, which can be understood as the optimism and high-level involvement of the stakeholders. On the other hand, it shows the unknowledge of the challenges of a STIP implementation. The research effort returned a robust body of results. It was noticed that there are critical issues for the development of the STIPs, such as governance structure, government action, and the relationship with universities and research centers (knowledge creators).

Limitations/implications

The study is limited to the STIPs in operation and design stages in the State of Rio de Janeiro, Brazil. The findings cannot be assumed to all Brazilian or foreign STIPs.

Practical and/or Social Implications

The results obtained indicate that even though common factors are present in all studied environments, local particularities, specific characteristics, regional vocations, and other elements impact the performance and, therefore, the management of the STIPs. This situation indicates the need for policies from the government and more engagement from the industry. Additionally, the research has theoretical character combined with the practical application of the AMIEM. The analysis provides useful information to scholars, government officials, and STIPs managers and stakeholders.

Originality/Value

The AMIEM had been previously applied, but never in evaluation environments such as STIPs in the design phase, allowing a comparison between two different realities and perspectives. The study also allows a comparison between the metropolitan and inland region of the State of Rio de Janeiro, regarding STIPs and an overview of regional economic dynamics. Another contribution lies in the possibility of providing information for the elaboration of public policies to support the STIPs.

Keywords: Innovation Environments; Science and Technology Parks; Assessment Models; AMIEM; State of Rio de Janeiro.

References

Amaral, M. G.; Faria, A. F.; Schocair, M. M. (2020, forthcoming). Assessing the Innovation Environment of the Research Triangle Region. *Review of Administration, Society and Innovation* (RASIS). DOI:10.20401/rasi.6.2.386

Amaral, M. G. (2015). Management and assessment of innovation environments. *Triple Helix Journal*, 2:19. DOI 10.1186/s40604-015-0030-5

Hora, A. L. F (2019). *Avaliação da Gestão de Ambientes de Inovação: Aplicação do Amaral's model for innovation environment management (AMIEM) em Parques Tecnológicos do Estado do Rio de Janeiro*. Master dissertation. Professional Master in Administration. Fluminense Federal University, Brasil. 215 pages [in Portuguese].

Corporate venture capital strategies in open innovation ecosystem

Meriam Cherif, PhD student, National Research University, Higher School of Economics, Russia

Type: Paper Research Design

Problem Statement

This dissertation lies at the intersection of Innovation strategic management with the decision sciences. We are interested in models where the ecosystem characteristics influence the human decisions and thus the followed strategy for companies.

By definition, an open innovation ecosystem entails the sharing of knowledge and other resources in order to facilitate the transfer of ideas from outside and to provide better solutions and products.

However, integrating external partners into internal innovation projects should be carefully studied and executed. (Chesbrough,2003 ; Chesbrough,2010).

In this purpose, Corporate venture capital units are one of the most applied investment tools for innovation and invention funnel, (Maula, 2001). By funding innovation and collaborating with startups, they seek not only to make a financial profit but also a strategic value and making the balance between strategic value and financial return is not easy for corporate venture capital units (Covin & Miles, 2007)

This is the reason why Innovation managers need to answer the strategic question when they start to develop their innovation capabilities. But, making the good decision is challenging when there's no clear based metrics for the management strategy, due the difficulties that face the business unit to manage a collaborative process with external partners. Even though it is always difficult to forecast performant strategy that corporation could implement, we believe that limiting the landscape of the useful metrics, their importance according to target companies based on both financial and strategic results afterward would clarify the view for innovation managers during the process.

Purpose

Selecting the appropriate metrics for an innovation project is challenged task to identify [project scope](#). Many companies face many difficulties to make decision regarding the Choice of the metrics are using the same strategies and metrics of investment in the open innovation ecosystem as in the usual environment without considering it as an entire dynamic environment where they need to adapt and operate.

In this paper, Based on the selection of metrics used in innovation management strategies and according to the characteristics of the open innovation ecosystem , the aim is to provides a comprehensive view and classification of the different decision making approach of management strategies by corporate venture capital.

Originality of the study

This Study is distinct from other innovation management research in two respects: First, we emphasize the measurement in open innovation ecosystem from corporate venture capital firm's point of view. Secondly, the study aim to classify the decision from two points of view, the investment tool and the uncertainty of the environment

Limitation of the study

We believe that in order to better define all kind of strategies based metrics and to analyze the level of successful methods, including data about the startups and using workshop or interviews with them would strength our results and clarify the analyses, However the focus was only on corporate venture capital units variables and the ecosystem of open innovation model.

