

TRIPLE HELIX

JUNE 26-29 XXI CONFERENCE

Book of Abstracts



PRESENTATION

Dear readers,

We are delighted to present this book, which is closely related to the 21th International Conference of the Triple Helix Association, held in La Salle Ramon Llull University in the beautiful city of Barcelona from the 26th to the 30th of June. The conference provided a platform for scholars, young researchers, policymakers, and practitioners to come together and delve into the concepts and experiences of the global Triple Helix movement, with a special focus on "Entrepreneurial and Engaged Universities for Sustainable Development: Linking education, research and innovation to achieve the SDGs & ESGs," – the Conference's theme.

The conference featured 28 ordinary sessions, encompassing 99 presentations that form the abstracts compiled in this book, selected from a pool of 169 submitted abstracts. These 99 abstracts were thoughtfully categorized into 19 tracks, reflecting the main themes of discussion, although many presentations touched upon more than one topic.

Additionally, the conference program included panel discussions in 17 special sessions and 6 discussion panels, and speeches and debates in 3 plenary sessions, 6 semi-plenary sessions, 18 Pitching Stages. If you are interested in materials from these other sessions, they can be accessed through the Conference's website at <https://triplehelixconference.org/>

Over the course of the event, we delved into a multitude of inspiring discussions, thought-provoking sessions, and interactive workshops that provided a comprehensive understanding of the paths towards sustainability. Esteemed speakers, distinguished scholars, industry professionals, policymakers, and passionate students came together to share their expertise, experiences, and best practices, igniting a collective effort towards a greener and more inclusive future.

The conference offered an extraordinary opportunity to exchange knowledge, network with like-minded individuals, and build meaningful collaborations. Together, we explored innovative strategies to develop the synergies between academia, government, industry, and society, while aligning our efforts with the SDGs and ESGs.

Our gratitude extended to all the Sponsors, Partners, Steering Committee, International Scientific Committee, Awards Committee, and members whose dedication and unwavering support made this event possible. Their commitment to sustainable development and entrepreneurship education played a crucial role in shaping this conference into a platform for transformative ideas and actions.

We hope that you will thoroughly enjoy reading the abstracts presented in this book and that it sparks your curiosity to learn more from the authors themselves. The Triple Helix Journal will soon publish a new issue featuring the best papers selected from the conference.

Looking ahead, we invite you to mark your calendars and join us for the XXII International Triple Helix Conference, which will take place at Sao Paulo University during the last week of June 2024.

Happy reading!
Sincerely,



Dr. Josep M. Pique
Co-Chair of the Triple
Helix Conference
President - Triple Helix
Association
Executive President -
La Salle Technova
Barcelona



Dr. Carina Rapetti
Co-Chair of the Triple
Helix Conference
General Manager Triple
Helix Association
Innova Institute -
La Salle - URL

COMMITTEES



INTERNACIONAL SCIENTIFIC COMMITTEE



Marcelo Amaral
DSc, Technology Innovation
Management Fluminense
Federal University, Brazil



Jorge Audy
PhD, Information Systems
Pontifical Catholic
University, Brazil



Joaquín Azagra
PhD, Economics
Polytechnic University of
Valencia, Spain



Karen Baranon
Master in Applied Research in
Entrepreneurship and Economics
Technology of Monterrey, Mexico



Marco Bellandi
PhD, Political Economy
Florence University, Italy



Jasmina Berbegal
PhD, Engineering
Management
Polytechnic University of
Catalonia, Spain



Yuzhuo Kai
PhD, Administrative
Science
Tampere University,
Finland



David Campbell
PhD, Political Science
Alpen-Adria University of
Klagenfurt, Austria



Elias Carayannis
PhD, Philosophy and
Management of Technology and
innovation George Washington
University, USA



Patrick Cohendet
PhD, Economics
HEC Montreal, Canada



Michele Coletti
PhD, Philosophy
Grenoble School of
Management, France



Mark Deakin
PhD, Sustainable Urban
Development
Edinburgh Napier
University, UK



Irina Dezhina
PhD, Science and Innovation
Policy Institute of International
Relations and World Economy,
Russia



Jorge Durán
Master's degree,
Communication and Media
Studies University of the
Americas Puebla, Mexico



Tariq Durrani
BEng MSc PhD, Electronic
Engineering University of
Strathclyde, UK



Kadigia Faccin
PhD, Administration and Business
University of Vale do Rio dos
Sinos (Unisinos), Brazil



João Ferreira
PhD, Management
University of Beira Interior,
Portugal



Adriana Ferreira
Post Doctorate in Innovation
Management Federal
University of Viçosa, Brazil



Emanuele Fiore
PhD, Economics and
Management National
Research Council, Italy



Antonio Hidalgo
PhD, Industrial Engineering
Polytechnic University of
Madrid, Spain

INTERNACIONAL SCIENTIFIC COMMITTEE



Andrzej Jasinski
Master of Science, Industrial
Economics University of
Warsaw, Poland



Poh Kam
PhD, Regional Planning
NUS Business School,
Singapur



Marcos Lima
PhD, Information
and Communication
Technologies Skema
Business School, France



Andréa Mineiro
PhD, Business
Administration Federal
University of Itajubá, Brazil



Montserrat Pareja
PhD, Economics University
of Barcelona, Spain



Fransec Sole Parellada
PhD, Industrial Engineering
Knowledge and Development
Foundation, Spain



Marcelo Perin
Post-doctorate, Innovation
and Technological
Transfer Getulio Vargas
Foundation, Brazil



Josep Piqué
PhD, Ecosystems of
Innovation La Salle –
Ramón Llull University,
Spain



Einar Rasmussen
PhD, Sociology
Nord University, Norway



James Sefe Dzisah
PhD, Business
Administration University
of Ghana, Ghana



Annika Steiber
PhD, Technology
A.S. Management
Insights, USA



Virginia Trigo
PhD, Entrepreneurship and
Strategic Management
University Institute of
Lisbon, Portugal



Rahmat Ullah
Master of Business
Administration
Institute of Research
Promotion, Pakistan



Han Woo Park
PhD, Informatic
Communications Yeungnam
University, South Korea

AWARDS COMMITTEE



Alexander Heichlinger
Master's degree, Business
Administration and
Management
Govinsight, Spain



Emanuele Fiore
PhD, Economics and
Management National
Research Council, Italy



Virginia Trigo
PhD, Entrepreneurship and
Strategic Management
University Institute of
Lisbon, Portugal

TABLE OF CONTENTS



01

GOVERNANCE MODELS AND POLICY DESIGN FOR TRIPLE HELIX INITIATIVES FOR SDG'S

1.1 The root cause of the socialization of corruption: how it derails the promise of the Triple Helix.

page 16

1.2 Collaborative Governance in the Public Sector: Bibliometric Review.

page 17

02

PARTNERSHIPS AND PACTS FOR INNOVATION

2.1 "Everything has to be Done the Polish Way" - other words - how Individual Empowerment Contributes to Social Powerlessness. The Difficulties of Partnership for Innovation Experienced by Innovators in Post-Soviet Society.

page 19

2.2 The role of innovation intermediaries in orchestrating innovation networks.

page 21

2.3 The urban sustainability challenge: How and when innovation ecosystems emerge?

page 23

2.4 How can cooperation in innovation ecosystems reverse negative trends in rural areas?

page 24

2.5 Striking the right balance between top-down and bottom-up directionality in post-pandemic regional development strategies in the EU.

page 25

2.6 The Triple Helix Model for Innovation – A companies' perspective.

page 26

2.7 Strategic Partnerships for Innovation: UFV Case.

page 27

2.8 University spin-offs' founding teams and early networks: a longitudinal study on growth, market introduction and upscaling in contrasting Triple Helix ecosystems.

page 28

2.9 A comparative analysis of the development of oil capitals in Brazil and Norway from the perspective of the Triple Helix.

page 29

2.10 Who are the Actors of Quadruple and Quintuple Helix? Multiple Cases in Consolidated Science and Technology Parks.

page 30

2.11 Potentialities and limitations for the action of industries federation in supporting innovation ecosystems in the state of Rio de Janeiro.

page 31

02

PARTNERSHIPS AND PACTS FOR INNOVATION

2.12 Factors interfering in a successful technology transfer process involving digital assets generated by public research institutes.

page 32

2.13 International Triple Helix between Brazil and Sweden: windows of opportunity for industrial policy on smart cities and sustainability.

page 34

2.14 Developing Entrepreneurial Universities under the evolution of innovation system and strategy of innovation-driven development, the case of Shenzhen, China.

page 35

03

ENTREPRENEURIAL AND ENGAGE UNIVERSITIES FOR SOCIAL, ECONOMIC AND SUSTAINABLE DEVELOPMENT

3.1 Towards Entrepreneurial Universities: Regional Research-Educational Centers in Russian Context.

page 37

3.2 Engaging for Sustainable Development and Transformation – exploring the concept of Transformative Academic Institutions.

page 38

3.3 Engaged Humanities - Exploring the contribution of Italian studies to local development.

page 39

3.4 "Nothing exists until it is measured": a systematic review of indicators and metrics of the university's contribution to society.

page 41

3.5 An approach to a model to analyze the level of the Entrepreneurial University based on Quintuple Helix Model.

page 42

3.6 Development of an Innovation Ecosystem at a Brazilian Research Public University the case of the University Federal Fluminense.

page 43

3.7 Agents of change – regional actor's perspective on university-industry collaboration through student's involvement in challenge-based learning projects.

page 44

3.8 University-Industry cooperation: a case study of student innovation projects in Latvia.

page 45

3.9 When entrepreneurial universities meet SDGs.

page 46

3.10 Boosting students' entrepreneurial mindset: a challenge-based learning approach.

page 47

3.11 Fostering Entrepreneurial Activity: A graduate perspective of bridging university education and support.

page 49

03

ENTREPRENEURIAL AND ENGAGE UNIVERSITIES FOR SOCIAL, ECONOMIC AND SUSTAINABLE DEVELOPMENT

3.12 Advancing Higher Education Sustainability: An Assessment of the Sustainable Entrepreneurial Universities Framework.

page 50

3.13 Entrepreneurial and Obsessive Scientific Passion in Academia: How Role Models and Perceived Entrepreneurial Climate Influence the Passion Orchestra.

page 51

3.14 Embedding Sustainability at a Liberal Arts University.

page 53

3.15 Entrepreneurial University and Innovation Environments: Entrepreneurship as a Basis for Development.

page 56

3.16 Modelling the industry perspective of university research commercialisation.

page 56

3.17 The role of entrepreneurial universities in the creation of spin-offs: a systematic literature review.

page 57

3.18 Innovating bilateral cooperation to promote a net-zero future in cities.

page 59

3.19 Is it a difficult situation or is it truly deserved? ESG Information Disclosure and Green Innovation Performance of Enterprises: Empirical Evidence from Chinese Enterprises

page 60

04

BOOSTING ECOLOGICAL TRANSITION WITH TH STRATEGIES

4.1 Analyzing benefits and trade-offs of innovative nutrient recovery solutions from different sanitation systems guided by the SDGs.

page 62

4.2 NICER Programme: Interdisciplinary collaboration for Circular Economy system change.

page 63

4.3 Lagoon of Venice – Coastal restoration under changing climate conditions and high human pressure.

page 64

05

THE FOURTH INDUSTRIAL REVOLUTION, INNOVATION MEGA TRENDS AND NEW CHALLENGES THROUGH TH APPROACHES

5.1 Planet4 experience: an Erasmus+ project filling the gap between Industry and Academia in the context of Industry 4.0.
page 67

5.2 Design and application of a Twin Transition assessment framework for the sustainable digitalization of SME.
page 68

06

INNOVATION ECOSYSTEMS FOR URBAN, ECONOMIC, AND SOCIAL DEVELOPMENT

6.1 Revitalizing forgotten spaces through local leadership and social entrepreneurial ecosystems: the case of Muszyna commune, Poland.
page 70

6.2 A-Place Project: Placemaking in L'Hospitalet.
page 72

6.3 Ecosystem Integration Labs as Responsible Innovation-Led Entrepreneurial University Transformation Centres – an example of the RiEcoLab project.
page 73

6.4 A System Dynamics Model to Analyze Development of Innovation Districts.
page 74

6.5 NGOs: core actors for green innovations.
page 75

6.6 The role of entrepreneurial universities within quintuple helix innovation ecosystems. A system analysis.
page 76

6.7 Societal engagement in the innovation eco-systems of e-health, industrial automation and construction to promote sustainable development.
page 77

6.8 Exploring Regional Innovation Ecosystem: Theory and Evidence from China.
page 78

07

SUSTAINABLE CITIES & COMMUNITIES

7.1 Strategies and Impact Pathways to halt air pollution in Barcelona. Participative Governance for sustainable urban development.
page 80

7.2 Monitoring Citizen Science Performance towards Sustainable Development Goals.
page 82

08

THE ROLE OF UNIVERSITIES IN CONNECTING LOCAL COMMUNITIES WITH GLOBAL KNOWLEDGE NETWORKS

8.1 Unlocking the potential of digital co-creation between heis, ngos and citizens.
page 84

8.2 Marketing strategies and research groups lost in connection: the voice of principal investigators.
page 85

8.3 Towards the Development of a Strategic Framework for Entrepreneurial universities: A case of Botswana public universities.
page 86

8.4 Unlocking the potential of digital co-creation between heis, ngos, and citizens.
page 88

8.5 The Role of Universities in Pharmaceutical Networks in Brazil.
page 89

8.6 Enhancing Higher Education Institutions Engagement with Digital Water Smart Specialization Strategies for Sustainability: A study in selected European countries.
page 90

09

NETWORK INTELLIGENCE TO BOOST INNOVATION ECOSYSTEMS

9.1 Technology Parks and business incubators as instruments for networking and regional development.
page 93

9.2 The impact of the COVID-19 pandemic on research collaboration networks: an analysis for laboratory heads linked to Brazilian public universities.
page 94

9.3 Evaluation of Innovation Networks Using a Social Network Based Tool.
page 96

10

RESPONSIBLE CONSUMPTION, PRODUCTION AND WORK

10.1 Environmental, Social, and Governance Implementation in Healthcare Organizations: A Case Study of Assuta Medical Centers.
page 98

11

TH STRATEGIES IN DEVELOPING COUNTRIES

11.1 Triple Helix and sustainable growth in emerging economies: Stakeholders tensions in the entrepreneurial ecosystem.
page 100

11.2 An adaptive evolution of policy transfer: the case of Vietnam-Korea Institute of Science and Technology.
page 102

11.3 Faculty Promotion Evaluation and The Third Missions of Universities: Empirical Evidence from a Developing Country.
page 103

11.4 A Quadruple Helix that Respects and Nurtures Indigenous Australian Innovation and Development.
page 104

11.5 Determining the boosters for innovation in LAC: an econometric analysis.
page 106

11.6 Politicians and money go hand by hand: Local officials and interregional high tech investment flows.
page 107

11.7 The synergy of Public and Private Entrepreneurship in the formation of an Emerging Industry—the case of BOE and LED industry in China.
page 108

12

ENTREPRENEURSHIP EDUCATION IN THE CONTEXT OF TH APPROACHES

12.1 How to teach soft skills at university. A critical incident analysis of entrepreneurship teachers' reflections in five European countries.
page 110

12.2 Academic accelerator program, the value of quality education through university-industry – government support. Case study based on accelerator program for AI start-ups in Brussels.
page 111

13

OPEN INNOVATION FOR THE ECONOMIC, SOCIAL & ENVIRONMENTAL DEVELOPMENT

13.1 From Startup Nation to Open Innovation Nation: The Evolution of an Open Innovation Ecosystem in Israel.
page 113

13.2 Markets and Competencies of multiplex biosensors for a sustainable transformation: An exploratory bibliometric analysis.
page 114

13.3 Open innovation and technological impact: Linking R&D collaboration to patent quality in the aerospace industry.
page 115

13.4 Does public R&D funding facilitate regional industrial innovation performance? A case of Chinese pharmaceutical industry.
page 116

13.5 Evolutionary Governance dynamics of powerful customer engagement in industrial innovation: evidence from China's IT infrastructure industry.
page 117

13.6 Research on global open science governance framework.
page 118

13.7 Digital Finance and Urban Innovation—Evidence from China's Municipal Level.
page 119

14

GENDER BALANCE AND REDUCTION OF INEQUALITIES

14.1 Academic career and gender inequalities in Brazil: the effect of postdoctoral mobility abroad.
page 121

14.2 Women participation - institutional and structural factors affecting the commercialisation of their research outputs: Findings from Nigeria Universities.
page 123

14.3 Does global innovation consider the elements of equity, diversity, and inclusiveness?
page 124

15

WELL-BEING SOCIETIES

15.1 Six policy intervention points to foster the protein transition towards sustainability - Addressing repercussions of regime shifts as a prerequisite.
page 126

15.2 The implementation of SDG-3 in Israel.
page 128

15.3 Behavioral Patterns Identification in Active Aging Homes: a Joint Approach by Health Care, Home Assistance and Research.
page 129

16

DATA DRIVEN STRATEGIES FOR SDG'S

16.1 Data Science for SDG: the experience of four data science projects into a triple helix model.
page 131

16.2 Inspiring Citizen Science Innovation on China's Monitoring of Water-related Sustainable Development Goals.
page 132

16.3 Governance and Data Sourcing in Supervised Learning Development-A Case of Healthcare Artificial Intelligence.
page 133

16.4 Digital Transformation of Administrative Services and Its Effect on Enterprise Innovation Performance: An Empirical Study of Beijing.
page 134

16.5 Building a balanced and inclusive international governance system for artificial intelligence.
page 135

17

HYBRID ORGANIZATIONS FOR KNOWLEDGE CO-CREATION, INNOVATION, ENTREPRENEURSHIP FOR SUSTAINABILITY

17.1 Does Social Identity Matter? How the Interaction of Social Identity and Passion Shape Commercialization Intention in Academia.
page 137

17.2 International Soft Landings Program: A Model for Transnational and University Collaboration for the Expansion of SDG Missioned Firms Across Borders.
page 139

17.3 Technological Parks in Brazil: a study of official papers and legislation.
page 141

17.4 Integration of knowledge silos in an emerging economy leveraging digital clusters – Creating a Case for Nigeria.
page 142

17.5 Technology parks in Brazil: an analysis of the performance evaluation.
page 143

17.6 APTENISA Acceleration Program: Government and Spain Science Parks Initiative.
page 145

17.7 Waste battery recycling patent/article trend analysis: From a knowledge spillover perspective.
page 147

18

THEORETICAL FOUNDATIONS AND METHODOLOGICAL APPROACHES FOR TH RESEARCH

18.1 Evolution of Triple Helix, Derived Models, and Other Abstractions.
page 149

18.2 Revisiting, Rediscovering, and Rethinking Triple Helix.
page 150

18.3 Econometric Models of Triple and Quadruple Spirals for Solving Applied Problems of Innovative Economy.
page 151

18.4 Visualizing Triple Helix in the Brazilian Context.
page 152

18.5 Arts for future: how arts-based interventions (ABIs) can contribute to learning and knowledge integration in transdisciplinary research.
page 153

18.6 Understanding the Complexities of University–Industry Collaboration in Iran’s Public Sector.
page 154

18.7 Helix Innovation Models: a Systematic Literature Review with data analysis script by R software.
page 155

18.8 Triple Helix and Cluster of Innovation approaches combined: exploring a new perspective on industrial value creation.
page 156

19

EVALUATING THE IMPACT OF TH INITIATIVES

19.1 Efficiency index of Triple Helix relations – network DEA model.
page 158

19.2 The challenges and opportunities of work-based learning in an online environment.
page 159

19.3 Validation of a framework for evaluating knowledge mobilization strategies: Delphi survey of experts.
page 160

19.4 Determinants and effects of university–industry collaboration in Latin America.
page 162

20

AWARDS

20.1 Best Conference Paper Award
page 164

20.2 Best Practical Innovation Cases
page 164

20.3 Early Career Researcher Award
page 164

01

GOVERNANCE MODELS AND POLICY DESIGN FOR TRIPLE
HELIX INITIATIVES FOR SDG'S

1.1 The root cause of the socialization of corruption: how it derails the promise of the Triple Helix

Dr. Yetunde Odugbesan-Omede¹

¹State University of New York - Farmingdale State, College, USA.