Methodology and Design

We will conduct a survey, which includes different types of metrics along the innovation process and the collaboration with the external partner, the startups. This survey should be answered by managers in corporate venture capital, where they will give scores to the listed potential metrics according their importance, in different types of strategy, Them , based on their selection, we will classify the decision making.

The first step is to specify the different stages in the process of collaboration with startup for innovation project. Then, we will specify the different metrics the input, process, and output that could be used in such environment by managers, according to the different stages in the innovation process. These indicators include financial metrics, strategic metrics.

In the survey, as mentioned, for each types of strategy we will evaluate the importance of metrics chosen by managers, the strategies will depends on the degree of the innovation, defensive strategy with incremental product or offensive strategy with radical innovation.

Expected outcomes and Implication

From Academic perspective, First, this study extends current literature on open innovation processes by describing the ecosystem characteristics from managerial strategy based metrics point of view .Secondly, this research focus on the corporate venture capital because of their complex structure and the duality of their objective, both financial and strategic

Thirdly, this paper bring together different topics in one level, decision making classification, utilization of metrics in open innovation and types of strategies.

Furthermore, the current study will open important question for further research , By Investigating for other types of structure and organization different from corporate venture capital firms and conclude whether if Open innovation ecosystem is characterized by one type of decision making .

From practitioner's perspective, it is intended that the findings of this research paper could be a guide for innovations managers to better decide about the metrics for their strategies in uncertain environment, once they can select their based metrics and strategies, they will understand about their decision making type.

Keywords: Open Innovation, Management, selection, metrics, decision making, Corporate Venture Capital

References

1. COVIN, J. G., & MILES, M. P. (2007). Strategic Use of Corporate Venturing. *Entrepreneurship Theory and Practice*. 31, 183-207.
 2. CHESBROUGH, H. W. (2003). *Open innovation: the new imperative for creating and profiting from technology*. Boston, Mass, Harvard Business School Press.
 3. CHESBROUGH, H. W. (2010). *Open Services Innovation: Rethinking Your Business to Grow and Compete in a New Era*. Hoboken, John Wiley & Sons.
 4. MAULA, M. V. J. (2001). Corporate venture capital and the value-added for technology-based new firms. Espoo, Helsinki University of Technology.
 5. MAULA, M. V. J. (2007). Corporate venture capital as a strategic tool for corporations. *Handbook of Research on Venture Capital*. 371.
 6. SCHUMPETER, J.A. (1939). *Business Cycles: A Theoretical, Historical and Statistical Analysis of the Capitalist Process*, 2 vol, New York: McGraw-Hill.
 7. SCHUMPETER, J.A. (1942). *Capitalism, Socialism and Democracy*, 3rd edition, London: George Allen and Unwin
-

Boundaries of and possibilities for promoting gender equality in regional networks through action research

Minna Leinonen, Tampere University, e-mail: firstname.lastname@tuni.fi

Type: original research

Gender and gender equality in the regional research and innovation systems are understudied research themes, even though policy makers in the EU level consider gender as important to improve the societal relevance of knowledge, technologies and innovations as well as the suitability of goods and services produced (Pépin 2019). Also, the Nordic countries, although typically at the top of innovation scoreboards in Europe, suffer from decline in investment in research and innovation and higher education. Especially in Finland, the context of this study, the focus of investment in research and innovation is narrow. There is also a need for more cooperation between higher education institutions and business. (Griffin 2019). Innovation activities usually focus on male-dominated fields and are promoted through often male-dominated networks. Addressing gender issues has, however, required reconsidering relevant stakeholders (Lindberg, Lindgren & Packendorf 2012).

Following the Nordic (e.g. Gustavsen 1998, 2004) and feminist strands (Heiskanen et al. 2015, Gatenby & Humphries 2000, Drejhammar 1998) of action research with a strong emphasis on democratic participation and equality, gender sensitivity and diffusion of knowledge, my research aims to organize spaces for furthering gender sensitivity and equality in a research and innovation intensive region in Finland in collaboration with public, private and university actors, including civil society actors where possible. My research will also study those spaces and their immediate outcomes. In a series of action research workshops conducted in winter/ spring 2020, these actors are invited to establish the current state of gender equality in the region's research and innovation activities, to consider how gender equality could be promoted, how gender equality could solve problems in the research and innovation activities, how the development could be sustainable and be linked to and supported by the national level.

My data, mainly participant observation fieldnotes, derive from both the organizing of action research forums and from the discussions on those forums. The participants representing regional

and economic development and the university are also involved in the planning of the forums to which also private businesses and civil society actors are invited as well.

Main question of this study is as follows:

How can gender equality be included in research and innovation systems in a regional context?

Sub-questions: Who are considered relevant partners and actors in the regional networks, when both r&i and gender equality are considered? What kinds of roles in development do these different actors adopt in the process? How do these different actors approach gender issues? What kinds of aspects do different stakeholders bring to discussions on solving gender inequalities in the male dominated regional research and innovation networks? What are the possibilities of action research to bring about change?

Expected findings are related to action research approaches used and resistance related to gender equality. Considering the collaborative planning process of the action research workshops, it can be expected that gender equality issues in the processes of different actors coincide with or challenge the joint process(es) of promoting gender equality. This will lead to balancing different action research aims and to reconsidering choices within action research. Regional actors are also protective of their development processes, which may hinder connections between the regional and national level. Motivating private sector actors to regional gender equality work will present another challenge. Working with these issues will illuminate the critical points of promoting gender equality and what kind of a status it is given in the r&i system. Resistance is a typical part of gender equality work and part of the whole process is to find ways to work around and through resistance.

This research effort is a part of a larger *Nordic Centre of Excellence Nordwit* that studies women's technology-driven careers in Nordic urban and rural settings. At the same time the centre and its subprojects connect and work with various stakeholders cross-sectorally with public-sector and private-sector actors, according to the 4-helix model (Carayannis amp; Rakhmatullin 2014), including academia, centres for economic development, business and civil society (e.g. gender equality consulting companies, women's networks). The analysis of the action research forums will in part show the boundaries and possibilities of such collaborations. Ongoing research on women's careers based on career interviews and expert interviews in the region feeds back into the action research process and is part of the efficacy of the whole research process.

The possible limitations of the research are, firstly, related to contextual issues. When planning similar processes it must be taken into account that outcomes and efficacy are always at least partly linked to the specific context they are produced in. Secondly, action research workshops analyzed in this study are part of larger processes. They are conducted in a relatively short time. The long-term outcomes and what happens at the implementation stage of necessary changes cannot be seen. However, there may be some immediate effects to current practices depending on how pressing the issue handled is to the participants.

The research has several practical and social implications: It will investigate, how to bring gender awareness and gender sensitivity to networks not used to handling on those terms. Such networks are wide spanning from individuals and organizations to the regional and national levels. My research furthers understanding on how to engage different actors to collaborate on promoting gender equality and on what kinds of gender equality effects these efforts may have.

Keywords: gender equality, region, action research

[Enabling university-industry linkages in developing economies: Adaptive collaborations and change creation among partners](#)

Sidath Alwis, Tueku School of Economics, Sidath.h.alwis@utu.fi

Type: Original research paper

Introduction

In the process of knowledge-based economic growth, universities are considered as important partners of knowledge creation process and contributors of industrial and social innovation (Höyssä, 2009). The development of successful university-industry linkages (UIL) is an important prerequisite for a knowledge-based economic development and it is a key driving force for increased economic returns, industrial regeneration, developing of new industrial identity and regional renewal of a particular region (Astebro and Bazzazian, 2011). Such connections are influenced by the policy and institutional support of the government forming a triple-helix type

partnership among them (Etzkowitz, 2008). Regional science literature has highlighted a wide range of university outputs that generate both direct and indirect impacts on regional development. Moreover, it has been identified multiple ways of university engagements that are taken place with regional economic partners (Krol et al, 2016). However, the establishment of linkages between two different organisations operating in different institutional domains may subject to different constraints. It is important to develop necessary adaptations within the systems and processes of collaborating parties and interacting in an adaptive manner to develop successful collaborations. The adaptive collaboration between the collaborating teams of university and firm could necessarily be important condition for successful cross-sectoral interactions. Although there are studies on university-industry collaborations, they have mainly focused on the dynamics of different types and forms of collaborations and also mainly based on the context of advanced economies. Only a few studies have focused on the process of emergence and development of collaborations from the perspectives of adaptive changes of participants and adaptive collaboration (AC) process.