ABSTRACT

How does corruption become socialized? Corruption is a major global problem. The effects are devastating. Corruption undermines rule of law, breaks down the social fabric of society, erodes morality and positive values systems. It significantly undermines public trust in institutions and their leaders. On a societal level, the pervasiveness of corruption within a society can lead to an increase in negative structural and systemic practices as well as encourage individual corrupt behavior that ultimately erodes public morality. Considering these reasons and more, this dissertation analyzes the role corruption plays in normalizing deviant behavior, which may result in the socialization of corruption further eroding the impact triple helix model may play in society.

The second Millennium Development Goal specified by the United Nations says that all human beings should have access to a basic education. Education is one of society's most powerful institutions. Education is the fundamental precondition for political development, democracy and social justice. There is no development without education. The world community has long since recognized this fact and developed clear political demands and consciousness on the subject as well. According to the OECD Report on Education in Focus, "Early philosophers such as Aristotle and Plato pointed out that education was central to the moral fulfillment of individuals and the well-being of the society in which they live."

Education completes the socialization process for children and is charged to instill respect, integrity, morality and understanding of rules and laws. Most studies on corruption focus on the roots of corruption as a collaborative effort between bad leadership, political instability and historical conquests; however, the role of education is rarely seen as a major cause in the formation, perpetuation and socialization of corruption. One of the greatest threats affecting institutions of education is corruption. Corruption in the education sector can be defined as "the systematic use of public office for private benefit, whose impact is significant on the availability and quality of educational goods and services, and, has impact on access, quality or equity in education." Corruption, if unchecked in institutions of education can cause a breakdown of good social values, increase the tolerations of academic dishonesty within schools and create further inequalities within society.

DESIGN / METHODOLOGY / APPROACH

In order to effectively explore the phenomenon of corruption, address the research questions at different levels and overcome the limitations of a single design, this research utilized a mix method approach. Mixed methods research is a methodology for conducting research that involves collecting, analyzing and integrating quantitative data and qualitative research. The benefit from utilizing a mixed method approach is that it allows for gaining a deeper understanding of the study and corroboration. The quantitative part of this study examines the correlation between a set of independent variables, derived from literature on corruption, criminology, public administration and education under factor groupings: cultural, psychological and collective social values while the qualitative part provides deeper insights into the mechanisms facilitating corruption in educational insights.

FINDINGS OR EXPECTED OUTCOMES

Corruption happening every day on the local level is often ignored and deemed unimportant because of the amount of money being exchanged by ordinary citizens. It is the low-level bribery, however, that does the most damage because it is the most recurring form of corruption. It normalizes corrupt acts, and the longer it goes unchecked the more it seeps into the fabric of society. This study sheds light on the human costs corruption has and the effects corruption in institutions of education can have on a whole country. It is safe to say that corruption in education can be considered the root cause of corruption permeating every other sector; after all, the majority of professionals are first trained in school before arriving at their

professional destinations, meaning the values or lack thereof that they bring to the workplace can be traced back to their educational. This study sheds light on the human costs corruption has and the effects corruption in institutions of education can have on a whole country. It is safe to say that corruption in education can be considered the root cause of corruption permeating every other sector; after all, the majority of professionals are first trained in school before arriving at their professional destinations, meaning the values or lack thereof that they bring to the workplace can be traced back to their educational.

ORIGINALITY / VALUE

The findings of this study contribute a unique perspective to corruption research in examining the impact institutions of education have on the breakdown of collective values systems.

PRACTICAL / SOCIAL IMPLICATIONS

This study further asserts that the breakdown of collective positive social values amongst youths globally is directly attributed to corrupt acts committed by those in authority in formal institutions of education specifically in countries with high levels of corruption. Future studies should consider adapting the proposed provisions and models offered in this study to focus on corruption in institutions of education as a hazard in the development and positive progression of higher education institutions and the potential to harness a generation of millennial who have the ability to occupy strategic leadership positions in national life. This study provides recommendations that can also be applied and utilized by countries also facing similar issues and who also hold the desire to attain the United Nations Millennium Development Goals by 2030.

KEYWORDS (3-5)

good governance, human security, education, social values.

1.2 The root cause of the socialization of corruption: how it derails the promise of the Triple Helix

Igone Porto Gomez¹, Elsayed Fathi Moussa Mohamed¹

¹University of Deusto, Spain.

PURPOSE

Over the past few decades, collaborative governance (CG) research has witnessed a special scholarly attention. Nonetheless, the extant literature needs to be summarized and classified to add conceptual clarity and consistency for better understanding of the field. Consequently, the purpose of this study is to provide a comprehensive assessment/ review of CG articles published in scholarly journals, and to identify the development of this field in terms of the research streams, the emerging trends, the gaps in literature, and the distribution patterns of research.

DESIGN / METHODOLOGY / APPROACH

This study performs a combination of systematic literature review process with a bibliometric review on 901 articles extracted from the Web of Science (WoS) Core Collection database. Using both methodologies contributes in reducing any possible bias that exists in the traditional literature reviews, moreover it provides a neutral and reliable approach for this kind of study.

FINDINGS OR EXPECTED OUTCOMES

Over the recent years, there is a growing interest in CG research, where it has been published heavily under public administration, environmental studies, political science, and management categories. For the research production, the United States, and by far, comes on the top of the list. However, Europe, collectively, has the biggest share of production. Patterns of active collaboration and co-authorship between researchers has been identified, especially within European research institutions. CG used in the time of complex challenges, crisis and natural disasters, and conflict resolution. Some countries seem to adopt CG for certain purposes; China practices CG to confront air pollution and environmental challenges, whilst Canada and Australia execute it to collaborate with indigenous people. Generally, governments adopt CG to confront wicked problems, to manage natural resources, to achieve sustainability, and to realize innovation and public value.

ORIGINALITY / VALUE

The study contributes to CG research by providing holistic review of its literature, with special focus on research themes, patterns, and trends. To the best knowledge, this study is the first to provide bibliometric analysis using natural language processing of the field.

PRACTICAL / SOCIAL IMPLICATIONS

This research will add insightful clarity for the research body of the field, where other researchers could benefit from its conclusions and suggested future research lines. For policymakers and practitioners, the study represents an overview of CG; its conditions, applications, and outcomes.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Inevitably, this study is limited by using one single database (WoS), with a specific spectrum of terms included in the search. Additionally, the study database only includes articles, thus other types of publications (i.e. article review, books, conference papers, etc.) have been excluded. Future literature reviews should avoid these limitations to include larger literature production for better representation of the field. Moreover, future research could focus more, when investigating CG, on other geographical and economic clusters and contexts (i.e. developing countries, and emerging economics), comparative studies through various contexts deserve more attention as well. Another prominent research line could be the relationships between CG and other disciplines and topics such as strategic management, crisis management, public innovation, etc.

KEYWORDS (3-5)

Literature review; bibliometric analysis; natural language processing; collaborative governance; stakeholders collaboration.

02

PARTNERSHIPS AND PACTS FOR INNOVATIONS

2.1 “Everything has to be Done the Polish Way” - other words - how Individual Empowerment Contributes to Social Powerlessness. The Difficulties of Partnership for Innovation Experienced by Innovators in Post-Soviet Society

Agnieszka Karpińska¹

¹University Of Bialystok, Poland.

PURPOSE

Innovators from post-Soviet transition societies experience barriers to innovation different from those shared by inventors in developed countries. Since there has been little research into this subject so far, the aim of the study is to explore the sociological determinants of the low level of partnership in the national innovation system in a post-communist country from the perspective of social agency paradigm developed by Margaret Archer. Consequently, the research question of this study is in what manner the structural-cultural social context influences innovators reflexivity and thus contributes to the development of partnership among the NIS.

DESIGN / METHODOLOGY / APPROACH

The research question emphasises the first perspective and lead to qualitative methods using individual, in-depth interviews. Purposive sampling was used to select participants from the population of innovators living in Bialystok. In the study, an innovator was defined as a person who has developed and implemented at least one new product or service in the last five years, independently or in a team, in cooperation with an institution of the innovation system (e.g. in the form of internship, scholarship, employment, or doctoral school). In total, 20 face-to-face interviews were conducted with 13 men and 7 women. The relatively small number of the respondents resulted from the exploratory nature of the research. As the aim of the research is to reflect upon the reflexivity of innovators, the small size does not affect the essence of their accounts and thus should not influence the essence of the study (Crouch and McKenzie 2006). Apart from that, innovators are a social group which has some features of a hard-to-reach population (Sadler et al. 2010) and is limited.

FINDINGS OR EXPECTED OUTCOMES

The research has found that the interviewees function in a highly entrepreneurial culture, which is demonstrated by the number of initiatives they have taken and the ease of establishing networking relations with other inventors. On the other hand, the innovators unanimously agree that public institutions in the NIS are still based on the post-Soviet pattern of nepotism and hierarchy developed on the foundation of division between the ones who have the access to financial, technological, and know-how resources and those who do not. No other abilities (experience or specialisation) are of any real importance. Like in the past Soviet structure, '[t]he heart of the system was the all-powerful leader, above the law and a law himself, ... without a balancing accountability, and limiting all other institutions to auxiliary, administrative functions' (Ledanova 2009, 268). However, the results of this study clearly show that innovators simply do not want to play the game – they are aware of the façade mechanisms of the NIS, e.g. in case of the disposal of funds for innovation, and do not want to participate in it. Instead, they are so focused on achieving their individual goals that they have organised an innovation-friendly environment as autonomously as possible. The most significant finding to emerge from this study, though, is that innovators do not identify themselves with the NIS. No symptoms of group consciousness were observed among them. Instead, the innovators strongly manifest the attitude of being self-made people struggling with the burden of structural and cultural hindrances. So far innovators' interest remains focused on the personal need to change rather than a need of the group as a whole. It seems that adopting an active attitude is linked to creating a change for themselves as opposed to waiting for others to create the change. This included forward thinking, maintaining a strong work ethic, and creating opportunities that helped innovators achieve professional success. The personal emergent power of innovators is thus very strong, though too weak in itself to create collective relations. Interactions between actors in the NIS are weak and the few that exist are mainly based on informal, personal contacts. Apart from individual experiences though, on the macro scale, the attitude of distrust towards the potential partner within the NIS significantly discouraged the interviewees from engaging in cooperation. The most successive innovators have decided to work as freelancers running their own

businesses, hardly ever having any established form of cooperation with institutions of the NIS. It can be claimed though that these innovators function outside the NIS since they do not form any regular relations with academic or spin-off institutions and only occasionally take up short-term collaborations which usually do not survive longer than the duration of one project. Clearly, these initiatives do not result in any networks. Consequently, the innovators do not feel they belong to the NIS, as the experience they describe is rather a form of dropping in and out of the system without the willingness to establish any stable relations within it. The interviewees discussed extensively the reasons for their aversion to cooperating with NIS partners. On the whole, they demonstrated the attitude of distrust towards innovation system stakeholders. In the group of academics, this mostly referred to co-workers within the academia and business people.

ORIGINALITY / VALUE

There is an impressive body of literature that recognises the importance of innovation for modern societies. However, much of the research has been quantitative in nature and restricted to comparisons of developed countries. Though research concerning innovation in developing economies is growing in importance, the majority of those studies are limited to macroeconomic analyses examining e.g. Organization for Economic Cooperation and Development (OECD) or European Union (EU) innovation policies and academic entrepreneurship (Apanasovich 2016; Apanasovich, Heras and Parrilli, 2016). A considerable number of works on the innovation capacity of Eastern European countries (EECs) is thus limited to econometric descriptive analyses and case studies (Radosevic and Auriol 1999; Radosevic and Kutlaca 1999; Marinova 2000; Piech and Radosevic, 2006). This study is an attempt to fill this gap.

PRACTICAL / SOCIAL IMPLICATIONS

Contrary to expectations, the study did not find significant examples of corporate agency reported by innovators. It does not mean they cannot have an effect 'but the effects are unarticulated in both senses of the word – uncoordinated in action and unstated in aim' (Archer 1995, p. 259). Generally, the majority of the interviewees clearly formulated their interests addressed to the stakeholders of the NIS, and yet, they have no determination to establish an organised group within it. This phenomenon may be explained with negative experiences of such cooperation and the overwhelming feeling of distrust resulting from it, combined with being part of postcommunist societies' mentality. The innovators experienced the dualism of the NIS, in which a hierarchical post-Soviet cultural system coexisted with an emerging entrepreneurial economic system.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The present study lays the groundwork for future research into the role of human reflexivity (Archer, 1996; 2000; 2003) in overcoming innovation barriers. Since the existing attempts to explore innovators' activity focus on the commercialization process and underplay creativity as the central tenet of innovation, future studies could explore what creativity barriers are experienced by innovators from a post-Soviet society.

KEYWORDS (3-5)

National innovation system, innovation, social agency, post-communism country.

REFERENCES

- Apanasovich, Natalja. 2016. Modes of Innovation: a Grounded Meta-Analysis. *Journal of the Knowledge Economy* 7: 720–737. doi: 10.1007/s13132-014-0237-0.
- Apanasovich, Natalja, Henar Alcalde Heras and Mario Davide Parrilli. 2016. The Impact of Business Innovation Modes on SME Innovation Performance in Post-Soviet Transition Economies: The Case of Belarus. *Technovation* 57-58: 30-40. doi: 10.1016/j.technovation.2016.05.001.
- Archer, Margaret Scotford. 1995. *Realist Social Theory: the Morphogenetic Approach*.
- Archer, Margaret Scotford. 2000. *Being Human: the Problem of Agency*.

- Archer, Margaret Scotford. 2003. Structure, Agency and the Internal Conversation.
- Archer, Margaret Scotford. 2007a. Making Our Way Through the World: Human Reflexivity and Social Mobility.
- Archer, Margaret Scotford. 2007b. The Trajectory of the Morphogenetic Approach: an Account in the First-Person. *Sociologia, Problemas e Práticas* 54: 35–47. Available from: <https://sociologiapp.iscte-iul.pt/pdfs/54/550.pdf> [Accessed: 21 March 2022].
- Archer, Margaret Scotford. 2012. The Reflexive Imperative in Late Modernity.
- Archer, Margaret Scotford. 2013. Social Morphogenesis.
- Caetano, Ana. 2015. Defining Personal Reflexivity: A Critical Reading of Archer's Approach. *European Journal of Social Theory* 18 (1): 60-75. doi: 10.1177/1368431014549684.
- Chagelishvili, Lali. 2013. Education Development Problems in the Post-Soviet Space. *European Scientific Journal* 1: 418-424. Available from: <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1013.4259&rep=rep1&type=pdf> [Accessed: 1 March 2022].
- Crosby, Wayne. 2013. Moving Through Uncertain Times: A Morphogenetic Approach to Understanding People's Response to Crisis in Two Forest Community Contexts in Rural British Columbia. doi: 10.7939/R3NC5SP98.
- Crouch, Mira and Heather McKenzie. 2006. The Logic of Small Samples in Interview-Based Qualitative Research. *Social Science Information* 45(18): 483-499. doi: 10.1177/0539018406069584.
- Freeman, Christopher. 1987. Technology Policy and Economic Performance - Lessons from Japan.
- Global Entrepreneurship Monitor. 2022. Global Entrepreneurship Monitor 2021/2022 Global Report: Opportunity Amid Disruption. London, GEM. Available from: <https://www.gemconsortium.org/file/open?fileid=50900> [Accessed: 21 March 2022].
- Godin, Benoît. 2005. The Linear Model of Innovation: the Historical Construction of an Analytical Framework. Project on the History and Sociology of S&T Statistics, Working Paper No 30/2005. Available from: http://88.167.97.19/temp/The%20Linear%20Model%20of%20Innovation.%20The%20Historical%20Construction%20of%20an%20Analytical%20Framework_Godin_30.pdf [Accessed: 14 March 2022].
- Golob, Tea and Makarovič Matej. 2019. Reflexivity and Structural Positions: the Effects of Generation, Gender and Education. *Social Sciences* 8 (248): 1-23. doi:10.3390/socsci8090248.
- Hays, Sharon. (1994) Structure and Agency and the Sticky Problem of Culture. *Sociological Theory* 12 (1): 57-72. doi: 10.2307/202035.
- Holmes, Leslie. 2013. Postcommunist Transitions and Corruption: Mapping Patterns. *Social Research* 80 (4): 1163–86. Available online: <http://www.jstor.org/stable/24385655>.
- Hung, Isabelle and Appleton Peter. 2016. To Plan or Not to Plan: The Internal Conversations of Young People Leaving Care. *Qualitative Social Work* 15 (1): 35-54. doi: 10.1177/1473325015577408.
- Karpińska, Agnieszka. 2020. Innovation and Science Dilemmas. Unintended Consequences of Innovation Policy for Science. *Polish Experience*. *Cogent. Social Sciences* 6, n. pag. doi: 10.1080/23311886.2020.1718055.
- Lašaková, Anna, Lubica Bajzíkova and Indra Dedze. 2017. Barriers and Drivers of Innovation in Higher Education: Case Study-Based Evidence Across Ten European Universities. *International Journal of Educational Development* 55: 69-79. doi: 10.1016/j.ijedudev.2017.06.002.
- Ledeneva, Alena. 2009. From Russia with Blat: Can Informal Networks Help Modernize Russia? *Social Research* 76 (1): 257-288. Available from: <http://www.jstor.org/stable/40972146> [Accessed: 24 February 2022].
- Leder, Andrzej. 2014. Prześlona rewolucja. Ćwiczenie z logiki historycznej [An Oeiric Revolution: an Exercise in Historical Logic].
- Leder, Andrzej. 2022. Kraina podwójnego języka [A Land of Double Tongue]. *Polityka [Politics]* 7 (3350): 20-23. Available from: <https://www.polityka.pl/tygodnikpolityka/spoleczenstwo/2153535,1,jacy-wyborcy-taka-wladza-prof-andrzej-leder-o-przykrych-cechach-polakow.read> [Accessed: 21 March 2022].
- Marinova, Dora. 2000. Eastern European Patenting Activity in USA. *Technovation* 21: 571-584. doi: 10.1016/S0166-4972(00)00077-8.
- Meinzen-Dick, Ruth Di Gregorio Monica and McCarthy Nancy. 2004. Methods for Studying Collective Action in Rural Development. *Agricultural Systems* 82: 197-214. doi: 10.1016/j.agsy.2004.07.006.
- Miettinen, Reijo. 2012. Innovation, Human Capabilities, and Democracy. Towards an Enabling Welfare State.
- Miles, Mathew and Huberman A. Michael. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*.
- Mrozowski, Adam. 2011. Coping with Social Change: Life Strategies of Workers in Poland's New Capitalism.
- Mytelka, Lynn Krieger and Keith Smith. 2002. Policy Learning and Innovation Theory: an Interactive and Co-Evolving Process. *Research Policy* 31 (8-9): 1467-1479. doi: 10.1.1.453.7890.
- Novikova, Kateryna. 2015. Informal Networking as Effective Resource and Sociocultural Traditions of Homo Sovieticus. *Zeszyty Naukowe Uniwersytetu Przyrodniczo-Humanistycznego w Siedlcach* 31 (104): 187-194.
- Organisation for Economic Cooperation and Development and Eurostat. 2018. Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation. 4th edition. The Measurement of Scientific, Technological and Innovation Activities. OECD Publishing. doi: 10.1787/9789264304604-en.
- Piech, Krzysztof and Radošević Slavo. 2006. The Knowledge-Based Economy in Central and East European countries: Countries and Industries in a Process of Change.
- Radošević, Slavo and Auriol Laudeline. 1999. Patterns of Restructuring in Research, Development and Innovation Activities in Central and Eastern European Countries: An Analysis Based on S & T indicators. *Research Policy* 28: 351-376. doi: 10.1016/S0048-7333(98)00124-3.
- Radošević, Slavo and Kutlaca Djuro. 1999. Technological Catching-up Potential of Central and Eastern Europe: An Analysis Based on US Foreign Patenting Data. *Technology Analysis and Strategic Management* 11: 95-111. doi: 10.1080/095373299107609.
- Rasmus, Lema, Erika Kraemer-Mbula and Marija Rakas. 2021. Innovation in Developing Countries: Examining Two Decades of Research. *Innovation and Development* 11 (2-3): 189-210. doi:10.1080/2157930X.2021.1989647.
- Robinson, Olivier C. and Smith Jonathan A. 2010. Investigating the Form and Dynamics of Crisis Episodes in Early Adulthood: The Application of a Composite Qualitative Method. *Qualitative Research in Psychology* 7: 170–191. doi: 10.1080/14780880802699084.
- Sadler, Georgia R., Lee Hau-Chen, Seung-Hwan, R. and Judith Fullerton. 2010. Recruitment of Hard-to-reach Population Subgroups via Adaptations of the Snowball Sampling Strategy. *Nursing & Health Sciences* 12 (3): 369-374. doi:10.1111/j.1442-2018.2010.00541.x.
- Sawyer, R. Keith. 2012. Explaining Creativity: the Science of Human Innovation.
- Szambelan, S. Markus and Yi Dragon Jiang. 2020. Effectual Control Orientation and Innovation Performance: Clarifying Implications in the Corporate Context. *Small Business Economics* 54 (3): 865-882. doi: 10.1007/s11187-019-00156-7.
- Wedel, Janine. 2003. Clans, Cliques and Captures States: Rethinking 'Transition' in Central and Eastern Europe and the Former Soviet Union. *Journal of International Development* 15: 427-440. doi: 10.1002/jid.994.
- Wedel, Marco. 2021. Ways to Foster the Scientific System: It's the People, Stupid! *Innovation: The European Journal of Social Science Research* 34 (3): 273-277. doi: 10.1080/13511610.2021.1954821.
- Meinzen-Dick, Ruth, Di Gregorio Monica and McCarthy Nancy. 2004. Methods for Studying Collective Action in Rural Development. *Agricultural Systems* 82: 197-214. doi: 10.1016/j.agsy.2004.07.006.
- Wimalasena, Lakshman. 2017. Reflexivity and women's agency: a critical realist morphogenetic exploration of the life experience of Sri Lankan women. *Journal of Critical Realism* 16 (4): 383-401. doi:10.1080/14767430.2017.1346988

2.2 The role of innovation intermediaries in orchestrating innovation networks

Moritz Stahl¹

¹La Salle - Ramón Llull University, Spain.