Purpose

The study explores the potentials to develop collaborations between universities and firms in an adaptive manner and the conducive situations and challenging conditions related to that. Therefore, the study aims to empirically investigate the development of university-industry linkages through developing adaptive changes in collaborating organizations and implementing an adaptive process for collaboration. This purpose will be fulfilled by identifying relevant motives and actions for adaptations and collaborations respectively under two organisational contexts. The study particularly emphasizes the context of a developing economy, further considering the immense need that exists in the literature on relevant countries.

Research methodology

The research was conducted as a case study focusing on university engagement activities of a metropolitan university in Sri Lanka. The data were collected from key informant persons including the academics, researchers and research supporting staff of the university and directors, managers and R&D staff from respective firms which were industry partners of respective university-industry collaboration projects of the university. The respective informant persons were purposively selected based on their profiles and through snow balling technique by getting information from other academics and industrialists. The data were collected through semi-structured interviews with

selected interviewees and interview duration was 1-2 hours for each respondent. The data were electronically recorded during the interviews and they were transcribed to text immediately after each interview. The transcribed data were further subjected to the reviewing by interviewees. Secondary data were collected from university and firm publications, websites, news (papers), magazines, archival material, et cetera to further complement the interviewed data. The data was analysed using thematic analysis methods. The study was conducted from June 2018 to January 2019.

Results

The results reveal the necessity of developing collaborations in an adaptive manner in order to generate successful outcomes through university-industry links. The partnering firms have induced universities to develop business-focused interaction mechanisms and procedures within the university under certain collaborations and similarly academics have involved in to make aware the firms about academic environment. However, the initial interactions taken place between academics and firm executive officers in personal level as a form of social interaction is important to develop successful formal interactions between both parties later. Such informal social interaction helps to develop initial trust among two parties. Moreover, such types of initial social interactions help to develop successful adaptive collaborating mechanisms. The qualitative content analysis further led to identification of adaptation motives of partners and courses of actions for adaptive collaboration. This identification ultimately led to formulate a framework for collaboration process for an adaptive collaboration. Further, the overall results provide necessary suggestions for policy makers and administrators of university and industry on necessary actions to be performed: to introduce or to modify administrative procedures into flexible and adaptive forms.

Theoretical/ Conceptual Implications

The framework developed through the findings of the study support to understand the organisational adaptations especially in university environment under the context of a developing economy, which is received limited attention in the literature related to university engagement. The framework provides relevant support for the policy studies on innovation and regional development further.

Practical implications

UILs could be successful if universities can proactively involve in making aware the regional industries and firms about the potentials of prospective and suitable collaboration opportunities as majority of firms where SMEs account for a larger proportion in developing countries focus their less attention on innovation-based business development. The findings bring attentions to administrators and academics of universities and management of firms on how to develop a pragmatic process for collaborations while finding some alternatives for regulatory issues exists and without challenging them. Organizational and academic culture and regulations of universities, investment capacities and risk-taking propensities of firms and also proactiveness of collaborators are indicated as some of key considerations for pragmatic UILs.

Originality/value

The analysis of the case which yielded a framework for adaptive collaborations reflects elements of novelty in connection with the context of university-industry linkages in developing countries, compared to the existing information in the literature related to advanced economies.

Keywords: university-industry linkages, adaptive collaboration, operational efficiency, spinoff, developing economy

[Strengthening the public-private collaboration within innovative public procurement](#)

Sini Kahilaniemi, University of Tampere

Type: research design

Purpose of the study

This paper describes the research design, main terminology and initial observations of the ongoing research of innovative public procurement practices in the Finnish smart mobility and transport context.

Main aims of innovative public procurement are typically the improvement of productivity, quality and effectiveness of public services. In addition, creation of demand and references for novel

products and services developed in the private sector are at the core too. Innovative public procurement as a term has various definitions but generally refers to public purchase of the innovative goods or services, procurement of R&D services, innovative design and delivery of public services and/or innovative procurement processes and models.

Significant scale of public procurement (roughly 20 % of GDP) illustrates the vast potential of accelerating the development, commercialisation and diffusion of innovative solutions as well as the opportunities to pursue for better, smarter and more sustainable solutions for various societal needs.

According to Uyarra et al. (2014), the use of public procurement to stimulate private sector innovation has been a much-debated issue lately, especially in the context of so-called demand-side innovation policies (Edler et. al 2006). European Commission (2010) emphasizes the role of public procurement by including the public procurement as one of the key market-based policy instruments of smart, sustainable and inclusive growth in the Europe 2020 strategy. Furthermore, the use of public procurement has been associated with the emergence of so-called 'lead markets' (see e.g. Edler and Georghiou 2007, Uyarra 2014) and thus the Smart Mobility sector gains strong interest too. From the innovation policy viewpoint this sector has been ranked as one of the most potential sources of innovation and growth.

Design and methodology

In this study, survey research method has been combined with a qualitative method of group interviews.

Main aim of the survey and group interviews was to map out the insight of the most beneficial way of procuring innovative solutions within the chosen field: cooperation between public and private sector, analyzing possible differences of opinions between procurers and suppliers, and impacts of public procurement for the businesses.

Findings

In general, the results prove that innovative public procurement in the smart mobility sector is seen as a potential support for innovation and the use of these practices should be added.

From the perspective of execution of the innovative public procurement procedure, 92 % of the respondents see the ability to choose the right procurement procedure for each case as the critical phase. This indicates the importance of education, training and benchmarking.

Intensive interaction among the suppliers and procurers is seen as a very significant feature among the respondents. Important is that the interaction is continuous, not only within the procurement processes. Aforementioned aspects are seen as more important than i.e. financial incentives. Also, the importance of precise definitions of IPR issues is strongly emphasized in the survey results.

As this paper focuses on the collaboration among the public and private sector, the results indicate that open networks (with participants of public, private, academia) are considered as a support for procurement activities. In addition, precise, open and anticipated communication of the upcoming procurement and its scale would deepen the collaboration among public and private sector from the innovation viewpoint.

The most significant barriers for innovation are finding the appropriate and most suitable quality criteria and too prescriptive requirements specifications. Company respondents see the insufficient knowledge of the market among the public sector buyers as the rationale behind choosing the unsuitable procurement practices. Buyers see that the lack of both technical and procurement knowledge is the barrier for innovations. On the other hand, public actors emphasize that the lack of understanding the needs of public procurer is also a barrier for innovation. Based on the companies' responses of the survey, 44 % of them see that too strong productional role of the public sector acts as a barrier for innovation.

From the economic and innovation policy viewpoint, over 50 % of businesses have resulted in new contracts in the domestic public and private sector due to the public sector references. This reflects the significant role of the public and private collaboration in the mobility sector. Important is that 73 % of the private smart mobility companies claim to have increased their R&D investments significantly or to some extent due to innovative public procurement.

The main benefits of the innovative public procurement for the companies are the encouragement for R&D activities and improvement of opportunities for the testing, piloting and demonstrations. Main benefits for the procurers then are the better insight for the procurers of the market offering, increased opportunities for utilizing the innovative solutions, products and services, more effective use of financial resources and improved procuring capabilities.

Limitation, implications

Response rate for the survey was limited, results are indicative and are not yet analysed thoroughly at this state of the research.

Practical and/or Social implications

Results of this research support and improve the public-private collaboration within the public procurement field and could both boost the economy of Finnish companies as well as improve the public services.

Originality/Value

This research offers new knowledge of the innovative public procurement as an innovation policy tool and as a means of public-private collaboration within the transport and mobility sector.

Keywords: Innovative Public Procurement, Public-Private Collaboration, Mobility

References

1. Uyarra, E., Edler, J., Garcia-Estevez, J., Georghiou, L., Yeow, J. (2014). *Barriers to innovation through public procurement: A supplier perspective*. Technovation 34, pp 631-645.
2. Edler, J., Edquist, C., Georghiou, L., Hommen, L., Hafner, S., Papadakou, M., Rigby, J., Rolfstam, M., Ruhland, S. & Tsipouri, L. (2006). *Innovation and Public Procurement: Review of Issues at Stake. Study for the European Commission* (No ENTR/03/24). Fraunhofer Institute for Systems and Innovation Research.
3. Edler, J. & Georghiou, L. (2007). *Public procurement and innovation - Resurrecting the demand side*. Research Policy 36 (7), s. 949–963.