PURPOSE

Startups engage in innovation networks to acquire complementary assets outside their boundaries to innovate. Orchestration roles associated with such networks have attracted increasing attention. Innovation intermediaries are essential connecting links to foster innovation by providing companies the ability to access external resources. In this paper we propose a research framework with five orchestration functions of intermediation, drawing upon network orchestration and innovation intermediation literature.

DESIGN / METHODOLOGY / APPROACH

We propose a conceptual framework of orchestration functions by drawing upon two literature streams: innovation network orchestration (Dhanaraj and Parkhe, 2006, Ritala et al., 2011, Hurmelinna-Laukkanen et al., 2011, Nambisan and Sawhney, 2011, Reypens et al., 2019, Batterink et al., 2010) and innovation intermediation (Howells, 2006, Johnson, 2008, Gassmann et al., 2011, Dalziel and Parjanen, 2012, Katzy et al., 2013, Lichtenthaler, 2013, Agogué et al., 2017, De Silva et al., 2018, Russo et al., 2019, Germundsson et al., 2021, Kivimaa et al., 2019). The proposed framework is subject to empirical examination. We propose an abductive approach by comparing the existing conceptualization of the orchestration functions of intermediaries obtained from the extant literature with the empirical data of a cross-case analysis of nine dyadic relationships between one orchestrator and the startups in all phases of their reciprocal relationship. It is intended to provide a more fine-grained understanding of orchestration functions while exploring dyadic relationships between the innovation intermediary and nine startups within the innovation network.

FINDINGS OR EXPECTED OUTCOMES

This study is undertaken through the lenses of one focal innovation intermediary¹ as an orchestrating entity while focusing on the orchestration functions. Specifically, the dyad relationship between the intermediary and nine affiliated case startups within the innovation network is considered the unit of analysis. Hence, the expected contribution is twofold. Firstly, we aim to extend earlier research on innovation network orchestration by identifying essential functions currently not well-defined in an unexplored field of literature. Secondly, previous works are developed in different industries and contexts (Gausdal and Nilsen, 2011, Hurmelinna-Laukkanen et al., 2022, Mignoni et al., 2021, Palmié et al., 2021, Reypens et al., 2016, Batterink et al., 2010), lacking insights from the context of nascent startups with scarce resources, where key functions are even more important to be defined (Marcon and Ribeiro, 2021, Bailetti, 2012, Fukugawa, 2017).

ORIGINALITY / VALUE

The case studies and framework presented here clarify the undertheorized orchestration role that innovation intermediaries play in brokering inter-organizational relationships by providing practical insights into the underlying tasks, activities, and relevance of intermediary functions in an entrepreneurial environment (Giudici et al., 2018, Katzy et al., 2013).

PRACTICAL / SOCIAL IMPLICATIONS

Identifying orchestration functions and activities provide insights into the context in which orchestrating intermediaries operate and the value creation between network members. Thus, this understanding facilitates startups in achieving their business goals, as they can analyze the surrounding ecosystem more extensively and thoroughly. Besides, startups can refocus their relationship with external actors by understanding orchestration activities and, from there, develop their current role.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Overall, our findings contribute to the literature on innovation intermediaries by providing a deeper understanding of their role, functions, and activities as requested by Abbate et al. (2013). Specifically, we illustrate the interdependencies between orchestration functions within and between the stages of the innovation process

and how these functions evolve over time in early-stage startup development. Additionally, our study highlights the fundamental orchestration mechanisms utilized simultaneously at several levels by the innovation intermediary in line with related practices, activities, and outcomes. This enhances the understanding of earlier studies that examined single-level or phase orchestration mechanisms (Paquin and Howard-Grenville, 2013, Reypens et al., 2016, Schepis et al., 2021). Finally, we also acknowledge that our study has several limitations, which have implications for future research. The limits of our study, situated within the same innovation region, are acknowledged. Due to the specific nature of each case study, generalizations of our findings to other startup networks cannot be undertaken. Our explorative research instead aims to analytically generalize our set of results through replication logic, and future research could also investigate how intermediation activities relate to startup performance. Overall, our study provides valuable insights for startups and innovation intermediaries to better understand the ecosystem and optimize their relationships with external actors, as well as for policymakers to design and implement policies aimed at promoting entrepreneurship and innovation.

KEYWORDS (3-5)

Network Orchestration, Innovation Intermediary, Innovation Network, Startup.

REFERENCES

- ABBATE, T., COPPOLINO, R. & SCHIAVONE, F. 2013. Linking Entities in Knowledge Transfer: The Innovation Intermediaries. *Journal of the Knowledge Economy*, 4, 233-243.
- AGOGUÉ, M., BERTHET, E., FREDBERG, T., LE MASSON, P., SEGRESTIN, B., STOETZEL, M., WIENER, M. & YSTRÖM, A. 2017. Explicating the role of innovation intermediaries in the "unknown": a contingency approach. *Journal of Strategy and Management*, 10, 19-39.
- BAILETTI, A. J. 2012. What technology startups must get right to globalize early and rapidly. *Technology Innovation Management Review*, 5-16.
- BATTERINK, M. H., WUBBEN, E. F. M., KLERKX, L. & OMTA, S. W. F. 2010. Orchestrating innovation networks: The case of innovation brokers in the agri-food sector. *Entrepreneurship & Regional Development*, 22, 47-76.
- DALZIEL, M. & PARJANEN, S. 2012. Measuring the Impact of Innovation Intermediaries: A Case Study of Tekes. *Practice-Based Innovation: Insights, Applications and Policy Implications*.
- DE SILVA, M., HOWELLS, J. & MEYER, M. 2018. Innovation intermediaries and collaboration: Knowledge-based practices and internal value creation. *Research Policy*, 47, 70-87.
- DHANARAJ, C. & PARKHE, A. 2006. Orchestrating Innovation Networks. *The Academy of Management Review*, 31, 659.
- FUKUGAWA, N. 2017. Is the impact of incubator's ability on incubation performance contingent on technologies and life cycle stages of startups?: evidence from Japan. *International Entrepreneurship and Management Journal*, 14, 457-478.
- GASSMANN, O., DAIBER, M. & ENKEL, E. 2011. The role of intermediaries in cross-industry innovation processes. *R & D Management*, 41.
- GAUSDAL, A. H. & NILSEN, E. R. 2011. Orchestrating Innovative SME Networks. The Case of "HealthInnovation". *Journal of the Knowledge Economy*, 2, 586-600.
- GERMUNDSSON, L. B., FRANKELIUS, P. & NORRMAN, C. 2021. The role of innovation intermediary organisations in forming value creating meetings: the agri-food firm perspective. *International Food and Agribusiness Management Review*, 24, 993-1004.
- GIUDICI, A., REINMOELLER, P. & RAVASI, D. 2018. Open-System Orchestration as a Relational Source of Sensing Capabilities: Evidence from a Venture Association. *Academy of Management Journal*, 61, 1369-1402.
- HOWELLS, J. 2006. Intermediation and the role of intermediaries in innovation. *Research Policy*, 35, 715-728.

- HURMELINNA-LAUKKANEN, P., MOLLER, K. & NATTI, S. 2011. Innovation Orchestration Matching Network Types and Orchestration Profiles. 27th IMP-conference. Glasgow.
- HURMELINNA-LAUKKANEN, P., MÖLLER, K. & NÄTTI, S. 2022. Orchestrating innovation networks: Alignment and orchestration profile approach. *Journal of Business Research*, 140, 170-188.
- JOHNSON, W. H. A. 2008. Roles, resources and benefits of intermediate organizations supporting triple helix collaborative R&D: The case of Precarn. *Technovation*, 28, 495-505.
- KATZY, B., TURGUT, E., HOLZMANN, T. & SAILER, K. 2013. Innovation intermediaries: a process view on open innovation coordination. *Technology Analysis & Strategic Management*, 25, 295-309.
- KIVIMAA, P., BOON, W., HYYSALO, S. & KLERKX, L. 2019. Towards a typology of intermediaries in sustainability transitions: A systematic review and a research agenda. *Research Policy*, 48, 1062-1075.
- LICHTENTHALER, U. 2013. The Collaboration of Innovation Intermediaries and Manufacturing Firms in the Markets for Technology. *Journal of Product Innovation Management*, 30, 142-158.
- MARCON, A. & RIBEIRO, J. L. D. 2021. How do startups manage external resources in innovation ecosystems? A resource perspective of startups' lifecycle. *Technological Forecasting and Social Change*, 171.
- MIGNONI, J., BITTENCOURT, B. A., DA SILVA, S. B. & ZEN, A. C. 2021. Orchestrators of innovation networks in the city level: the case of Pacto Alegre. *Innovation & Management Review*, ahead-of-print.
- NAMBISAN, S. & SAWHNEY, M. 2011. Orchestration Processes in Network-Centric Innovation: Evidence From the Field. *Academy of Management Perspectives*, 25, 40-57.
- PALMIÉ, M., BOEHM, J., LEKKAS, C.-K., PARIDA, V., WINCENT, J. & GASSMANN, O. 2021. Circular business model implementation: Design choices, orchestration strategies, and transition pathways for resource-sharing solutions. *Journal of Cleaner Production*, 280.
- PAQUIN, R. L. & HOWARD-GRENVILLE, J. 2013. Blind dates and arranged marriages: Longitudinal processes of network orchestration. *Organization Studies*, 34, 1623-1653.
- REYPENS, C., LIEVENS, A. & BLAZEVIC, V. 2016. Leveraging value in multi-stakeholder innovation networks: A process framework for value co-creation and capture. *Industrial Marketing Management*, 56, 40-50.
- REYPENS, C., LIEVENS, A. & BLAZEVIC, V. 2019. Hybrid Orchestration in Multi-stakeholder Innovation Networks: Practices of mobilizing multiple, diverse stakeholders across organizational boundaries. *Organization Studies*, 42, 61-83.
- RITALA, P., ARMILA, L. & BLOMQUIST, K. 2011. Innovation Orchestration Capability – Defining the Organizational and Individual Level Determinants. *International Journal of Innovation Management*, 13, 569-591.
- RUSSO, M., CALOFFI, A., ROSSI, F. & RIGHI, R. 2019. Innovation intermediaries and performance-based incentives: A case study of regional innovation poles. *Science and Public Policy*, 46, 1-12.
- SCHEPIS, D., PURCHASE, S. & BUTLER, B. 2021. Facilitating open innovation processes through network orchestration mechanisms. *Industrial Marketing Management*, 93, 270-280.

2.3 The urban sustainability challenge: How and when innovation ecosystems emerge?

Prasanna Kumar Kukkamalla¹, Carlos Carrasco Farre², Joan Enric Ricart¹

¹IESE Business School, Spain, ²Toulouse Business School Barcelona, Spain.

PURPOSE

This research aims to explore the potential of cities to leverage innovation ecosystems to address pressing challenges. We examined successful cases of cities that have created such ecosystems and identified the key elements that have been instrumental in their success. Additionally, we investigate the challenges that cities face in setting up and managing such ecosystems and identify strategies that could be adopted to overcome these challenges. The research will provide valuable insights into how cities can strategically foster innovation ecosystems to address major challenges in the city.

DESIGN / METHODOLOGY / APPROACH

To address our research question, we apply a mixed-method approach. First, we collect financial data from a representative sample of European cities which are well-recognized innovative urban areas: Barcelona (Spain), Cologne (Germany), Helsinki (Finland), and Stockholm (Sweden). We use this data to populate a matrix with two variables: Complexity and Knowledge. This matrix is useful to analyze how cities are evolving towards building ecosystems as a form of public-private collaboration to tackle major challenges. We complement our quantitative analysis with field research, including interviews with city managers. With this, we provide an in-depth analysis of the context, inception, design, process, and governance structure of different public-private innovation ecosystems for solving sustainability challenges.

FINDINGS OR EXPECTED OUTCOMES

Research findings indicate that cities have utilized various stakeholders to design and develop strategies for programs. A framework has been formulated to illustrate how cities have developed strategies for programs and the patterns in idea development have been identified. Additionally, factors that have propelled cities to establish an innovation ecosystem, which facilitates the achievement of cities' goals, have been discussed. Citizens' involvement was found to be a key factor in strategy development for programs.

ORIGINALITY / VALUE

Our paper makes several contributions. First, we expand the literature on urban sustainability and digital transformation by analyzing how public-private innovative ecosystems need to be orchestrated. Our paper is one of the first to empirically evaluate the different phases and structures of this type of ecosystems. We explicitly incorporate the role of the city administration as orchestrator, bridging the literatures of public-private collaborations, digital transformation, and sustainability. Our work also advances the literature on relational stakeholder theory (Bridoux and Stoelhorst, 2016; Carrasco et al., 2022; Freeman, 2010; Jones et al., 2018; Ricart et al., 2021).

PRACTICAL / SOCIAL IMPLICATIONS

This research has implications for both practitioners and academics. For practitioners, it suggests the importance of relational stakeholder management for successful ecosystem orchestration, providing evidence of the problems and solutions observed in public-private innovative ecosystems. On the academic side, it demonstrates the need for further research on the topic, as well as the potential of relational stakeholder management for innovation and sustainability.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This research had a limited focus on Spain, Germany, Sweden, and Finland, and did not investigate how cities implemented programs and the challenges raised during the implantation process. Future studies should investigate the challenges of program implementation in cities in order to gain a more comprehensive understanding of the process and the relationships between different stakeholders.

KEYWORDS (3-5)

Innovation ecosystem, sustainability, smart cities

REFERENCES

- Bridoux, F., & Stoelhorst, J. W. (2016). Stakeholder Relationships and Social Welfare: A Behavioral Theory of Contributions to Joint Value Creation. *Academy of Management Review*, 41(2), 229–251. <https://doi.org/10.5465/amr.2013.0475>
- Carrasco-Farré, C., Snihur, Y., Berrone, P., & Ricart, J. E. (2022). The stakeholder value proposition of digital platforms in an urban ecosystem. *Research Policy*, 51(4), 104488. <https://doi.org/10.1016/j.respol.2022.104488>
- Jones, A., Pierce, M., Sutton, M., Mason, T., & Millar, T. (2018). Does paying service providers by results improve recovery outcomes for drug misusers in treatment in England? *Addiction*, 113(2), 279–286. <https://doi.org/10.1111/add.13960>
- Parmar, B. L., Freeman, R. E., Harrison, J. S., Wicks, A. C., Purnell, L., & de Colle, S. (2010). Stakeholder Theory: The State of the Art. *The Academy of Management Annals*, 4(1), 403–445. <https://doi.org/10.1080/19416520.2010.495581>
- Ricart, J. E., Snihur, Y., Carrasco-Farre, C., & Berrone, P. (2020). Grassroots Resistance to Digital Platforms and Relational Business Model Design to Overcome It: A Conceptual Framework. *Strategy Science*, 5(3), 271–291. <https://doi.org/10.1287/stsc.2020.0104>

2.4 How can cooperation in innovation ecosystems reverse negative trends in rural areas?

Øyvind Heimset Larsen¹, Jon Gunnar Nesse¹, Ingjerd Skogseid¹

¹Vestlandsforskning, Norway.

PURPOSE

Describe and analyze how rural areas with problems can create networks (innovation ecosystems; Moore, 1999) to enable change from negative to positive development.

DESIGN / METHODOLOGY / APPROACH

Interviews with informants in 18 networks in six countries. The data are from the Interreg project P-IRIS (2023), Policies to Improve Rural areas' Innovation Systems by professionalising networking activities and use of innovation tools, with partners from Croatia, Finland, Italy, Norway, Slovenia, and Spain. The networks are well documented through case descriptions. The case descriptions are analyzed to find progresses and challenges regarding the following network functions (Bergek et al., 2008; Larsen et al., 2021): Benefits for members and the local community, innovation and entrepreneurship, legitimacy (Aldrich & Ruef, 2006), institutional capacity (Healey et al., 1999), and sustainability. The overall objective of P-IRIS is to improve policies related to 3H / 4H cooperation in rural innovation systems, thus improving the public sector's role (Larsen et al., 2018).

FINDINGS OR EXPECTED OUTCOMES

- Show how cooperation in networks have had positive effects on benefits (for members and society), innovations, legitimacy building, institutional capacity, and sustainability.
- Show challenges and possible setbacks in addition to positive effects.
- Show that even incomplete TH-networks may have positive development.
- Show how incomplete TH-networks may change to more complete TH-networks.

ORIGINALITY / VALUE

International study of bottom-up establishment and performances of rural and incomplete TH-networks.

PRACTICAL / SOCIAL IMPLICATIONS

Other regions without, or with incomplete, TH-networks can learn from progresses and challenges in these 18 cases.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The study is limited to 18 cases in six countries in a relative short time (plus-minus 15 years). Therefore we suggest: Follow-up studies of the 18 cases to see development over a longer time period, and similar studies in other countries.

KEYWORDS (3-5)

Innovation ecosystems, network functions, rural development, cooperation.

REFERENCES

- Aldrich, H.E. & Ruef, M. (2006). *Organizations Evolving*. Sage Publications.
- Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S. & Rickne, A. (2008). Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. *Research Policy*, 37(3), 407-429.
- Healey, P., Magalhaes, C. d. & Madanipour, A. (1999). Institutional capacity-building, urban planning and urban regeneration projects. *FUTURA (Journal of the Finnish Society for Futures Studies)*, 3, 117-137.
- Larsen, Ø.H, Nesse, J.G, & Rubach S. (2018) The Public Sector's Role in Norwegian Network Cooperation: Triple Helix or Laissez faire? *Triple Helix, A Journal of University-Industry-Government Innovation and Entrepreneurship*, SpringerOpen (<https://rdcu.be/011IR>)
- Larsen, Ø. H., Nesse, J. G. & Skogseid, I. (2021). «Niliv»: Innovasjonsøkosystem for stadutvikling. – *Lærdomar frå åtte nettverk*. I L. Longvanes et al. (Red.), *Stadutvikling: Fjordantologien 2021* (s. 122143). Universitetsforlaget. (<https://www.idunn.no/doi/10.18261/9788215053349-2021-07>)
- Moore, J. F. (1993). *Predators and prey: A new ecology of competition*. *Harvard Business Review*, 71(3), 75-86.
- P-IRIS. (2023). Project summary. <https://projects2014-2020.interregeurope.eu/p-iris/>

2.5 Striking the right balance between top-down and bottom-up directionality in post-pandemic regional development strategies in the EU

Dimitri Corpakis¹

¹Former European Commission; Friends of Smart Specialisation, Belgium.