Study of the evolution and dissemination of technology parks in Brazil as intermediates in the Triple Helix Model

Prof. Dr. Adriana Ferreira de Faria, Federal University of Viçosa, Brazil

Type: original research

The technology park (TP) is s an intermediary between academy and industry balancing each other's aspirations for knowledge-based development. The understanding that technological parks appear as a strategic state public policy is justified when studies show that for every 1 real invested by the federal government in these habitats, 4 reals are collected from state, municipal governments and private initiative. There is still no consensus on what is a successful technological park and no common metric that allow comparison of different parks in a systematic view. Evaluating the performance of these enterprises is becoming an important issue for the actors involved, not only due to the need for transparency and justification for society regarding the public resources employed, but also for the collection of effective results in terms of local development, innovation and revenue for companies. According Etzkowitz and Zhou (2018), TPs take various guises and are neither a panacea nor a dead end. The authors argue that premature conclusions are sometimes drawn regarding SPs success and failure, relying on synchronic case studies, without taking into account potential for strategy change.

Purpose

In this perspective, this study aimed to analyze the evolution of technology parks in Brazil in order to verify the main indicators reached in order to support the thesis of the effectiveness of parks as an instrument of public policy. This work intends to begin the construction of a framework suitable to understand the dynamic nature of technology parks in Brazil and its resident companies with the construction of historical series, allow a multivariate statistical analysis to infer cause and effect relationships.

Design/Methodology/Approach

This research is characterized as exploratory and qualitative. Exploratory researches are developed with the objective of providing an overview of the fact (GIL, 2006) and help in the construction of hypotheses, providing understanding of the nature of the problem, being adequate to discover factors not structured by managers in processes, ideas and data (MALHOTRA, 2001). The qualitative character of the study is due to the emphasis given to processes and meanings (SALE, LOHFELD and BRAZIL, 2002) related to the understanding of the phenomenon of the evolution and dissemination of technology parks in Brazil.

To fulfill the research objectives, it was proposed to conduct an annual survey, with the technology parks in Brazil, in different stages of development, in order to, over time, build a historical series. For the annual survey was developed a tool of Information and Communication Technology, called InovaData-BR. This paper presents the results obtained with the data collection for 2017 and 2018, as well as the evolution of investment indicators and the resident companies occupation model from 2000 to 2018.

Findings or expected outcomes

The results show that the country has 54 technology parks in operation, which house more than 1800 resident companies, which generate about 30 thousand jobs, with revenues of around 4 billion reais. Brazilian parks, in all their history, have received only 10 billion reais in investments, mostly from state governments. It was found that 50% of technology parks are located in university-owned areas and the importance of the real state for park operating revenues. The results show that the parks value proposition is based on the interaction of companies with universities and their facilities and the governance models follow Triple Helix Model. The full paper is going to show the results of multivariate statistical analysis

Limitations/implications

Practical and/or Social Implications An important question that arises from the performance appraisal process is how the results can be used to promote improvement and fulfill institutional goals. Evaluation should be understood as a privileged moment of learning and understanding of difficulties and bottlenecks and beyond, as well as understanding how difficulties can be overcome. In the context of technology parks, it is hoped that the understanding of their nature can be deployed in the proposition of management models and public policies that contribute to the development and leverage of technological innovation and business competitiveness. Therefore, is it clear the needing for more systematic approaches, supported by consolidated analytical and statistical benchmarks, that can be applied practically by the actors involved.

The results presented here point out that the improvement of public policies is an investment for economic and social development, since resident companies can generate, among other results, new ventures, qualified jobs and revenues. The sustainable development perspective can be broken down into three strategic objectives related to social development and economic and financial sustainability. One park will be financially sustainable when its operating cash flow is positive, that

is, when the outflows required for its operation are assured by the revenues from its activities, related to fees, services rendered, rents and others. On the other hand, one park will be economically sustainable when it is able to return to society economic results related to the generation of qualified jobs and income, as well as the promotion of technological innovation. Being sustainable the park contributes to the social development of the region.

Originality/Value

Traditionally, technology park performance has been analyzed by comparing results obtained by technology-based companies within parks versus outside parks. Several studies have found whether there are significant statistical differences in indicators such as number of jobs created, sales volume, R&D results, new products and / or services and business survival rate [(LÖFSTEN and LINDELÖF, 2002), (LINK and SCOTT, 2003), (SIEGEL, WESTHEAD and WRIGHT, 2003), (ANGLE TECHNOLOGY, 2003), (DABROWSKA, 2011), (MONCK and PETERS, 2009)]. There is evidence of positive impacts of technology parks on the growth and image of the universities involved (FUKUGAWA, 2006), with more publications, patents and technology transfer, and better allocation of graduates (LINK and SCOTT, 2003). Comparative studies of the performance of resident and non-resident companies do not provide a complete picture of the value that parks add, not least because parks have only technology-based companies as residents (HANSSON, HUSTED and VESTERGAARD, 2005).

So this paper show an other perspective to demonstrate the performance of TP, in the context of public policies. There are many current challenges for the implementation of the park when it is considered that the Brazil is experiencing moments of political uncertainty and economic hardship, with significant retraction in investments in RD&I. However, looking to the future, it is possible to see that the macroeconomic outlook is positive and the new legal framework for science and technology points to the establishment of a legally sound innovation-friendly environment, especially with regard to public-private relations. The results of this paper also demonstrate what Etzkowits and Zhou (2018) have stated, when parks are a top-down public policy instrument, not investing significant resources to achieve the intended results is a “fallacy of innovation”.

Keywords: Technology Parks; Triple Helix; Public policy

Bibliografia

ANGLE Technology. (2003). *Evaluation of the past & future economic contribution of the UK Science Park Movement*.

Dabrowska, J. (2011). Measuring the success of science parks: performance monitoring and evaluation. *XXVIII IASP World Conference on Science and Technology Parks*, pp. 1-23.

Etzkowitz, H., & Zhou, C. (2018). Innovation incommensurability and the science park. 48(1), 73-87.

Fukugawa, N. (2006). Science parks in Japan and their value-added. *International Journal of Industrial Organization*, 24 , 381– 400.

Gil, A. C. (2006). *Métodos e Técnicas de Pesquisa Social*. (5. ed. ed.). São Paulo : Atlas.

Hansson, F., Husted , K., & Vestergaard, J. (2005). Second generation science parks: from structural holes jockeys to social capital catalysts of the knowledge society. *Technovation*, 25, 1039–1049.

Link, A. N., & Scott, J. (2003). U .S. science parks: the diffusion of an innovation and its effects on the academic missions of universities. *International Journal of Industrial Organization*, 21, 1323–1356.

Löfsten, H., & Lindelöf, P. (2002). Science Parks and the growth of new technology-based firms—academic-industry links, innovation and markets. *Research Policy*, 31, 859–876.

Monck, C., & Peters, K. (2009). Science parks as an instrument of regional competitiveness: measuring success and impact. *XXVI IASP World Conference on Science and Technology Parks*, pp. 1-19.

Siegel, D. S., Westhead, P., & Wright, M. (2003a). Science Parks and the performance of new technology-based firms: a review of recent U.K. evidence and an agenda for future Research. *Small Business Economics*, 20, 177–184.

The limits of reporting societal impact for research evaluation purposes - the case of sociology in UK and Norway

Reetta Muhonen, Collegium Researcher, Institute for Advanced Studies, TIAS, University of Turku, reetta.muhonen@utu.fi & Silje Tellmann, Postdoctoral Fellow, Centre for Technology, Innovation and Culture, University of Oslo, s.m.tellmann@tik.uio.no

Type: original research

Purpose

Prior studies (Martin 2007; Bornmann 2013) recognize four common problems in measuring societal impact of research. The first one concerns *causality* and the problem of attributing impacts to certain causes. The second one is the problem of *attribution*. Impacts might be complex and diffuse, even contingent, and it might not be possible to differentiate between what has happened because of research, and what based on other inputs. The third one relates to the fact that science is *international* and typically *incremental* by its nature, which makes attribution of impacts virtually impossible. Fourth, there is a problem of *time span* in measuring impacts and a challenge of providing evidence for long-term impacts.

Impact case study methodology used in Research Excellence Framework (REF) has become one of the most established ways to evaluate societal impact in European universities (Lyytinen et al 2015). The narrative form of REF impact case studies has been seen as a kind of a compromise enabling evaluating impact and also reporting indirect, non-linear and diffuse impacts. The REF has received relatively a lot of critique in general, e.g., for the way evaluation is connected to the allocation of funding (eg. Scott 2013), but there is hardly any discussion questioning the case study methodology concerning its limitations in demonstrating impacts. This study sets light on the researchers' possibilities to demonstrate the societal impact of their work and the nature of impacts reported.