PURPOSE

As the acute phase of the pandemic receded, EU governments introduced programmatic actions that gave emphasis on innovation for jobs and growth. A good example of this trend is the Recovery and Resilience Facility (RRF) of the European Union, introduced in late 2020 as the main funding mechanism of the initiative NextGenerationEU which is the EU's main instrument addressing the aftermath of the pandemic. Although not a rule, most governments identified rather classic tools for promoting jobs and growth, like actions to support regional innovation clusters, and initiatives for succeeding the green and digital transitions. As time for planning and submitting proposals for colossal budgets was relatively short, most governments followed a rather top-down hasty approach that was inevitably even-handed and did not take properly into account the principle of place-based innovation. Moreover, the effort for a renewed industrial policy was heavily influenced by the new realities of the pandemic and was oriented to particular sectors, considered important for Europe's new flagship concept of Open Strategic Autonomy (OSA). These sectors were identified through extensive analytical work by the European Commission and were given a particular impetus through the National Plans for the RRF.

However what is less clear is the correspondence between these choices and the National and Regional Operational Programmes, already largely in place in the EU when the pandemic hit (2021-27). These programmes had to observe compliance with national or regional smart specialisation strategies, which were conceived and actually in place on pandemic's arrival. Although the RRF consisted of new money, the actions on the ground could not and should not be modified substantially in terms of planning strategic objectives, since these were identified through a bottom-up process (the Entrepreneurial Discovery Process) combined of course with top-down regional objectives. This presents regional development policy makers and managers with a new problem: to which extent they should now align to a new reality (green and digital transitions, quest for the OSA, introduction of new top-down designed large projects) while at the same time, complying with the Smart Specialisation Strategies to which they were already a part?

DESIGN / METHODOLOGY / APPROACH

This paper will examine the question of embeddedness of existing smart specialisation strategies within the National Plans for the RRF by identifying relevant criteria, enablers and barriers as well as pinpointing opportunities for a better integration. It will also try to assess the flexibility of existing regional strategies to adapt to new demands and generate innovation, through relatedness and connectivity. In methodological terms, we will compare the key criteria and templates for the RRFs (National Recovery and Resilience Plans) with those found in the Strategic Partnerships and Operational Programmes of the European Structural and Investment Funds (ESIF). Where appropriate we will identify common areas and approaches as well diverging aspects and issues that create possible grey zones. We will then highlight possible attitudes and strategies that carry risks of conflictual or unproductive behaviour in terms of prioritisation of investment. In doing so, we will try to define an optimal path between top-down and bottom-up strategies, that promises to make the most of the European, national and regional investments towards growth and jobs.

FINDINGS OR EXPECTED OUTCOMES

The paper will identify a methodological framework that may be useful in attempting comparisons of frequent top-down European or National strategies for regional development with place-based bottom-up planning initiatives that adopt largely similar or complementary objectives but do not necessarily follow similar approaches neither at the planning or the implementation phases. It is a frequent issue in significant strategic programmes introduced by large international financial institutions that are then confronted with the important issue of implementation on the ground. Such a methodological framework

may be able to identify some key enablers or key barriers for the process that would help shape better similar future initiatives. Crafting this methodology would require a more focused view on the roles of the players of the Quadruple Helix and their interdependencies and interactions, in an evolving institutional and geopolitical environment.

ORIGINALITY / VALUE

To the best of our knowledge this will be an original paper with added value for its stakeholders.

PRACTICAL / SOCIAL IMPLICATIONS

Undertaking this research we aspire to offer a set of better planning tools to local planners that are often confronted with difficulties when translating an overall top-down scheme to a successful local initiative.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This would be only a first attempt to uncover a complex issue that demands additional time and resources to be properly treated. However a first set of useful conclusions may be available already by the time of the Barcelona conference.

KEYWORDS (3-5)

Strategic planning, Quadruple Helix, Top-down strategies, entrepreneurial discovery process, smart specialisation.

REFERENCES

- Recovery and Resilience Facility: The Recovery and Resilience Facility is the key instrument at the heart of NextGenerationEU to help the EU emerge stronger and more resilient from the current crisis.* https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility_en
- Watzka, Sebastian; Watt, Andrew (2020) : *The macroeconomic effects of the EU recovery and resilience facility: A preliminary assessment*, IMK Policy Brief, No. 98, Hans-Böckler-Stiftung, Institut für Makroökonomie und Konjunkturforschung (IMK), Düsseldorf
- Sonja Bekker: *The EU's Recovery and Resilience Facility: A Next Phase in EU Socioeconomic Governance? Politics and Governance* (ISSN: 2183-2463) 2021, Volume 9, Issue 3, Pages 175-185 <https://doi.org/10.17645/pag.v9i3.4290>
- Emiel Afman & Steven Engels & Sven Langedijk & Philipp Pfeiffer & Jan in 't Veld, 2021. "An overview of the economics of the Recovery and Resilience Facility," *Quarterly Report on the Euro Area (QREA)*, Directorate General Economic and Financial Affairs (DG ECFIN), European Commission, vol. 20(3), pages 7-16
- Corti, Francesco & Gros, Daniel & Ruiz de la Ossa, Tomás & Liscai, Alessandro & Kiss-Gálfalvi, Tamás & Gstrein, David & Herold, Elena & Dolls, Mathias, 2022. "The Recovery and Resilience Facility: A springboard for a renaissance of public investments in Europe?" *CEPS Papers 34969*, Centre for European Policy Studies
- L Guttenberg, T Nguyen, *How to spend it right-A more democratic governance for the EU Recovery and Resilience Facility* <https://opus4.kobv.de/opus4-hsog/frontdoor/index/index/docId/3559>
- Vanhercke, Bart and Verdun, Amy C., *From the European Semester to the Recovery and Resilience Facility: Some Social Actors are (not) Resurfacing* (January 20, 2022). *ETUI Research Paper - Working Paper 2021.13*, Available at SSRN: <https://ssrn.com/abstract=4013325> or <http://dx.doi.org/10.2139/ssrn.4013325>.

2.6 The Triple Helix Model for Innovation – A companies' perspective

Natália Figueiredo¹, Cristina Fernandes¹

¹Instituto Politécnico de Viseu, Universidade da Beira Interior, Portugal.

PURPOSE

The pressure felt and experienced by companies in an increasingly global competitive market forces them to be holders of innovation (Rubens, Spigarelli, Cavicchi, & Rinaldi, 2017). In this sense, companies are concerned about innovation (Fernández-López, Calvo, & Rodeiro-Pazos, 2019). The cooperation that companies can establish with universities is crucial as they allow the acquisition of complementary knowledge or capabilities and innovation (Un & Rodríguez, 2018). However, cooperation between industry and university (U-I) is in the interest of governments as it also allows for countries' development. Thus, they must encourage such collaboration through public funds (Aiello, Cardamone, & Pupo, 2019). The indicator that examines cooperation between university-industry-government (U-I-G) is Triple Helix (TH) (Etzkowitz & Leydesdorff, 2000; Park & Leydesdorff, 2010). This research analyzes the influence of government support (local/regional, national, and European) on companies' cooperation with Triple Helix (TH) agents, i.e., other firms, universities, or governments. The analysis incorporates agents from the same country and another European country.

DESIGN / METHODOLOGY / APPROACH

This research uses the Community Innovation Survey database – CIS 2016. It used data from 14 European Union (EU) countries and 97463 observations. The method uses logistic regression.

FINDINGS OR EXPECTED OUTCOMES

The role played by the government, namely through its public funds, is essential for the companies' process cooperation. Thus, the research demonstrates that all public funds positively influence the cooperation process between companies and TH agents of the same country or another EU country. However, not all have the same degree of influence. Central government funds are the ones that most influence companies' cooperation with TH agents from the same country or with companies from another EU country. The European funds have more influence in developing cooperation with universities or governments of another EU country.

ORIGINALITY / VALUE

This study attempts to understand better the relationship between companies, universities, and governments based on the TH model. It provides substantial theoretical contributions on the subject, providing more information about the importance of public funds in the cooperation that companies established with TH agents. This research compares cooperation with agents from the same country and from other EU countries, based on 14 EU.

PRACTICAL / SOCIAL IMPLICATIONS

This study confirmed the importance of obtaining public funds for establishing cooperation, whether it be companies, universities, or the government. It would be necessary for companies to become aware of the need to increase their cooperation network to achieve innovation. Thus, companies must adopt policies and strategies that promote cooperation and collaboration for innovation, eventually taking advantage of the public resources available for this purpose. They must increase cooperation with universities and research centers and develop long-term partnerships as far as possible. On the other hand, the organization leaders must be aware of the funds available from the government. Instead, leaders should see these funds as an opportunity to increase their knowledge and improve their performance.

To develop U-I cooperation, HEIs could take initiatives in this direction. So, HEIs must develop proactive measures that allow the development of society and the economy, disseminate knowledge, and use their third mission. The current pandemic further reinforces the need for HEIs to interact and cooperate with companies.

Cooperation is fundamental for companies and countries, allowing for innovation and development. Thus, the importance of cooperation with HEIs has increased, as has the role of the government. Therefore, the government must develop and promote its public funds. Central

and even local governments must facilitate cooperation between companies and HEIs to enable growth in R&D and innovation. Thus, differentiated initiatives should be developed and offered according to each country and company's specific needs and strategies.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

An important aspect is that the survey included only the countries that participated in the CIS data. On the other hand, the data used refers to the year 2014. The lack of access to some variables is another limitation of the CIS questionnaire. The study has an aggregated analysis of the data. Future studies may consider the breakdown of each country because different countries have different policies as well. Thus, developing specific approaches to consider each context is essential to promote TH agents' cooperation. Future research would be essential to analyze the importance of public funds in different activity sectors. A suggested analysis could be a division between technological and non-technological sectors.

KEYWORDS (3-5)

University-Industry Cooperation, Triple Helix, CIS, Public funding.

REFERENCES

- Aiello, F., Cardamone, P., & Pupo, V. (2019). New evidence on the firm-university linkages in Europe. The role of meritocratic management practices. *International Review of Applied Economics*, 33(6), 813–828. <https://doi.org/10.1080/02692171.2019.1608917>
- 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(2), 109–123. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)
- Fernández-López, S., Calvo, N., & Rodeiro-Pazos, D. (2019). The funnel model of firms' R&D cooperation with universities. *Science and Public Policy*, 46(1), 45–54. <https://doi.org/10.1093/scipol/scy036>
- Park, H. W., & Leydesdorff, L. (2010). Longitudinal trends in networks of university-industry-government relations in South Korea: The role of programmatic incentives. *Research Policy*, 39(5), 640–649. <https://doi.org/10.1016/j.respol.2010.02.009>
- Rubens, A., Spigarelli, F., Cavicchi, A., & Rinaldi, C. (2017). Universities' third mission and the entrepreneurial university and the challenges they bring to higher education institutions. *Journal of Enterprising Communities: People and Places in the Global Economy*.
- Un, C. A., & Rodríguez, A. (2018). Local and Global Knowledge Complementarity: R&D Collaborations and Innovation of Foreign and Domestic Firms. *Journal of International Management*, 24(2), 137–152. <https://doi.org/10.1016/j.intman.2017.09.001>

2.7 Strategic Partnerships for Innovation: UFV Case

Luciana Ramos Soares¹, Daniela Leocádio Silva¹, Jucelia Maria Lopes Maia Roberto¹, Adriana Ferreira de Faria¹

¹TecnoPARQ - Technological Park of Vicosa, Brazil.

PURPOSE

The objective of this article is to present the contributions of the Innovation Link program of tecnoPARQ/UFV, which promotes university-business interaction in favor of technological innovation.

DESIGN / METHODOLOGY / APPROACH

The present work is a bibliographical and documentary research in which data and information will be collected through access to secondary sources. Document analysis, also called documentary research, involves investigating internal documents, from the organization, or external, governmental, non-governmental organizations or research institutions, among others, being a technique used both in quantitative and qualitative research (ZANELLA, 2013).

FINDINGS OR EXPECTED OUTCOMES

Since 2020, innovation meetings have contributed to the establishment of qualified connections that generate internal and external partnerships, redirection of research and technologies, among other results that continue to this day. Table 1. below lists some of its indicators.

Number of innovation meetings held	Number of researchers involved	Number of Projects presented	Number of Projects selected by the companies for negotiation of the partnership	Resources in partnership contracts signed to date
20	130	125	39	BRL 1.5 million

Table 1. Own Source. Innovation meeting indicators ref. 2020 to 2022.

With the results of this work, it is hoped that more researchers will develop research projects oriented to the needs of the market, and that companies will increasingly seek universities to solve the problems faced in an innovative way. In addition, that more universities incorporate, together with the teaching, research, and extension pillar, the Innovation axis and, finally, that the Innovation Link Program consolidates itself as an instrument that enhances the interaction between the UFV and the market, acting as a facilitating agent of this process.

ORIGINALITY / VALUE

The Innovation Link Program, is a tecnoPARQ/UFV program that was inspired by the practice of the best universities in the world, presents itself as a Liaison Office, whose function is to manage the interface between the academy and external institutions, being a centralizer of services. This was conceived by tecnoPARQ in partnership with players in the innovation ecosystem. The differential of this program is that it is operated in partnership with the Nucleus of Technological Innovation of the UFV (NIT), responsible for managing intellectual property, as well as for guiding the academic community on issues involving secrecy and intellectual property, contracts for the transfer of technology and licensing. In addition to the UFV Pro-Rector for Research and Graduate Studies, which outlines and promotes policies and actions for excellence in research and graduate studies, and the Pro-Rector for Culture and Extension (PEC), a body that coordinates and encourages extension activities and UFV culture.

PRACTICAL / SOCIAL IMPLICATIONS

Through innovation meetings, public-private partnerships are established that make it possible for the knowledge generated within the scope of the Federal University of Viçosa to reach the market in the form of innovative products, services and processes that may enable improvements in people's quality of life, as well as generate quality jobs and income, thus contributing to socioeconomic development.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Despite being a subject of extreme relevance for the area of innovation and consequently for the technological development of the country, there are still few recent works on the subject.

KEYWORDS (3-5)

Innovation, triple helix, technology parks, Innovation link.

REFERENCES

- ALBAHARI, A. et al. Technology Parks versus Science Parks: Does the University make the difference? MPRA Paper. Anais.2013.
- ETZKOWITZ, H. ZHOU, C. Regional Innovation Initiator: The Entrepreneurial University in Various Triple Helix Models. Theme paper (Chinese version) for the VI Singapore Triple Helix Conference, May 16-18, 2007. Available at: <<http://www.triplehelix6.com>>. Accessed on: 01/24/23.
- GRANSTRAND, O., & HOLGERSSON, M. (2020). Innovation ecosystems: A conceptual review and a new definition. *Technovation*, 90, 102098.
- ZANELLA, Liane Carli Hermes. Research Methodology. 2013. Available at: http://arquivos.eadadm.ufsc.br/EaDADM/UAB_2014_2/Modulo_1/ Metodologia/material_didatico/Livro Metodologia da Pesquisa.pdf. Accessed: 20 January. 2023.

2.8 University spin-offs' founding teams and early networks: a longitudinal study on growth, market introduction and upscaling in contrasting Triple Helix ecosystems

Van Geenhuizen Marina¹

¹Faculty of Technology, Policy and Management, Delft University of Technology, The Netherlands.

PURPOSE

To better understand university spin-offs' growth, market introduction and scaling-up through founding team diversity and early (Triple Helix) networks.

DESIGN / METHODOLOGY / APPROACH

The approach is longitudinal (retrospective), altogether covering max. 20 years of spin-offs' life time, in a quantitative modelling approach (sample of 100 spin-offs) and in an in-depth case study approach (13 spin-offs).

FINDINGS OR EXPECTED OUTCOMES

The preliminary findings are the following:

- Founding team diversity tends to be modest at start of spin-offs, with a negative relationship with growth for teams' experience and education. However, there is a positive relationship with growth for domestic networks and international networks.
- By broadening the perspective, in particular with innovation (radicalness) and use of venture capital, but also risk-reducing strategies, several 'preliminary' life-trajectories are identified, e.g. (1) a start with small diversity in teams and networks while taking large financial risks in innovation, often ending with firm bankruptcy; (2) adoption of balancing teams and networks (co-creation at university), related diversification providing self-investment, often facilitating market introduction and scaling-up; (3) a less critical role of teams/network diversity, like in services, including smaller risks.
- Metropolitan character of Triple Helix ecosystems does not directly matter, but it matters through higher density of market-related networks in metropolitan ecosystems compared to 'thin' Triple Helix ecosystems.
- In 'thin' regions founding teams tend to act differently, with specific types of 'workplace-learning' that compensate short in local networks. Further, independent from type of urban ecosystem, it seems that the local university provides rich opportunities for networking, like in co-creation.
- The following age-related events in USOs life could be identified. In radical product innovation and co-creation (often with university) and also in advanced services, USOs' market-introduction is often very quick (age 1 or 2). In contrast, in radical product innovation with persistently weak teams/networks, but large venture capital investment without risk-reducing strategies, market introduction is often not reached due to bankruptcy, often at age 7 or 8; the same age of bankruptcy holds for more incremental innovation and upscaling of production, while USOs still suffer from persistently weak teams. Finally, acquisition of USOs happens at different age, most probably at start of upscaling (age 5 or 6) and after several years of upscaling (age of 15).

ORIGINALITY / VALUE

High level of originality (longitudinal character with age-related events, and attention for role of Triple Helix ecosystem networking).

PRACTICAL / SOCIAL IMPLICATIONS

The results inform policy-making by specific actors as follows:

- Incubator (accelerator) organizations and technology transfer organizations (TTOs): more attention needs to be given to rational formation of founding teams thereby preventing low diversity or too much diversity. Also, coincidence of weak teams (and networks) and substantial R&D investment needs to be avoided. One solution to be advised if low team diversity, is a timely shift to co-creation and external support. Other risk-reducing solutions are to add related services to R&D activity, or to postpone starting a USO until the invention is more mature.
- Local/regional policymakers and incubator organizations in non-metropolitan Triple Helix ecosystems: market-related networks (facilities) are often missing here. Technology specialization, however, could support in reaching quality levels of co-creation and other

networks. This means to stimulate specialization at local universities, e.g. by drawing on localized energy resources, like windy ridges, rugged shorelines and vast woodlands, and local testing opportunities as well as specific local skills, like in fine-mechanics and advanced metal work. Specialized activity in remote places is preferably also connected with metropolitan platforms to benefit from market-related knowledge.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The study has some limitations (challenges) that offer avenues for future research:

- Our measurement of diversity is simple and straightforward, but could be more refined, e.g. by assigning additional weights to specific differences causing fragmentation in teams, and absence of key technology players in networks. Similarly, non-linearity in influences on performance deserves more attention.
- The quantitative modelling could be more advanced drawing on a more complex research design and a larger longitudinal sample, like in using structural equation modelling in which aside from market introduction also upscaling and survival are involved, and aside from type of innovation and concomitant investment strategy, also diversification and co-creation are included as strategies.
- Specific attention is needed to critical advantages and limits of co-creation for USOs in radical innovation and to required capabilities in USOs' learning and management (Scaringella et al. 2017). Several issues need to be solved, like selection of customers if radical innovation; appropriation issues concerning intellectual ownership; specific management of relationships due to asymmetries with more powerful co-creators; and management of USOs' own learning and absorption concerned.

KEYWORDS (3-5)

University spin-offs; founding team diversity; Triple Helix ecosystems; risk-taking; longitudinal approach.

REFERENCES

- Mathisen, M.T. and Rasmussen E. (2019). The development, growth, and performance of university spin-offs: a critical review. *The Journal of Technology Transfer*, 44, 1891-1938.
- Moog, P., Soost, C. (2022). Does team diversity really matter? The connection between networks, access to financial resources, and performance in the context of university spin-offs. *Small Business Economics* 58, 323-351.
- Scaringella, L., Miles, R., E., Truong, Y. (2017). Customers involvement and firms absorptive capacity in radical innovation: The case of technology spin-offs. *Technological Forecasting and Social Change*, 120, 144 – 162.
- Soetanto, D., Van Geenhuizen, M. (2015). Getting the right balance: University networks' influence on spin-offs' attraction of funding for innovation. *Technovation* 36/37, 26–38.
- Tagliacuzzi, G., Marchi, G., Balboni, B. (2021). A nonlinear relationship between the team composition and performance in university spin-offs. *Technological Forecasting and Social Change*, 172, 121061.
- Taheri, M., Van Geenhuizen, M. (2019). Knowledge relationships of university spin-off firms: contrasting dynamics in global reach. *Technological Forecasting and Social Change*, 144, 193-204.