Design

In our research, we analyse impact cases written by sociologists from UK (n=24) and Norway (n=29) respectively. The template instructions consist of five different sections: 1. *Summary of the*

impact, 2. Underpinning research, 3. Reference to research, 4. Details of impact and 5. Sources to corroborate the impact. Norway has implemented REF impact template to their evaluation as such. The evaluation was implemented in Norway in 2018. Impact case studies are approximately 3–4 pages long. Both UK and Norway impact case studies are publicly available online. The context of the evaluation differs in regards the way these two countries utilize the results of the evaluation: unlike the REF results, the Norwegian evaluation results are not used by the Research Council for the allocation of funding, but for developmental purposes.

Preliminary findings

We introduce the distinction between direct and wider impacts to illuminate the practices of reporting impact processes, and we link this to the sources of evidence offered in narrative impact reports. Based on our preliminary analysis, researchers are mostly able to report impacts on minor things, whereas wider changes in society are difficult, even impossible to prove.

We discuss also the values researchers are engaging with in their reported impacts and link them to the characteristics of sociology as a discipline, and the underlying assumptions that is legitimizing the value of sociological research in society. Sociologists in both countries used the whole variety of the values as arguments for their studies. Their arguments were mainly based on values like social cohesion and communality, social justice and equality as well as sustainable development and environmental risk prevention. Only in few cases, the impact of sociology was argued with claims based on technological advancement and efficiency or economic growth.

Limitations

The characteristics of impact creation of different fields derive from differences in disciplinary cultures (Becher 1989), from whole variety of research practices beginning from the fundamental differences in disciplinary specific ways of knowledge production and cultural understandings on what count as science, to the measurement and evaluation of research. Our focus in this study is on the ‘pure-soft’ (Becher 1989) field, sociology. Based on the understanding of discipline specific nature of impact creation we are aware that this study contributes mainly on knowledge on the evaluation of sociology and other ‘pure-soft’ fields, but leaves the question of evaluation of impact in ‘applied’ and ‘hard’ fields for the interests of future research.

Practical and Social Implications

This is a timely project in relation to recent references to the era of post-truth politics and alternative facts. Researchers need to be able to demonstrate the evidence for the usefulness of their research even more than before. Improving the learning aspect of impact is crucial as many academics struggle with it. In a wider context of science policy, the project will build empirically anchored and theoretically informed arguments about how to discuss and evaluate (or not to evaluate) the societal impact of scientific research.

Originality/Value

In spite of well-documented challenges of measuring impact in previous literature, researchers in different countries are confronted with the demand to report impact pathways for evaluation purposes and give evidence on them. Several countries (e.g. Norway & Finland) have followed the UK example by importing impact case study methodology into their evaluation practices. Developing rational criteria for discussing the value of research in society and possibilities to evaluate it requires research that reflects critically the limitations of impact case study methodology and the question of what kind of research the current impact agenda encourages.

Keywords: Societal impact, Evaluation, Impact case studies, Sociology, Values

References

- Becher, T. (1989) *Academic tribes and territories*. Milton Keynes: SRHE & Open University Press.
- Bornmann Lutz (2013) 'What Is Societal Impact of Research and How Can It Be Assessed? A Literature Survey', *Journal of the American Society for Information Science and Technology*, 64(2), pp. 217-233.
- Lyytinen, A., Hölttä, S., Kivistö, J., Kohtamäki V., Mugabi H. & Pekkola E. (2015) 'Korkeakoulujen kolmas tehtävä ja sen mittaaminen: kansainvälinen selvitys' in Ministry of Education and Culture in Finland (ed.) *Vastuullinen ja vaikuttava: tulokulmia korkeakoulujen yhteiskunnalliseen vaikuttavuuteen*. Ministry of Education and Culture and Finland 2015:13, pp. 49-78.
- Martin, B.R. (2007) 'Assessing the impact of basic research on society and the economy', *FWF-ESF International Conference on Science impact: Rethinking the impact of basic research on society and the economy*, 11 May 2007. Vienna.

Scott, P. (2013) 'Why research assessment is out of control?', *Guardian*, 4 November [online].
Available at: <https://www.theguardian.com/education/2013/nov/04/peter-scott-research-excellence-framework> (Accessed: 31 January 2020).