2.9 A comparative analysis of the development of oil capitals in Brazil and Norway from the perspective of the Triple Helix

Carlos Eduardo Lopes da Silva¹

¹Federal University of Rio de Janeiro, Brazil.

PURPOSE

Oil is the largest source of energy in the world and producing regions experience different prospects for economic development depending on their strategies and public policies. These determine the rules for exploration, production and distribution of oil and its derivatives, as well as investment for technological development and the production chain, as well as social and environmental policies in the region of influence of this activity. From the perspective of the Triple Helix model (ETZKOWITZ and LEYDESDORFF, 2000), this article aims to establish a comparative analysis of the cities of Macaé, in the state of Rio de Janeiro - Brazil, and Stavanger, located in western Norway in the region of Rogaland, known as the "capitals of oil" in their respective countries. The comparative study between Stavanger and Macaé aims to analyze the historical trajectory of these cities with an emphasis on development from the discovery of oil. In this way, it seeks to highlight the main points of convergence and divergence from the perspective of the Triple Helix, in public policies and in the role of government, universities and companies for economic development and sustainability.

DESIGN / METHODOLOGY / APPROACH

This study is part of a research that aims to evaluate the dilemma of "oil capitals" from the point of view of diversifying the economy based on the principles of sustainability. The choice of Macaé and Stavanger cases is due to the fact that both have similar economic vocations, playing an important role for the oil industry in Brazil and Norway, respectively, in addition to having a series of other similarities that will be the object of analysis in this article, such as the time when oil was discovered and the economic and social background of the regions. The research is structured in two stages. The first with Multiple Case Study (YIN, 2014) on Macaé and Stavanger, carried out from the analysis of secondary data - considering research in scientific articles and technical publications - and interviews with representatives of government, industry and university actors. The second stage establishes a comparison between the cities in terms of geographic, social, economic and environmental indicators. Then, a cross-case analysis is carried out using a qualitative approach from the perspective of the development of the triple helix actors.

FINDINGS OR EXPECTED OUTCOMES

The convergences and divergences in the development model of these cities are analyzed in terms of geographic, economic, social and environmental indicators and by a qualitative analysis of the role played by the actors of the triple helix. As a result, a timeline was built, as well as comparative tables and, subsequently, the characteristics that reinforce the opportunities for protocols such as "sister cities", as well as proposals for the development of synergies and learning were analyzed. It is observed that there is a lot of connection between the challenges that the institutions of the two cities (Stavanger and Macaé) are solving. Despite the focus shifting from oil to a broader spectrum of energy sources and other technologies, in both cities the oil industry makes an important contribution to inducing investment in innovation.

ORIGINALITY / VALUE

The present study is a pioneer in comparing, based on the Norwegian and Brazilian experiences, the challenges and opportunities for a city to evolve from an economy based on oil and gas exploration, to an economy focused on energy and sustainability, with high capacity technological development, business creation and social development. In this way, the research is valuable for being able to demonstrate that similar starting situations, originating with the discovery of oil in both countries, unfolded in quite different trajectories and results, as a consequence of the decisions and actions of the actors of the Triple Helix.

PRACTICAL / SOCIAL IMPLICATIONS

By approaching the role played by the actors of the Triple Helix for socioeconomic development through innovation in a society in transformation - as is the case of cities whose economy is based on

oil exploration - the article contributes to the formulation of policies that they aim, in the medium and long term, at the diversification of the economy, contemplating new sources of energy and greater capacity for technological development, for example. The survey results present characteristics that reinforce opportunities for sister city protocols and proposals for developing synergies and learning between cities.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The developments in the 50 years following the discovery of oil in the regions of Stavanger and Macaé show significant differences in the results obtained in terms of socio-environmental development. As future work, a deeper investigation into the role of the University in this process is suggested, based on a diagnosis of the entrepreneurial maturity of the University of Stavanger and the Federal University of Rio de Janeiro in Macaé. In this way, it will be possible to elucidate how such mechanisms (of the entrepreneurial university) were important to create more powerful innovation competencies in Stavanger than in Macaé, helping in the development of policies in this sense. In addition, it would be interesting to analyze the contribution of startups to the development of socio-environmental solutions and to analyze their contribution to the diversification of the regional economy and dependence on oil.

KEYWORDS (3-5)

Oil and Gas, Triple Helix, Regional Development, Macaé, Stavanger.

REFERENCES

ETZKOWITZ, H.; LEYDESDORFF, L. The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy*, v. 29, p. 109-123, 2000. YIN, R.K. (2014), *Case Study Research: Design and Methods*, Sage Publications, Kindle ed., Thousand Oaks, CA.

2.10 Who are the Actors of Quadruple and Quintuple Helix? Multiple Cases in Consolidated Science and Technology Parks

Andréa Aparecida da Costa Mineiro¹, Cleber Carvalho de Castro², Marcelo Gonçalves do Amaral³

¹Federal University of Itajubá (UNIFEI), ²Lavras Federal University (UFLA), ³Triple Helix Research Group Brazil / Fluminense Federal University.

PURPOSE

The objective of this study was to identify if actors' role in Quadruple and Quintuple Helix in consolidated Brazilian Science and Technology Parks aligns with Carayannis and Campbell's (2009) proposition in their seminal paper.

DESIGN / METHODOLOGY / APPROACH

We carried out multiple case studies in three consolidated Science and Technology Parks (STPs). We collected data from primary (interviews and field notes) and secondary sources (documents), and used them for data triangulation. As to data treatment, we used content analysis by frequency and topic.

FINDINGS OR EXPECTED OUTCOMES

The three STPs studied have different ways of defining the Quadruple Helix (QH), but converge in their reports on the Quintuple Helix. All of them can see society concretely, either through associations, collectives or communities, or even through a single identity, such as Pacto Alegre. Distinctions in representing society can result from the maturity of environments, cultural aspects of localities, and their formation history. On the other hand, Quintuple Helix is not seen as an actor, but is noticed in sustainability actions and as a driver, represented by disseminating business impact at Tecnopuc and Porto Digital.

The managers of Tecnopuc and Porto Digital also see the collectives as civil society's representatives. Collectives have a solid role in the mobilization of the ecosystem, with challenges regarding their form of governance, renewal, and engagement, which QH representatives confirmed. These groups, led by young people, assumed roles very similar to those of the association, leading entrepreneurs to question bureaucratic structures and their value. At Porto Digital, the associations got closer to the collectives, joining forces and preventing actors from destroying themselves.

Carayannis and Campbell's (2009) perception can be seen in the collectives and in Pacto Alegre, present at Porto Digital and Tecnopuc. Collectives are a representation of society, comprised by citizens in mutual support, which strengthen each day and foster a cultural revolution supported by digital transformation. In addition, members of the collectives hold different positions in society, which reinforces their representation, showing a more active society. Collectives contribute to the ecosystem by bringing a new view to the processes, raising necessary topics for the ecosystem, besides contributing to a process of digital change that society undergoes. Regarding Pacto Alegre, society is represented by several entities from different spheres, that come together to contribute to the process of transforming the city into a world reference for innovation.

ORIGINALITY / VALUE

This study clarifies QH representation, by identifying actors and ways of strengthening STPs, through the different perceptions of STP managers and helix representatives. In the Quintuple Helix, the study adds on the perception of environmental sustainability as a basis, and focuses on disseminating companies through impact businesses. The role of QH can be drivers for other STPs, and even for those that we studied. Finally, the paper shows an active society, with voice to mobilize public policies and review how STPs operate. Thus, society ceases to be a basis and becomes a strong actor for mobilization and connection. In addition, the study explains that associations cannot represent the Quadruple Helix, since they represent companies that are already part of the Triple Helix.

PRACTICAL / SOCIAL IMPLICATIONS

We only noticed the Quadruple Helix described in that seminal paper in the collectives and in Pacto Alegre, present in two of the STPs examined. The study also shows an active society capable of fostering public policies and reviewing how Science and Technology Parks act, going from a foundation to a strong actor that mobilizes the ecosystem.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Limitations of the study include the lack of approach to new actors' relationships, how STPs are connected to society, characterization of these environments' formation, and how companies see the new actors. To fill this gap, we suggest that future studies seek to understand how the shape of environments can influence the definition of society's representation, what are the primary relationships established by the new helices, besides identifying other forms of sustainability perception.

KEYWORDS (3-5)

Quadruple and Quintuple Helix, Science and Technology Parks, Collectives.

REFERENCES

- Cai, Y., & Etzkowitz, H. (2020). Theorizing the Triple Helix model: Past, present, and future. *Triple Helix*, 1-38. <https://doi.org/10.1163/21971927-bja10003>
- 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(3-4), 201-234. <http://dx.doi.org/10.1504/IJTM.2009.023374>
- Carayannis, E. G., & Campbell, D. F. (2011). Open innovation diplomacy and a 21st-century fractal research, education and innovation (FREIE) ecosystem: Building on the quadruple and quintuple helix innovation concepts and the "Mode 3" knowledge production system. *Journal of the Knowledge Economy*, 2, 327. <https://doi.org/10.1007/s13132-011-0058-3>
- Etzkowitz, H., & Leydesdorff, L. (1995). The Triple Helix—University-Industry-Government relations: A laboratory for knowledge based economic development. *EASST Review*, 14(1), 14–19. <https://ssrn.com/abstract=2480085>
- 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(2), 109-123. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)
- Laguna, N. E., & Durán-Romero, G. (2017). Science parks approaches to address sustainability: A qualitative case study of the science parks in Spain. *International Journal of Social Ecology and Sustainable Development*, 8(3), 38-55. <https://doi.org/10.4018/IJSESD.2017070103>
- Leydesdorff, L. (2000). The triple helix: An evolutionary model of innovations. *Research Policy*, 29(2), 243-255. [https://doi.org/10.1016/S0048-7333\(99\)00063-3](https://doi.org/10.1016/S0048-7333(99)00063-3)
- Mineiro, A. A. C., Souza, T. A., & Castro, C. C. (2018). A operacionalização das Hélices Quádrupla e Quíntupla a partir de uma meta-síntese. In *Proceedings of the 42nd Enanpad Conferência*, Curitiba-PR. http://www.anpad.org.br/abrir_pdf.php?e=MjU2NDI=
- Mineiro, A.A.C., Castro C.C. & Amaral, M. (2019). Quem são Os Atores da Hélice Quádrupla e Quíntupla? Casos Múltiplos em Parques Científicos e Tecnológicos consolidados. In *Anais... XXII Seminários de Administração, SemeAd*, São Paulo-SP.

2.11 Potentialities and limitations for the action of and industries federation in supporting innovation ecosystems in the state of Rio de Janeiro

Thiago Renault¹, Julia Bloomfield Gama Zardo², Marcos André Farias de Oliveira²

¹Federal Rural University of Rio de Janeiro, ²FIRJAN, Brazil.

PURPOSE

This article uses the innovation ecosystems approach to analyze FIRJAN's performance in fostering an innovation environment in the state of Rio de Janeiro. For this, four successful cases were presented, Recife and Santa Catarina in Brazil, Aveiro in Portugal and Tel Aviv in Israel. Each of the success stories highlights one of the components of its innovation ecosystem.

DESIGN / METHODOLOGY / APPROACH

Case study.

FINDINGS OR EXPECTED OUTCOMES

The analysis carried out shows that Rio de Janeiro has a very heterogeneous socioeconomic environment, which demands sectoral and customized policies. Although FIRJAN operates in all components of the innovation ecosystem in the State of Rio de Janeiro, there is room for customization and sectorization of its activities.

ORIGINALITY / VALUE

The article analyzes the strengths and limitations of a specific case based on four successful experiences in building innovation ecosystems.

PRACTICAL / SOCIAL IMPLICATIONS

The article brings insights for the elaboration and implementation of public policies.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The research can be expanded to a comparative study on the role of industry federations in supporting the construction of innovation ecosystems in different contexts.

KEYWORDS (3-5)

Innovation Ecosystems; Entrepreneurship; Public Policy; Federation of Industries.

REFERENCES

Clark et al (2016) "Building the Innovation Economy | Case study: Tel Aviv" Disponível em <https://1bl5hbukq5a2dpgyuo8uvz44-wpengine.netdna-ssl.com/wp-content/uploads/2016/10/Tel-Aviv-Case-Study.pdf> acessado em 26/11/2022.

Gomes, L.A.V., et al., Unpacking the innovation ecosystem construct: Evolution, gaps and trends, *Technol. Forecast. Soc. Change* (2016), <http://dx.doi.org/10.1016/j.techfore.2016.11.009>

Breschi, Stefano, Malerba, Franco, 1997. Sectoral innovation systems: technological regimes, Schumpeterian dynamics, and spatial boundaries. In: Edquist, Charles (Ed.), *Systems of Innovation: Technologies, Institutions and Organizations*. Routledge, pp. 130–156.

Nelson, Richard R., Rosenberg, Nathan, 1993. Technical innovation and national systems. In: Nelson, Richard R. (Ed.), *National Innovation Systems: A Comparative Analysis*. Oxford University Press, New York.

Lundvall, Bengt-Åke (Ed.), 1992. *National Systems of Innovation: towards a Theory of Innovation and Interactive Learning*. Pinter Publishers, London.

Cooke, P., Gomez Uranga, M., & Etxebarria, G. (1997). Regional innovation systems: Institutional and organisational dimensions. *Research Policy*, 26(4-5), 475–491. doi:10.1016/s0048-7333(97)00025-5

Cooke, P. (2001). Regional Innovation Systems, Clusters, and the Knowledge Economy. *Industrial and Corporate Change*, 10(4), 945–974. doi:10.1093/icc/10.4.945

Edquist, C. (1997). "Systems of Innovation: Technologies, Institutions and Organizations". Printer, London. Emergence of a Triple Helix of university—industry—government relations. (1996). *Science and Public Policy*. doi:10.1093/spp/23.5.279

Etzkowitz, H.; (2008). "Triple Helix: University, Industry and Government". Routledge, New York, USA.

OCDE (2019) "Initial Scan of the Israeli

Public Sector Innovation System" Disponível em <https://oecd-opsi.org/wp-content/uploads/2020/01/Initial-Scan-of-the-Israeli-public-sector-innovation-system-FINAL.pdf> acessado em 26/11/2022.

ETZKOWITZ, H. (2002). "MIT and the Rise of Entrepreneurial Science". Routledge, London and New York.

Freeman, C. (1987), *Technology policy and economic performance: Lessons from Japan*, London, Pinter Publishers.

Lundvall, B-Å. (ed.) (1992), *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, London: Pinter Publishers.

Malerba, F. (2002). Sectoral systems of innovation and production. *Research Policy*, 31(2), 247–264. doi:10.1016/s0048-7333(01)00139-1

Nelson, R. (1993). "National Innovation Systems: A Comparative Analysis". Oxford University Press.

INSPER (2022) Por que Israel tem um dos melhores ecossistemas de inovação do mundo <https://www.insper.edu.br/noticias/por-que-israel-tem-um-dos-melhores-ecossistemas-de-inovacao-do-mundo/#>

Drori (2013) "Helix model of innovation in Israel: The global scheme and its local application" disponível em <https://www.triplehelixassociation.org/wp-content/uploads/2015/12/The-Helix-Model-of-Innovation-in-Israel.pdf> acessado em 26/11/2022

2.12 Factors interfering in a successful technology transfer process involving digital assets generated by public research institutes

Breno Assunção¹, Cleidson Dias²

¹University of Brasilia(UnB) / Embrapa, ²University of Brasilia (UnB) / Federal University of Goiás (UFG)/ Embrapa, Brazil.

PURPOSE

Identify and summarize literature related factors that influence the Technology Transfer processes of Digital Innovation Assets between Public Research Institutes (PRIs) and private companies. This study aims to conduct descriptive research about the factors that influence a successful TT process for digital assets from PRIs. The identification of these factors will initially take place from a literature review and subsequently through analysis and clustering of these factors into new key factors. In this way, the present study seeks to better understand the context in which the production and knowledge, and development of new businesses involving digital assets are inserted, as well as to analyze the critical success factors for the adoption of these assets through TT.

DESIGN / METHODOLOGY / APPROACH

Systematic Literature review combined with a card sorting technique to cluster similar factors founded on literature (Spencer, 2009). As a result of applying the technique to the 129 factors from the 7 selected studies, 25 factors were identified that can affect the successful TT process involving digital assets, as shown in figure 1 below.

Figure 1 -Result of the card sorting process



Source: Elaborated by the authors

ORIGINALITY / VALUE

In the search for the ideal configuration to drive innovation, different proposals were systematized to explain the forms of organization that produced better results. One of the best known models is the Triple Helix, which was proposed by Etzkowitz and Leydesdorff (2000) and is based on the joint action of 3 relevant actors in the ecosystem: the Government, companies and universities. In this model, the State acts as a promoter and regulator of innovation; the Universities (or PRIs), act in scientific and technological production; and Industry (or companies), act as disseminators of the innovations produced for society (Etzkowitz, 2003). In the knowledge economy, the triple helix model has been

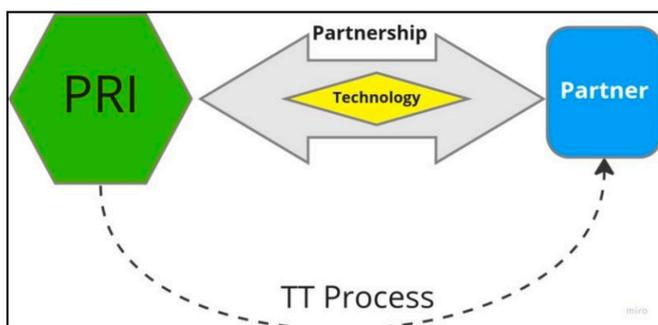
fundamental to explain the generation of innovation and how it has been achieved through the sharing of R&D activities (Pan & Guo, 2022). Due to the relevance that TT brings to society as a whole, it has been widely studied by academia. However, although there are numerous studies on the subject, Bengoa et. al (2021) indicate, from a bibliometric review with 3,200 articles, that more than 81% of authors who have published on the topic of TT have only one publication in the area, which generally indicates that the research field is new and / or has not yet reached sufficient maturity. The subjects studied are varied, but it stands out the studies related to performance,

barriers, enablers, university-industry relationship, commercialization, innovation, entrepreneurship, among others (Bengoa et al., 2021). Allied to this context, as a background, the effects of the recent and growing digitization that we are experiencing has significant reflections in virtually all sectors of society, including the practice of TT. This accelerated digitization promotes new ways of producing and accessing goods and services, also enabling the creation of new forms of relationships between the actors of the innovation ecosystem (Autio et al., 2018).

FINDINGS OR EXPECTED OUTCOMES

Based on this methodology, was found 25 factors that were grouped into 4 components of the proposed model (Public Research Institute, Technology Transferred, Partner and Relationship), a representation of this model is presented in figure 2 below. These factors describe the main aspects that can impact the result of the Technology Transfer process, mainly when the transferred object is a Digital Technology.

Figure 2 - Model of TT process



Source: Elaborated by the authors

PRACTICAL / SOCIAL IMPLICATIONS

This study aims to contribute to a better understanding of the dynamics of TT, in order to help PRIs in conducting the TT processes, considering the eventual specificities that are inherent to this process when the object of TT is a digital solution. Thus, it is expected to contribute to the improvement of the success rate in the TT processes, increasing the adoption of technologies produced by PRIs and eventually expanding the revenues earned through these technologies.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

These findings represent a synthesis of the selected articles and do not intend to exhaust all the works published on the subject. The result will be used to carry out a quantitative research in a public research institute to assess in a real situation if these factors actually interfere in the result of the TT process and to what extent.

KEYWORDS (3-5)

Technology transfer, critical factors, digital innovation, public research institutes, public-private partnerships.

REFERENCES

- Autio, E., Nambisan, S., Thomas, L. D. W., & Wright, M. (2018). Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal*, 12(1), 72–95.
- Bengoa, A., Maseda, A., Iturralde, T., & Aparicio, G. (2021). A bibliometric review of the technology transfer literature. *The Journal of Technology Transfer*, 46(5), 1514–1550.
- 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*.
- Etzkowitz, H. (2003). Innovation in Innovation: The Triple Helix of University-Industry-Government Relations. *Social Sciences Information. Information Sur Les Sciences Sociales*, 42(3), 293–337.

Pan, J., & Guo, J. (2022). Innovative collaboration and acceleration: An integrated framework based on knowledge transfer and triple helix. *Journal of the Knowledge Economy*, 13(4), 3223–3247.

Spencer, D. (2009). *Card Sorting: Designing Usable Categories*. Rosenfeld Media.

2.13 International Triple Helix between Brazil and Sweden: windows of opportunity for industrial policy on smart cities and sustainability

Walter Shima¹, Keiko Fonseca², Ricardo Luders², Ricardo Torres¹, Livia dos Santos¹, Denilson Zych¹, Semida Silveira³

¹4P/UFPR, Brazil. ²UTFPR, Brazil. ³Cornell University, USA.

PURPOSE

This paper discusses an original and successful international Triple Helix (TH) arrangement encompassing different institutions from Brazil and Sweden consolidated in a single (which means deep interaction) project named “Smart city concepts in Curitiba – innovation for sustainable mobility and energy efficiency”. This is an innovative engagement of institutions whose different research carried out addresses important recommendations and ideas for industrial policy and national technological development. It began in 2013, when KTH Royal Institute of Technology (university), the City of Curitiba (government of Paraná State) and institutions including local universities and the Federation of Industries of the State of Paraná (industry) signed a Memorandum of Understanding to develop projects in the areas of mobility, urban planning and environment. This first period lasted from Oct/2014 to Dec/2017. There are others institutions from industry, government and universities involved in addition to those mentioned with different backgrounds¹ (¹<https://www.energy.kth.se/energy-systems/completed-projects/smart-city-concepts-in-curitiba-innovation-forsustainable-mobility-and-energy-efficiency-1.561109>). The main were The Municipality of Curitiba, VOLVO (industry), SAAB Combitech (industry), UTFPR (Federal University of Technology - Paraná), UFPR (Federal University of Parana), Vinnova (Sweden's innovation agency), URBS (Companhia de Urbanização e Saneamento de Curitiba - government) and IPPUC (Instituto de Pesquisa e Planejamento Urbano de Curitiba - government) - see. All of them can be seen at. The target of the project was to explore the deployment of new technologies for improved mobility and energy efficiency in Curitiba. The project aims at sustainable technological solutions for the improvement of urban critical infrastructure. At the end the results were, besides the scientific publications, field tests of new technological solutions for buses and services under real environment operation. Moreover, the consolidation of the open data policy was obtained as a tool to better understand the city problems, to evaluate the efficacy of some public policies in a medium/short term, and to disclose some city challenges (short and long term). The city linked data were not usually open to the public to be addressed from the academy perspective or as opportunities for start-ups or companies. This aspect was a push to the creation of a municipal council of Science, Technology and Innovation¹. solutions for low-carbon transport of passengers and goods in an urban environment. The project includes data mining and analysis, energy and emission balances for various transport solutions and fuel alternatives, as well as the design of scenarios for smart mobility and a platform for digital reality in 3D. The results will contribute new insights and tools to address urban mobility and explore avenues for innovation and infrastructure transformation. The implementation is organized around seven main tasks³. (³<https://www.vinnova.se/en/p/smart-city-concepts-incuritiba---low-carbon-transport-and-mobility-in-a-digital-society/>).

DESIGN / METHODOLOGY / APPROACH

Currently, the second period focuses on “Smart City Concepts in Curitiba - low-carbon transport and mobility in a digital society”. Launched in Dec/2019, it is expected to end in Dec/2023. The project explores smart and sustainable open avenue for national development. The most important point is that policy makers should understand that a plan for national suppliers and open data is central to a smart city.

FINDINGS OR EXPECTED OUTCOMES

The broad perspective of the project is solving challenges of infrastructure for open data integration and information sharing in a smart city. Initially, UTFPR performed a diagnosis of which infrastructure and information-sharing tools are being currently used by the city. The objective was to understand citizen's wishes, to increase citizen's participation, to understand how services are provided, to address channels for feedback, and to provide better service efficiency and performance. Based on that vision industry, KTH and UTFPR (the universities) have carried out different possibilities and academic research: i) monitoring systems capable of identifying and responding

to abnormal behaviour related to public infrastructure: optical network disaster recovery, which needs mechanisms for protecting and restoring services, and resilient communication with performance (especially in latency), even during a catastrophic event; ii) modelling and optimising public transportation systems, a smart system design that makes public transport fast, reliable and easy to use, among others. On the other hand, IPPUC, URBS and the municipality of Curitiba (government) have implemented solutions and their own policies that contributed for discussing alternatives and applied results.

ORIGINALITY / VALUE

It is an original TH arrangement that brings the interaction encompassing different institutions from Brazil and Sweden. In addition, it is an arrangement where cultural differences should be faced and managed. For instance, how solutions should be scaled in countries with very different dimensions, or how to consider the different levels of development in both countries. Different institutions from industry, government and academia from both countries have brought different and fruitful approaches to each other.

PRACTICAL / SOCIAL IMPLICATIONS

This project raised important issues concerning industrial policy on smart cities and sustainability. It is an important planning element of a public policy focused on providing public services founded on the needs surveyed by the population. In addition, it brings the discussion on the national dynamics capabilities to build a high-tech value chain (which means solutions suppliers and manufacturers of high-tech equipment). Considering that the smart city concepts are still a new approach and demand local solutions.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The TH approach requires trust to be built among partners, which usually refers to people beyond institutions. The existence of projects with meaningful goals and deadlines (since 2014 until nowadays) helped the trust building process. However, changes on the municipality management team (officer's retirement, key partners in key sectors, like urban planning and mobility) and/or industry partners posed challenges to the academy team (which usually remains the same). As a long-term cooperation, the key partners should collaborate for a long time, sometimes without formal funding to support the planned tasks but aiming at long term impacts.

KEYWORDS (3-5)

TRIPLE HELIX, KTH, UFPR, UTFPR, SMART CITIES.

REFERENCES

- KTH (2023) Smart city concepts in Curitiba – innovation for sustainable mobility and energy efficiency. Available at: <https://www.energy.kth.se/energy-systems/completed-projects/smart-city-concepts-in-curitiba-innovation-forsustainable-mobility-and-energy-efficiency-1.561109>. Access 11/02/2023.
- VINNOVA (2023) Smart City Concepts in Curitiba - low-carbon transport and mobility in a digital society. Available at: <https://www.vinnova.se/en/p/smart-city-concepts-in-curitiba---low-carbon-transport-and-mobility-in-a-digital-society/>. Access 11/02/2023.
- Ministério da Integração e do Desenvolvimento Regional. Carta Brasileira para Cidades Inteligentes (SD). Available at: <https://www.gov.br/mdr/pt-br/assuntos/desenvolvimento-urbano/carta-brasileira-para-cidadesinteligentes/CartaBrasileiraparaCidadesInteligentes2.pdf>. Access 11/02/2023.
- <https://www.vinnova.se/en/p/smart-city-concepts-in-curitiba---innovation-for-mobility-and-energy-efficiency/> <https://www.vinnova.se/en/p/smart-city-concepts-in-curitiba/> <https://www.vinnova.se/en/p/smart-city-concepts-in-curitiba---low-carbon-transport-and-mobility-in-a-digital-society/>

2.14 Developing Entrepreneurial Universities under the evolution of innovation system and strategy of innovation-driven development, the case of Shenzhen, China

Walter Shima¹, Keiko Fonseca², Ricardo Luders², Ricardo Torres¹, Livia dos Santos¹, Denilson Zych¹, Semida Silveira³

¹UFPR, Brazil. ²UTFPR, Brazil. ³Cornell University, USA.

PURPOSE

As the world economy is increasingly driven by knowledge creation, the innovation system, which aims to achieve development and competitiveness becomes a central goal of most leaders of economies (World Bank, 2019). The innovation system brings together various resources and creates dynamic interactions among entities like government, enterprises, universities, and hybrid institutes. This partnership promotes knowledge creation, diffusion, and transfer, which are crucial for economic growth and competitiveness. In a knowledge-based economy, universities are increasingly involved in third mission activities such as entrepreneurship and innovation. This is accomplished by transferring knowledge and technology to both industries and society at large, thereby contributing to social, economic, and cultural development in the regions where they operate. Currently, more than 200 universities worldwide are recognized for their leadership in innovation, but there is a lack of empirical and comparative studies in different contexts. This study will expound China's emerging regional innovation system and innovation-driven development strategy with a focus on the development of entrepreneurial universities. The research will address the following questions: 1) What are the challenges and opportunities for universities to participate in partnerships for innovation and contribute to social, economic, and sustainable development? 2) How can partnerships and alliances among Triple and Quadruple Helix actors be established to drive innovation and support development? 3) How do the three spheres of innovation interact and characterize the Triple Helix model in a context of a developing economy?"

DESIGN / METHODOLOGY / APPROACH

This study utilizes the Triple, Quadruple, and Quintuple Helix framework to investigate the entrepreneurial environment and activities, focusing on analyzing interactions and partnerships among actors in the Triple Helix model. The research will take place in Shenzhen, a renowned hub of entrepreneurship and innovation known as the "Silicon Valley of China." To answer the research questions, a mixed-methods approach will be employed, combining a literature review with expert semi-structured interviews that include structured surveys and open-ended questions. The literature review will offer a comprehensive understanding of universities that are entrepreneurial and involved in partnerships for development, as well as policy analysis to comprehend the local context of innovation. The expert interviews will provide valuable insights into the practical aspects of developing entrepreneurial universities and Triple Helix partnerships in Shenzhen. The open-ended questions will further explore the interactions and dynamics within the emerging innovation system, along with the strategies and partnerships developed to drive innovation.

FINDINGS OR EXPECTED OUTCOMES

The findings of this study will offer valuable insights for universities, industry, and policymakers in the Shenzhen region. The results will shed light on the pattern of innovation partnerships and describe the entrepreneurial university as a dynamic ecosystem that can mobilize its resources, capabilities, and strengths. For example, a proposed input-process-output-outcome model that encompasses inputs (such as resources from different stakeholders), processes (such as funding selection, research activities, and incubation), and outputs (such as inventions, networks, and innovation centers) could help explain why some entrepreneurial universities are more successful and provide implications for innovation-driven development strategies. Additionally, the study will provide recommendations for overcoming the challenges and making the most of the opportunities for Triple Helix innovation partnerships in the Shenzhen area.

ORIGINALITY / VALUE

By investigating how universities in Shenzhen interact with external (government and industry) and internal stakeholders to create local innovation system, this study systematically explores how universities become more entrepreneurial and how partnership of Triple Helix

actors is forged within a different economic context. Theoretically, the study contributes to empirical case in an eastern developing context and a comparative perspective. The study's findings offer a better understanding of the role of universities in socio-economic transformation by elucidating how universities become entrepreneurial in different contexts. Unpacking novel approaches and practices to orchestrating innovation partnership, this study also underpins implications for science, technology and innovation policies, university practices, and R&D collaborations.

PRACTICAL / SOCIAL IMPLICATIONS

This research will analyze survey data from industrial, university, and government institutions in a representative city of entrepreneurship in China to examine the pattern of the local innovation system and the impact of various Triple Helix actors. It will also analyze the challenges and obstacles encountered by the innovation system. The findings will inform better science and technology innovation policies and offer practical insights into successful multi-collaboration projects. Furthermore, the study will provide implications for university development strategies and approaches to collaboration with external stakeholders by examining the current role, opportunities, and challenges faced by universities.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Future studies could also explore the interplay of entrepreneurship and innovation in emerging industries, such as new technologies like artificial intelligence and biotechnology, and how universities and other stakeholders can support their development. Comparing university strategies for entrepreneurship and local development is another direction. The role of university and societal values in shaping the innovation environment could also be compared. Research-led and teaching-led universities may have different priorities and strategies for innovation and entrepreneurship. This angle can provide strategies for universities at various stages of development. Investigating how successful innovation partnerships and ecosystems can be scaled and replicated in other regions and countries could provide valuable insights for policy makers and practitioners. The sustainability of partnerships and long-term benefits they bring to the local economy and society is another avenue for further research.

KEYWORDS (3-5)

Entrepreneurial University, Innovation-driven development, Triple Helix Model, Hybrid institutions.

REFERENCES

1. Etzkowitz, H & Chunan Zhou (2018) *The Triple Helix: University-Industry-Government Innovation and entrepreneurship* (2nd edition) . Routledge, London and New York.
2. Eric Lehmann Michele Meoli & Stefano Paleari(ed)(2021) *Innovation and Entrepreneurship in the Academia*, Routledge, London.
3. Dirk Merssner., Erkan Erdil. & Joanna Chataway (ed)(2018) *Innovation and the entrepreneurial university*, Routledge, London.
4. EC & OECD (2012). *A Guiding Framework for Entrepreneurial Universities*. European Commission & the Organization for Economic Co-operation and Development.
5. World Bank Group (2020). *Promoting Innovation in China: Lessons from International Good Practice*. Finance, Competitiveness, and Innovation Insight. World Bank, Washington, DC.
6. Rainer, K., Wolfgang, D., Erkki, K. (2022). *How to make an entrepreneurial state, Why Innovation Needs Bureaucracy*, New Haven: Yale university press.

03

ENTREPRENEURIAL AND ENGAGE UNIVERSITIES FOR
SOCIAL, ECONOMIC AND SUSTAINABLE DEVELOPMENT

3.1 Towards Entrepreneurial Universities: Regional Research-Educational Centers in Russian Context

Irina Dezhina¹

¹Gaidar Institute for Economic Policy, Russia.

PURPOSE

Towards Entrepreneurial Universities: Regional Research-Educational Centers in Russian Context.

DESIGN / METHODOLOGY / APPROACH

Design: analysis of RECs in historical context of post-Soviet development; evaluation of the first results of RECs activities

Methodology: triple helix concept of interaction of government, academia and industry with a focus on regional development; regional innovation systems approach

Approach: analysis of secondary sources and official statistical data; analysis of legal documents related to RECs and technological sovereignty.

FINDINGS OR EXPECTED OUTCOMES

The paper analyzes Russia's government, academia, and business interactions under a new format of Research-Educational Centers of the World Level (RECs). REC is a relatively new organizational form aimed at facilitating cooperation among the key actors of the Triple Helix. The goal of RECs is three-fold:

1. Stimulate sustainable economic development at the regional level.
2. Encourage universities to give more attention to their third mission.
3. Attract regional resources to scientific and technological development.

The government started the REC program in 2019, creating these centers in five regions of Russia. The centers were established without competition because it was a pilot stage. The concept of a REC implies that there is a core university. It hosts a Center. The REC unites various actors, such as universities (not necessarily from the same region), research organizations, companies, and regional authorities. All participants keep their autonomy but work together on joint projects to develop new technologies.

The underlying assumption is that special conditions and additional federal funding will significantly facilitate the production of scientific knowledge and new technologies. During the post-Soviet period, Russia accumulated vast experience establishing centers of excellence, but only some were effective. Factors contributing to success include the duration of financial support and a system of monitoring that combines indicators set by the government with those devised individually for each center according to its area of specialization and type of research. The REC represents a principally new approach when the emphasis is on cooperation at the regional level, which has to catalyze the development of entrepreneurial universities.

By the end of 2022, 15 RECs were established. These centers differ by scale and composition of participants. However, each REC should serve regional needs, and the crucial role in the approval of thematic subjects belongs to the regional Governor. He acts as a "checking point," deciding whether the area of activities under a given REC fits regional interests and demands. A REC's budget consists of public and private sources. Federal funding is modest, usually varying from 1% to 13% of the total REC budget, and therefore plays mostly an enabling role. Since 2022, the regional share of the budget has become more significant because, according to a new federal law, regional administrations received a right to invest in projects financed from the federal budget.

The central government plans to closely monitor the RECs' performance and conduct their rotation annually, with a rotation scale of up to five Centers per year. The evaluation system relies on quite challenging indicators, such as the growth of the gross regional product, new jobs created, new high-tech products produced, the volume of regional export, etc. The publication outputs, patents, and share of young scientists employed in projects are a measure of REC scientific performance.

In 2022, the government did not conduct REC rotation because the Centers had to reconsider their activities and performance indicators since now they have to contribute to a new all-country goal of developing technological sovereignty. It means that the Centers should audit their projects and concentrate resources on the country's

technological priorities while still pursuing the development of a regional economy. Some RECs include up to 30-40 organizations, and their re-evaluation will take some time. Aside from that, the ability of universities to manage such structures as RECs remains in question.

ORIGINALITY / VALUE

Originality and value are in the suggestions on how to adapt the REC format to solve the task of regional development, taking into account the new Russian environment.

PRACTICAL / SOCIAL IMPLICATIONS

The findings may help to redesign RECs activities to make them more effective instrument of regional development.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

further research may be conducted in comparative perspective between RECs and the U.S. NSF Engines program / Limitations: short period has passed since RECs establishment; information about RECs in public sources is rather scarce.

KEYWORDS (3-5)

Entrepreneurial universities, regional economic development, research and educational centers, triple helix, technological sovereignty.

REFERENCES

- Asheim, B. T., Grillitsch, M., & Trippl, M. (2016). Regional innovation systems: Past–present– future. *Handbook on the Geographies of Innovation*.
- Gokrberg, L., Kitova, G., Kuznetsova, T. (2008). Strategy of integration processes in the sphere of science and education. *Voprosy Ekonomiki*. No. 7. Pp.112-128. (In Russ.).
- Dezhina I. State of Science and Innovations. In: *Russian Economy in 2021. Trends and Outlooks*. Vol. 43. M.: Gaidar Institute Publishing, 2022. P. 473-498. (In Russ.).
- Starikova, M. *Chinovniki ne nashli kriteriev nauchno-obrazovatel'nykh tsentrov*. In: *Kommersant*, 24.06.2019 r.
- Borlaug, S. B. (2016). Moral Hazard and Adverse Selection in Research Funding: Centers of Excellence in Norway and Sweden. *Science and Public Policy*. Vol.43. No. 3. Pp.352–362. Doi: 10.1093/scipol/scv048
- Etzkowit, H., Zhou, C. (2017). *The triple helix: University–industry–government innovation and entrepreneurship*. Routledge.
- Hellström, T. (2018). *Centres of Excellence and Capacity Building: from Strategy to Impact*. *Science and Public Policy*. Vol. 45. Issue 4. Pp. 543–552. Doi: 10.1093/scipol/scx082
- Hicks, D., Katz, J. S. (2011). *Equity and Excellence in Research Funding*. *Minerva*. No.49. Pp. 137– 151. Doi: 10.1007/s11024-011-9170-6
- Langerfeldt, L., Benner, M., Sivertsen, G., Kristiansen, E., Aksnes, D., Borlaug, S.B., Hansen, H.F., Kallerud, E., Peikonen, A. (2015). *Excellence and growth dynamics: A comparative study of the Matthew effect*. *Science and Public Policy*. No.42. Pp.661-675. Doi: 10.1093/scipol/scu083
- Lundvall, B. Å., Joseph, K. J., Chaminade, C., & Vang, J. (Eds.). (2011). *Handbook of innovation systems and developing countries: building domestic capabilities in a global setting*. Edward Elgar Publishing.
- Orr, D., Jaeger, M., Wespel, J. *New Forms for Public Research: A Concept Paper on Research Excellence Initiatives*. Paris: OECD, DSTI/STP/RIHR (2011), 2011.

3.2 Engaging for Sustainable Development and Transformation – exploring the concept of Transformative Academic Institutions

Madeline Smith¹, Patricia Canto- Farachala², Emily Wise³

¹The Glasgow School of Art, Innovation School United Kingdom, ²Orkestra, Deusto Foundation and Deusto Business School, Spain, ³Lund University, CIRCLE and Collaboration Office, Sweden.

PURPOSE

Universities are increasingly being seen as a positive vehicle for territorial development and regional transformation, with an important role in enhancing Social, Economic and Sustainable Development of territories. However, it can be challenging to balance priorities and resources to actively engage with external actors to address societal challenges while simultaneously delivering on academic excellence (Aranguren et al. 2021; Benneworth and Fitjar, 2019; Cuesta-Claros et al. 2021; Kempton et al., 2021; Pugh et al., 2022). The academic institutions involved in this research all consider societal engagement and collaboration as a reciprocal interactive process based on mutual knowledge creation and dissemination (rather than a unidirectional transfer process), implying that engagement is a key fundamental in societal collaboration to bring about real change, and have identified a common interest in exploring this approach and how it can be operationalised.

The world's sustainability challenges are listed in the United Nation's Agenda 2030, that includes Higher Education Institutions (HEIs) as actors that can work in partnership with others in collaborative processes leading to the achievement of the Sustainable Development Goals (SDGs). The project partners (Orkestra, Basque Country, Spain; Innovation School, The Glasgow School of Art, UK; The University of British Columbia (UBC), Okanagan, Canada; Competitiveness Institute - Catholic University of Uruguay; and Collaboration Office, Lund University, Sweden) all have ambitions to enhance the societal impact of research through working collaboratively with other territorial partners (government, industry, civil society) and defining their research agendas to focus on detecting, understanding and addressing key regional challenges.

The purpose of this research is to explore and demonstrate the evolution of universities' role and engagement with society, and to identify the significant factors, challenges and opportunities to being transformative academic institutions (TAIs).

DESIGN / METHODOLOGY / APPROACH

This exploratory research brings together five academic partners (3 in Europe, 1 in North America, and 1 in South America) to understand their experiences of genuine societal engagement and collaborative partnership for change within their regions. The iterative process (Norman and Verganti, 2014; Sanders and Stappers 2014) started with exploratory and sharing workshops, before development of case studies for each partner perspective, a collaborative workshop to identify challenges and opportunities, and final reflections on learning and further research.

FINDINGS OR EXPECTED OUTCOMES

The partners had all (within their own contexts) looked to demonstrate and enhance the societal impact of the research activities through working collaboratively with other territorial partners (government, industry, civil society). This was not just to deliver against societal challenges, but also to define their research agendas embedded in the priorities of their regions and focused on understanding, defining and addressing key regional challenges. Thus by delivering "regionally responsive research" to address these complex societal challenges they aimed to become Transformative Academic Institutions (TAI). Whilst resonating with the proposed concept of TAI, the partners brought their individual context and experience to the discussions. This uncovered challenges and differences (in context, in institutional models, in local stakeholder relationships, and even in approach).

The five institutions explored and progressed towards better defining the significant factors, challenges and opportunities for TAI approaches, and reflected on how respective institutions might develop their transformative partnering capacities in the future. A common factor was that all partners were small in relation to the wider university structure, and therefore a further common challenge was how to scale and embed this approach into the overall organisational culture.

The results from this exploratory work point to a more strategic

partnering with external (non-academic) actors in order to contribute to (longer-term) change processes that address regional challenges. This can take universities beyond their existing roles in collaborative production and dissemination of knowledge towards new roles in curating collective knowledge, and catalysing and facilitating change.

ORIGINALITY / VALUE

The research presents a unique, international, cross-institutional approach to conceptual development and learning on capacities for transformative academic institutions, which moves the third mission of universities to one that is driven by societal needs in a process of collaborative knowledge creation.

PRACTICAL / SOCIAL IMPLICATIONS

- Evolution in the understanding of universities' role in societal collaboration and contribution to system-level change processes (and impact).
- Better definition of the significant factors, challenges and opportunities for TAI approaches.
- Initial case examples of TAI capacities and success factors becoming normal operations can serve as examples for others.
- Reflections on how institutions might develop their transformative partnering capacities in the future.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

- Continued work on how to evidence universities' contributions to sustainable development (addressing SDGs).
- Further work on embedding and scaling up to wider university structures and culture.

KEYWORDS (3-5)

Transformation, societal engagement, regional innovation systems, collaboration, co-design.

REFERENCES

- Aranguren, M.J., Canto-Farachala, P. and Wilson, J.R. (2021) 'Transformative Academic Institutions: An experimental framework for understanding regional impacts of research.' *Research Evaluation*, 30 (2), 191-200
- Benneworth, P. and Fitjar, R. (2019) 'Contextualizing the Role of Universities to Regional Development: Introduction to the Special Issue.' *Regional Studies, Regional Science*, 6, 331-8
- Cuesta-Claros, A., Malekpour, S., Raven, R. and Kestin, T. (2021) 'Understanding the Roles of Universities for Sustainable Development Transformations: A Framing Analysis of University Models.' *Sustainable Development*, <https://doi.org/10.1002/sd.2247>
- Kempton, L. Rego, M.C., Alves, L.R., Vallance, P. Aguiar-Serra, M., and Tewdwr-Jones, M. (eds.) (2021) *Putting Universities in their Place: An Evidence-Based Approach to Understanding the Contribution of Higher Education to Local and Regional Development*. Abingdon: Routledge
- Norman, D.A. and Verganti, R (2014) 'Incremental and Radical Innovation: Design Research vs. Technology and Meaning Change.' *Design Issues*, 30 (1) 78-96
- Pugh, R., Hamilton, E., Soetanto, D., Jack, S., Gibbons, A. and Ronan, N. (2022) 'Nuancing the Roles of Entrepreneurial Universities in Regional Economic Development.' *Studies in Higher Education*, 47 (5), 964-972
- Sanders, E.B.N. and Stappers, P.J (2014) 'Probes, toolkits and prototypes: three approaches to making in codesigning.' *CoDesign*, 10 (1) 5-14

3.3 Engaged Humanities - Exploring the contribution of Italian studies to local development

Letizia Donati¹, Marco Bellandi¹, Monica Barni²

¹University of Florence, Italy, ² University for foreigners of Siena Italy.

PURPOSE

In the context of the knowledge society, universities are increasingly expected to perform a role in local development behaving as civic institutions (Kempton et al., 2021; Benneworth et al., 2017). To meet this goal, they have institutionalized the so-call third mission beside teaching and research (Geuna and Muscio, 2009). Third mission entails a wide array of activities regarding the engagement of university with the outside society (Perkmann et al., 2013). Technology transfer and university-industry relation have been at the core of third mission to boost innovation and entrepreneurship in the Science, Technology, Engineering and Mathematics (STEM) domain (Olmos-Penuela et al., 2014). However, scholars have recognized that also the humanities (e.g., foreign language and culture) can be crucial in this regard (Etzkowitz et al., 2012) by contributing to create local wellbeing and development through culture and civic entrepreneurship. Notwithstanding their potential, their role in the third mission and engagement literature has been largely overlooked (Blasi et al., 2018). The Humanities are mainly involved within the broader framework of third mission which includes a wide set of people-based activities such as student placement, curriculum development and community engagement (Blasi et al., 2018) reflecting an Engaged university approach (Breznitz and Feldman, 2012). In particular, the concept of Engaged Humanities is slowly emerging in foreign language education (e.g., Spanish studies in the US) associated with strategies to increase the relations and the engagement with the local communities, especially when this latter are composed by immigrants (e.g., Latinos communities in the US). Such type of engagement exerts a positive impact on the social wellbeing of immigrants' local communities and on local development in general (Abbott, 2018). Our contribution aims at expanding this emergent literature by exploring how and why these engagement strategies have emerged in the context of Italian studies, specifically towards Italian migrants' communities and students of Italian abroad. The Italian case is salient because Italy experienced a high migration flow between the 19th and the 20th century which led to the establishment of Italian communities across different regions of the world (Baldassar, 2011). In some cases, Italian migrants have profoundly shaped the urban landscape and culture of the cities where they settled by starting new companies and by being active participants in the civic life of the local community (Iuliano and Baldassar, 2008). We posit that the positive interactions might be mediated and influenced by three different elements:

- i) the third mission strategy pursued by the central level of university.
- ii) the strategy pursued by the Italian Studies department towards the teaching of the Italian language
- iii) the features of the community with Italian origin where the university is located.

DESIGN / METHODOLOGY / APPROACH

We implement a comparative case study approach (Yin, 2003) on Italian studies department based at foreign universities in three cities that historically experienced Italian migration, i.e., Manchester, Sydney, and Toronto. In these cities, the engagement of Italian studies departments can take place through students' placement services by establishing place-based and transnational relations with Italian multinationals (Rubino and Beconi, 2018) or locally based Italian small and medium enterprises. The engagement might also entail relations with the local communities of Italian migrants in the context of community-based projects (Abbott, 2018) and quadruple helix partnership between university, industry, local municipalities, and civil society organizations (Carayannis and Campbell, 2009; Bellandi et al., 2021). We develop a theoretical framework entailing the elements recalled above which we adopted to conduct our data analysis.

FINDINGS OR EXPECTED OUTCOMES

We find that cities hosting well-established communities of Italian migrants and a University with an Italian studies department can build fruitful collaborations in terms of both placement of students and engagement activities with local actors. Overall, the Humanities can

exert a positive influence on the cultural dynamism of their cities, being also able to actively foster students' employability in the labor market.

ORIGINALITY / VALUE

There are few studies on the engagement humanities topic, and, to the best of our knowledge, this is the first study addressing the role of Italian Language in this context.

PRACTICAL / SOCIAL IMPLICATIONS

Italian language and culture thought at Italian Studies departments abroad might be a crucial channel to enhance the knowledge of Italian tradition in Made in Italy sector possibly fostering international trade relations (Vedovelli, 2016).

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This is case study research: we should be cautious with results generalization. Future research should be directed to better understand the engagement strategies within the field of the Humanities which are still at the margin of the university third mission's debate.

KEYWORDS (3-5)

Engaged university; engaged humanities; university third mission.

REFERENCES

- Abbott, A. (2018). Engaged humanities and the future of Spanish programs. *Hispania*, 100(5), 33-34.
- Baldassar, L. (2011). Italian migrants in Australia and their relationship to Italy: Return visits, transnational caregiving and the second generation. *Journal of Mediterranean Studies*, 20(2), 255-282.
- Bellandi, M., Donati, L., & Cataneo, A. (2021). Social innovation governance and the role of universities: Cases of quadruple helix partnerships in Italy. *Technological Forecasting and Social Change*, 164, 120518.
- 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(2), 235-248.
- Blasi, B., Romagnosi, S., & Bonaccorsi, A. (2018). Do SSH researchers have a third mission (and should they have)?: In *The Evaluation of Research in Social Sciences and Humanities* (pp. 361-392). Springer, Cham.
- Breznitz, S. M., & Feldman, M. P. (2012). The engaged university. *The Journal of Technology Transfer*, 37(2), 139-157.
- 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(3-4), 201-234.
- Etzkowitz, H. (2014). Making a humanities town: knowledge-infused clusters, civic entrepreneurship and civil society in local innovation systems. *Triple Helix*, 2(1), 1-22.
- Etzkowitz, H., Ranga, M., & Dzisah, J. (2012). Whither the university? The Novum Trivium and the transition from industrial to knowledge society. *Social Science Information*, 51(2), 143-164.
- Geuna, A., & Muscio, A. (2009). The governance of university knowledge transfer: A critical review of the literature. *Minerva*, 47(1), 93-114.
- Iuliano, S., & Baldassar, L. (2008). Deprovincializing Italian migration studies: An overview of Australian and Canadian research. *Flinders University Language Group Online Review*, 3(3), 1-16
- Kempton, L., Rego, M. C., Alves, L. R., Vallance, P., Serra, M. A., & Tewdwr-Jones, M. (2021). 5. Putting universities in their place: The ORPHIC Framework. *Regional Studies Policy Impact Books*, 3(1), 61-77.
- Olmos-Peñuela, J., Castro-Martínez, E., & d'Este, P. (2014). Knowledge transfer activities in social sciences and humanities: Explaining the interactions of research groups with non-academic agents. *Research Policy*, 43(4), 696-706.
- Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'este, P., ... & Sobrero, M. (2013). Academic engagement and commercialisation: A review of the literature on university-industry relations. *Research policy*, 42(2), 423-442.
- Rubino, A., & Beconi, A. (2018). Connecting language students with the

work environment: 'Made in Italy: Italian at work'. *Babel*, 53(3), 15-21.
Vedovelli, M. (2016). Latino e italiano nel mondo della superdiversità linguistica. *Italica*, 792-815. Yin, R.K. (2003), *Case Study Research: Design and Methods*, 3rd edn, Thousand Oaks: Sage.

3.4 “Nothing exists until it is measured”: a systematic review of indicators and metrics of the university’s contribution to society

Floriana Fusco¹, Angelo Riviezzo¹, Maria Rosaria Napolitano²

¹University of Sannio, Italy, ²University of Naples “Parthenope”, Italy.

PURPOSE

Over the last decades, the pressure on the university to directly contribute to economic, social, and cultural development has steadily increased. They are increasingly seen as ‘transformative institutions’, i.e. engines of change toward sustainable development (Trencher et al., 2014; Purchell et al., 2019).

As a result, new missions have been recognized for universities, and new labels have been coined, such as “entrepreneurial university”, “civic university”, “community-engaged university”, “transformative university”, or the “interconnected university”. This evolving and growing role of the university as an “anchor” institution (Goddard & Kempton, 2016) was explained in the light of several theoretical frameworks, including the “triple helix” and its extensions - the “quadruple helix” and the “quintuple helix” models of innovation (Etzkowitz & Leydesdorff, 2000; Carayannis & Campbell, 2010; Carayannis & Rakhmatullin, 2014) -, the “learning region” (Shaw & Allison, 1999), the “regional innovation systems” (Benneworth et al., 2017), or the “smart specialization strategy” (Kempton, 2015). Due to this progressive “enlargement” of the university’s role in local and community development dynamics, a corresponding evolution of performance metrics and indicators used to assess the impact of university activities is required. Despite the substantial increase in scientific interest in the topic, a comprehensive systematization of extant knowledge focusing on metrics is lacking. Hence, this study aims to fill this gap, widely reviewing and systematizing the actual knowledge on measures and indicators of university performance in terms of societal contribution.

DESIGN / METHODOLOGY / APPROACH

A systematic literature review was carried out, following the PRISMA guidelines (Moher et al., 2009). To comprehensively cover the multiple strands of the literature, two queries were identified and entered in Scopus and WoS databases by considering the title, abstract and keywords (i.e. topic):

1. (“entrepreneur* universit*” OR “civic universit*” OR “engaged universit*” OR “third mission” OR “fourth mission” OR “third role”) AND (evaluat* OR impact* OR indicator* OR outcome* OR output* OR performance OR contribut* OR role* OR effect* OR metric*).

2. (universit*) AND (“triple helix” OR “quadruple helix” OR “quintuple helix” OR “regional innovation system*” OR “regional development” OR “local innovation system*”) AND (evaluat* OR impact* OR indicator* OR outcome* OR output* OR performance OR contribut* OR effect* OR role* OR metric*).

Some refining criteria were selected (i.e. type of document: peer-review article; language: English). The search was launched on 14th October 2022 and returned 4,280 documents, which became 2699 after duplicate removal. The eligibility criteria, first for the screening of titles and abstracts, then for the inclusion in the qualitative analysis, are the following: i) topic: only papers presenting qualitative and quantitative measures or indicators relating to the contribution of the university to the local/community development; ii) type of studies: only empirical studies were considered. About 300 papers were selected for the full-text assessment phase, which is still in progress.

EXPECTED RESULTS

The literature review will identify a dashboard of qualitative and quantitative indicators used to assess the university’s performance in terms of third and fourth missions. We expect to observe an evolutionary path of used metrics from hard to soft, from one-dimensional to multi-dimensional. Indeed, the indicators used tend to be no longer strictly quantitative and focused on a single aspect (i.e. economic) but more multidimensional and qualitative. The study will also reveal gaps in the existing literature and, therefore, directions for future research.

ORIGINALITY / VALUE

To our knowledge, this is the first attempt to comprehensively and broadly synthesize the current knowledge on output/outcome metrics used to evaluate the university’s third and fourth missions or, more

generally, its contribution to societal development. This also provides a helpful guide for future research.

PRACTICAL / SOCIAL IMPLICATIONS

The study also contributes to the practical knowledge, as it provides policy-makers and university managers with a directly usable tool (i.e. a dashboard of indicators) for assessing university (economic, social and so on) contribution to the community.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The study has some limitations typically related to its method. While very comprehensive, the selection of sources to be reviewed is restricted by the search criteria, i.e. the identified keywords, the two databases and the filter criteria.

KEYWORDS (3-5)

Entrepreneurial university; Engaged university; Third mission; Evaluation; Literature review.

REFERENCES

- 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(2), 235–248.
- Carayannis, E. G., & Campbell, D. (2010). Triple helix, quadruple helix and quintuple helix and how do knowledge, innovation and the environment relate to each other? A proposed framework for a transdisciplinary analysis of sustainable development and social ecology. *International Journal of Social Ecology and Sustainable Development*, 1(1), 41–69.
- Carayannis, E. G., & Rakhmatullin, R. (2014). The quadruple/quintuple innovation helixes and smart specialisation strategies for sustainable and inclusive growth in Europe and beyond. *Journal of the Knowledge Economy*, 5(2), 212-239
- 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(2), 109–123.
- Goddard, J. & Kempton, L. (2016). *The Civic University. Universities in leadership and management of place*. Centre for Urban and Regional Development Studies, Newcastle University.
- Kempton, L. (2015). Delivering smart specialization in peripheral regions: the role of Universities. *Regional Science*, 2(1), 489-496.
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLOS Medicine*, 6(7), e1000097.
- Purcell, W. M., Henriksen, H., & Spengler, J. D. (2019). Universities as the engine of transformational sustainability toward delivering the sustainable development goals: “Living labs” for sustainability. *International Journal of Sustainability in Higher Education*.
- Shaw, J. K., & Allison, J. (1999). The intersection of the learning region and local and regional economic development: Analysing the role of higher education. *Regional Studies*, 33(9), 896–902.
- Trencher, G., Yarime, M., McCormick, K. B., Doll, C. N., & Kraines, S. B. (2014). Beyond the third mission: Exploring the emerging university function of co-creation for sustainability. *Science and Public Policy*, 41(2), 151-179.

3. 5 An approach to a model to analyze the level of the Entrepreneurial University based on Quintuple Helix Model

Jessica Paños Castro¹, María José Bezanilla Albisua¹

¹University of Deusto, Spain.

PURPOSE

Until a decade ago, universities aimed to develop the triple helix (industry, government and university). However, for some time now, the fourth and fifth helix (Castillo-Vergara, 2020), also known as Mode 3 (Carayannis and Campbell, 2009), has gained strength. The five helixes include the following subsystems: Educational System; Economic System; Natural Environment; the Public System based on media and culture and/or civil society, and the political system (Castillo-Vergara, 2020). In this sense, universities, as carriers of knowledge, have to respond to the challenges of the 2030 Agenda, and support and be a major player in sustainable development (Litardi et al., 2020; United Nations, 2015; European Commission, 2014). In order to know the current situation and policies related to Green Campus and Sustainability in universities around the world, UI GreenMetric elaborates every year a ranking where the efforts made by universities to implement sustainable and environmentally friendly policies and programs are reflected. However, current universities promote knowledge, but not knowledge and innovation for sustainable development to solve social problems (Hikkaduwa & Godfrey, 2022; Barcellos- Paula et al., 2021).

DESIGN / METHODOLOGY / APPROACH

Although the emerging literature on the Entrepreneurial University model has highlighted several characteristics that universities should have, so far there has been little empirical work. In this research we present a proposal to extend the model validated by Paños-Castro et al. (2021) on the Entrepreneurial University, including the fourth and fifth helix, such as the variables Green corporate governance, Green corporate culture, Green education, Green Research, Green community outreach, Green internal operations and Green reporting, among others.

FINDINGS OR EXPECTED OUTCOMES

Determine an integrated and comprehensive model with the five helixes to help universities analyse the level of the Entrepreneurial University.

ORIGINALITY / VALUE

To develop a state of the art and current model to advance sustainable problems such as climate change, greenhouse gas emissions and water shortage, among others; in addition to promoting entrepreneurial economic development from universities.

PRACTICAL / SOCIAL IMPLICATIONS

From a research point of view, our research will: (1) provide an empirical model to measure the level of the Entrepreneurial University, including the fourth and fifth helix; (2) contribute to fill the empirical gap we found on models that include the five helixes.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This is a model based on existing literature, so it would be interesting to validate the instrument for future research.

KEYWORDS (3-5)

Triple helix, fourth helix, fifth helix, entrepreneurial university, model.

REFERENCES

Barcellos-Paula, L., De la Vega, I., and Gil-Lafuente, A.M. (2021). The Quintuple Helix of Innovation Model and the SDGs: Latin-American Countries' Case and Its Forgotten Effects. *Mathematics*, 9, 416. <https://doi.org/10.3390/math9040416>

Carayannis, E.G. and Campbell, D.F.J. (2009) "Mode 3" and "Quadruple Helix": toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46(3-4), 201–234. <https://doi.org/10.1504/ijtm.2009.023374>

Castillo-Vergara, M. (2020). La teoría de las N-hélices en los tiempos de hoy. *Journal of Technology Management & Innovation*, 15(3), 3-5.

European Commission (2014). Towards a circular economy: A zero waste program for Europe. Retrieved from <https://www.oecd.org/env/outreach/EC-Circular-economy.pdf>

Hikkaduwa, S. & Godfrey, F. (2022). Greening Universities with Mode 3 and Quintuple Helix Model of Innovation–Production of Knowledge and Innovation in Knowledge-Based Economy, Botswana. *Journal of the Knowledge Economy*, 13, 1126–1156. <https://doi.org/10.1007/s13132-021-00769-y>

Litardi, I., Fiorani, G. and La Bara, L. (2020). The Role of the University for Promoting Sustainability through Third Mission and Quintuple Helix Model: The Case Study of the Tor Vergata University of Rome. *Management Dynamic in the Knowledge Economy*, 8(1), 45-60. <https://doi.org/10.2478/mdke-2020-0004>

Paños-Castro, J., Markuerkiaga, L. and Bezanilla, M.J. (2021). An Analysis of the Entrepreneurial University in the Faculties of Education in Spain: Self-Perception among Deans. *Sustainability*, 13(21), 11768. <https://doi.org/10.3390/su132111768>

UI Green Metric Ranking of World Universities. Retrieved from <https://greenmetric.ui.ac.id/rankings/overall-rankings-2022>

United Nations (2015). Transforming our world: the 2030 Agenda for Sustainable Development. Resolution adopted by the General Assembly on 25 September 2015. Retrieved from <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N15/291/89/PDF/N1529189.pdf?OpenElement>

3.6 Development of an Innovation Ecosystem at a Brazilian Research Public University: the case of the Universidade Federal Fluminense

Antonio Claudio Nobrega¹, Monica Savedra¹, Marcelo Amaral¹, Ricardo Leal¹

¹Universidade Federal Fluminense, Brazil.

PURPOSE

Since 2004, Brazil has been improving the science and technology legal framework to enhance innovation effectiveness in the country, particularly in public research institutions. Universidade Federal Fluminense (UFF) is the largest public university in the Brazilian federal system, with 65,000 students and a presence in nine cities. Its activities significantly impact Rio de Janeiro's state, contributing to social, economic, and sustainable development. In 2009, UFF created the Agency of Innovation, AGIR, to coordinate innovation initiatives in the university in progress since 1997. In the last years, other initiatives aiming at the development of an academic innovation ecosystem at UFF based on a Triple Helix model were successfully implemented by the UFF/AGIR. This work aims to describe and analyze these recent initiatives comprising the UFF's innovation ecosystem.

DESIGN / METHODOLOGY / APPROACH

This work is a practical experience study based on a collection of previous works, institutional documents, and action-research experiences. Since the creation of UFF's Innovation Agency, documentary and field research have been conducted to identify successful cases of innovation mechanisms and environments like incubators, technoparks, and technology transfer offices (Amaral et al., 2022; Stolze et al., 2022). Also, several internal players carried out benchmarking, experience exchange, and action-research activities (such as graduate programs, labs, and research groups) (Almeida & Amaral, 2019). In this approach, examples of projects and activities performed under university-industry-government interaction were studied to comprehend the configuration of an academic innovation ecosystem and the emergence of an entrepreneurial university (Velasco et al., 2022).

FINDINGS OR EXPECTED OUTCOMES

This set of projects and activities supported the profile and the mandate's definition of UFF's Innovation Agency, described in the innovation policy approved in 2020. One of its main objectives is to expand the technological incubator to receive projects and startups born in the University. Another key objective was enhancing the university-business interaction to execute research and innovation projects. These two objectives were accomplished with the support of government funding and regulation, composing a triplehelix approach. Since 2018, the support of state and federal government S&T funding agencies allowed the growth of AGIR through triple-helix projects. The two supporting agencies are FAPERJ, a Rio de Janeiro State Foundation to Support Research, and CNPq, a Federal Council of Research and Technological Development. FAPERJ granted resources through four programs to develop the UFF's Incubator at Niteroi (UFF's headquarters) and to spread innovation hubs to four other cities in the state. With the resources of these programs, mainly used for supporting the incubated companies through mentoring, the number of ideas and startups incubated from three in 2018 to ten in 2022, and four more startups will start the process in 2023. Most of the startup's opportunities resulted from UFF's R&D projects. Three of them have sustainable development as their purpose: 1) INNOMAKER developed an autonomous boat moved by solar energy to collect contaminant elements from rivers and oceans; 2) NEWBRICK is developing an ecological brick from industrial rejects; and 3) AMBMET uses computer simulation to develop long-term rain forecasts to electricity companies.

Regarding the ten current incubated companies, three were selected in FAPERJ's Entrepreneurial Doctor Program for researchers who concluded a doctorate level and wished to create startups. This program gives scholarships for a doctor and one student to work in the startup and resources for company development. With the support of another FAPERJ Program, AGIR is implementing innovation hubs in four cities where UFF has campuses and develops scientific and technological research in different areas of knowledge, such as engineering, computing, odontology, environmental technology and management sciences. The Virgula Innovation Hub VR is already

operating at Volta Redonda in partnership with the City Hall, two private colleges, and the local chamber of commerce. The other hubs in Rio das Ostras, Petropolis, and Friburgo will be implemented in 2023 with the same triple-helix managerial model. CNPq resources come through programs to support graduate students' projects developed in partnership with companies. Under these programs, called MAI/DAI, Academic Master and Doctorate for Innovation, CNPq supports scholarships while the associated company has to contribute with resources for the project development. UFF has been granted in these programs twenty doctorates, ten masters, and sixty undergraduates' scholarships; part already implemented. A total of nine UFF's graduate programs and fifteen companies are involved in these triple-helix projects. For 2023 and 2024, another FAPERJ program is already granted to prospect and develop patent licensing from the UFF's patent portfolio. Also, in 2023 it will be implemented in Niterói, an Innovation Center in association with UFF's foundation (Fundação Euclides da Cunha) and the City Hall to match local demands and offer technology and solutions.

ORIGINALITY / VALUE

All these initiatives have the value of contributing to the improvement of the academic innovation ecosystem at UFF with an impact on regional innovation systems at Rio de Janeiro State. The experience opens a new role for the university in being entrepreneurial through the development of startups and innovative projects beyond the formation of high-level professionals trained to work in tech companies.

PRACTICAL / SOCIAL IMPLICATIONS

The triple-helix initiatives described in this abstract has practical and social implication at UFF and in the cities where they are implemented: 1) the development of startups companies and job offer increase; 2) the development of innovation hubs in different cities allows innovative solutions to be implemented in these spaces, improving the competitiveness of local companies; and 3) the conclusion of the graduate students projects developed in partnership with companies creates opportunities to these high-level professionals in companies.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

For the future, it is important to have an overall balance of the results of these initiatives in the university and an endless search for funding and models or ways to interact with business and government.

KEYWORDS (3-5)

Business Incubator, Innovation Hubs, Scholarships for innovation, Innovation agencies; Entrepreneurial Universities; UFF.

REFERENCES

- ALMEIDA, F.; AMARAL, M. Conceptual Framework for Assessment Entrepreneurial Education. *International Journal of Knowledge, Innovation and Entrepreneurship*, v.7, p. 2-15, 2019.
- AMARAL, M. G.; MINEIRO, A. A. C.; FARIA, A. F. AS HÉLICES DA INOVAÇÃO: interação universidade- empresa- governo-sociedade no Brasil. Curitiba: Editora CRV, 2022.
- STOLZE, A.; AMARAL, M. G.; FERREIRA, A. The Localized Exploration Towards The Third Mission In Brazilian Entrepreneurial Universities. XX Triple Helix Conference. Florence: Triple Helix Association, 2022.
- UFF/AGIR annual reports and results presentations.

3.7 Agents of change – regional actor's perspective on university-industry collaboration through student's involvement in challenge-based learning projects

Tatiana Aleksandrovna Iakovleva¹, Masoumeh Shahverdi¹

¹University of Stavanger, Norway.

PURPOSE

Universities have come under increasing pressure in recent years to engage in Quadruple Helix, which include "a contribution to society to solve grand social challenges" in addition to their primary missions of doing research and teaching (Compagnucci & Spigarelli, 2020; Iakovleva et al., 2022,). In transferring knowledge and technology to industry and society at large, universities that participate in these initiatives are developing into engines that support the social, economic, and cultural development of the areas in which they operate (De Jong et al., 2014; Secundo et al., 2017). This could be done through engaging students with regional industrial actors to help them solving SDG. There are many possible forms of interaction, that can be broadly labeled "learning by doing" – for example via internships or through collaborative projects with regional actors. Government and higher education institutions (HEIs) underscore that such interactions constitute a good learning mechanism for students to participate in. In addition, such interaction can provide important feedback to the HEIs to ensure that the education curriculum and content are up to date and coherent with the demands of society (Benneworth, 2018). One of the developing approaches of "learning by doing" is Challenge-based learning (CBL). CBL is an emerging pedagogical model and practical approach that connects the classroom to the real-world issues. CBL takes places through the identification, analysis, and design of a solution to a social problem (Nichols & Cator, 2008). Furthermore, CBL offers specific benefits because of its focus on innovation, and is described as an 'innovative pedagogy that actively engages students in relevant real-world problems' (Portuguez Castro & Gómez Zermeño, 2020). The advantages of challenge-based learning (CBL) are apparent, including growing students into independent learners and assuring the societal relevance and impact of academic work (Renz et al., 2019). In addition, CBL enhances participants' soft skills, entrepreneurial intent, and academic achievement (Colombelli et al., 2021; Laurence F. et al., 2009). While most of research has focused on benefit of this pedagogical approach for students, we want to focus on the other stakeholders involved in this method – in particular, on regional actors – public or private organizations that served as challenge providers for the students. The purpose of this study is to explore how regional actors involved in student's CBL projects perceive such collaboration and whether CBL can be a useful method in enchanting a Quadplex Helix approach. The effects of the student's involvement might range from ideas that were picked up by organizations and implemented to self-reflection on organizational culture, development process or methods of work. Thus, we address the following research question: To what extent does participation on CBL allowed organizations to be reflective on their practices?

DESIGN / METHODOLOGY / APPROACH

This study adopts an exploratory research design with a purposive sampling approach. Data will be collected from the firms that have hosted students enrolled in courses in a medium-sized regional University in Norway that utilized CBL teaching method. CBL approach was practiced in the University of Stavanger in different courses, and in this article, we will utilize insights from two intra-curricular courses that applies CBL and three extra-curricular events. Each intra-curricular course lasted for one semester and students' involvement with the firms ranged for about two months. While for extra-curricular events which had different duration from 3-4 days, 4 weeks, and three-month project in the course that students trying to solve sustainability problems for the organizations in question. We started data collection autumn 2020 and continue this process spring 2023. So far, we have agreements with seven firms for in-depth interviews about their experiences and takeaway from this process.

FINDINGS OR EXPECTED OUTCOMES

Potential results deriving from arranged focus groups are expected to follow a growing strand of research into CBL, and as such explore the value of challenge-based learning methods for strengthen university-industry collaboration to meet the quadruple helix requirement. While

there are a wide range of literature of studies focusing on triple-helix from the university side, there are less literature on collaborative efforts and knowledge transfer from the firm's point of view. Thus, this study will contribute of building a holistic view on the university-industry interactions.

ORIGINALITY / VALUE

Challenge-based learning is an emerging pedagogical model that can be applied in any study field and is used more and more within higher education in Europe. Our research contributes to the existing literature by presenting the effects of this new pedagogical model on student's mindset. Moreover, with this study, we contribute to the debate on entrepreneurial mindset (Neck & Corbett, 2018; Piperopoulos, and Dimov, 2015) by extending the existing lines of research to include not only entrepreneurship programs and students seeking self-employment carriers, but also all types of students and learning programs.

PRACTICAL / SOCIAL IMPLICATIONS

We propose that involving both students and firms into challenge-based learning may create a new role for students that deviates from the classical student role of knowledge receivers. Instead, students can become agents of change and create social, environmental, and economic value for regional and industrial actors, while progressing at the same time in their respective knowledge fields. Further, we claim that CBL method can bridge the gap between academia and industry and allow natural and reciprocally beneficial collaboration within the educational activity. Finally, we argue that students who attend CBL courses evolve their role based on their learning and interaction with regional actors.

Educating students in any field to be creative, innovative, and entrepreneurial is an important task to universities as these new generations are to find innovative solutions to global challenges and to contribute to achieving sustainable development goals. CBL's close relationship to the innovation and creativity domain equips students with skills and competencies that are highly desirable for future employment. On top of that, CBL provides benefits for not only students and educators, but also for external stakeholders who, through participation in CBL projects, may gain valuable ideas and expertise specific to their organizations as well as an insight into the pool of highly engaged potential future employees.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This paper is proposed an initial point for future research on the link between challenge based-learning approach's outcome and its effect on the society. As well as this research can extend by using larger number of companies, organizations and business which have collaboration with students' CBL projects. In addition, the effect of Challenge-based learning projects can be tested longitudinally.

KEYWORDS (3-5)

Challenged-based learning, entrepreneurial mindset, risk taking, innovation, and proactiveness.

REFERENCES

Benneworth, P. (Ed.). (2018). Universities and regional economic development: Engaging with the periphery. Routledge.

3.8 University-Industry cooperation: a case study of student innovation projects in Latvia

Kaspars Steinbergs¹, Renate Cane²

¹EKA University of Applied Sciences, Latvia, ²Turība University, Latvia.

PURPOSE

Since 2019, a large-scale program called "Innovation Grants for Students" has been implemented in Latvia to promote cooperation between Latvian university students and companies (Labs of Latvia, 2019). The program envisages student teams implementing their own ideas or ideas proposed by companies. This program is financed with 85% of the European Union's funding, while universities have to attract the remaining 15% from companies. This type of industry-university collaboration project has previously been implemented on a much smaller scale, so such a program has created many challenges as well as new experiences. The aim of this study is to analyze the projects implemented by this program. The tasks of the research were to obtain the evaluations of entrepreneurs, university administrations, and students regarding participation in the program and the most important motivators, barriers, and benefits.

DESIGN / METHODOLOGY / APPROACH

The research questions of this study were:

- What factors motivate, facilitate, and create barriers for Latvian companies to develop cooperation with universities?

- What are the benefits for students from cooperation between universities and industry in Latvia?

- What were the benefits and challenges of companies and universities engaging in the Innovation Grants for Students program?

In this study, semi-structured interviews were done with representatives of the enterprises that participated in projects of the Innovation Grants for Students program, as well as officials of the university administrations that were engaged in the planning and implementation of these projects. In addition, a survey using the Likert scale was conducted with the students who participated in these projects. This resulted in a detailed analysis of the progress and results of the program projects. The research methodology was based on the approach and results of the report *The State of University- Business Cooperation in Europe* (Davey et al., 2018).

FINDINGS OR EXPECTED OUTCOMES

According to interviews with entrepreneurs and university administration officials, industry-university collaboration in Latvia takes the following forms: curriculum co-delivery, student mobility, joint R&D, consultation to business, and student entrepreneurship. Analyzing the Innovation Grants for Students program, it can be seen that entrepreneurs' main motivators for cooperating with universities were the opportunity to access a pool of potential employees, the opportunity to implement ideas and develop new products and technologies, as well as the mutual exchange of knowledge.

For entrepreneurs, the most important barriers were related to a lack of capacity and time; therefore, the implementation of such projects was welcomed, which allowed the implementation of long-cherished ideas as well as the development of new products. Universities considered the problem of attracting financial resources to be the biggest barrier. This is due to the fact that entrepreneurs and other stakeholders are interested in cooperation but do not always want to invest in it or are not aware of all the costs.

In general, the Innovation Grants for Students program received a positive response from businesses, institutions, and students; still, its biggest issue was recruiting private corporate co-financing.

ORIGINALITY / VALUE

Because this scale of industry-university cooperation is new in Latvia, the Innovation Grants for Students program revealed numerous issues of cooperation that cannot be handled on the scale of a single university or project. At the same time, the study showed that the motivators, barriers, and benefits for companies and universities of such cooperation are quite similar to those elsewhere in Europe. It was also shown that macro-environmental issues, such as the war in Ukraine, rising prices, and fears of a recession, had a major impact on

the forms, breadth, and orientations of collaboration.

PRACTICAL / SOCIAL IMPLICATIONS

It is possible to apply the results of the research when planning support programs and projects of a similar orientation for the current European Union planning period. It is also possible to take them into account when planning various types of university-industry cooperation in the future, both at the national level and at the level of organizations.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This study was based on the analysis of only three projects in the Innovation Grants for Students program; therefore, it would be desirable to continue the research by expanding it in the future.

KEYWORDS (3-5)

University-industry cooperation, innovation projects, student innovations.

REFERENCES

1. Cassiman, B., & Veugelers, R. (2002). R&D cooperation and spillovers: some empirical evidence from Belgium. *American Economic Review*, 92(4), 1169-1184.
2. Czarnitzki, D., & Rammer, C. (2003). Technology transfer via the internet: A way to link public science and enterprises?. *The Journal of Technology Transfer*, 28(2), 131-147.
3. Dan, M. C. (2013). Why should university and business cooperate? A discussion of advantages and disadvantages. *International Journal of Economic Practices and Theories*, 3(1), 67-74.
4. Davey, T., Meerman, A., Galán-Muros, V., Orazbayeva, B., & Baaken, T. (2018). The state of university-business cooperation in Europe.
5. Ejubovic, A., Davey, T., Briede, L., Meerman, A., Galan-Muros, V., Orazbayeva, B. (2019). State of Latvia University Business-Cooperation Report (University Perspective).
6. Etzkowitz, H., Webster, A., Gebhardt, C., & Terra, B. R. C. (2000). The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm. *Research policy*, 29(2), 313-330.
7. Fernández López, S., Pérez Astray, B., Rodeiro Pazos, D., & Calvo, N. (2015). Are firms interested in collaborating with universities? An open-innovation perspective in countries of the South West European Space. *Service Business*, 9(4), 637-662.
8. Hanel, P., & St-Pierre, M. (2006). Industry-university collaboration by Canadian manufacturing firms. *The Journal of Technology Transfer*, 31(4), 485-499.
9. Labs of Latvia (2019, October 11). "Innovation grants available to students at six higher education institutions" Retrieved October 11, 2022, from <https://labsoflatvia.com/en/news/innovation-grants>
10. Laukkanen, M. (2003). Exploring academic entrepreneurship: drivers and tensions of university-based business. *Journal of Small Business and Enterprise Development*.
11. Orazbayeva, B., Davey, T., Plewa, C., & Galán-Muros, V. (2020). Engagement of academics in education-driven university-business cooperation: A motivation-based perspective. *Studies in Higher Education*, 45(8), 1723-1736.
12. Rothaermel, F. T., Agung, S. D., & Jiang, L. (2007). University entrepreneurship: a taxonomy of the literature. *Industrial and corporate change*, 16(4), 691-791.
13. Rõigas, K., Mohnen, P., & Varblane, U. (2018). Which firms use universities as cooperation partners? - A comparative view in Europe. *International Journal of Technology Management*, 76(1-2), 32-57.

3.9 When entrepreneurial universities meet SDGs

Yuzhuo Cai¹, Rómulo Miguel Pinheiro², Po Yang³, Evandro Coggo Cristofolletti⁴

¹Faculty of Management and Business, Tampere University, Finland, ²Department of Political Science and Management, University of Agder, Norway,

³Graduate School of Education, Peking University China, ⁴Laboratory of Public Sector Studies of School of Applied Science, Innovation Policies Analysis Group, Unicamp, University of Campinas, Brazil.

PURPOSE

University transformations, observed in most countries, are often driven by the imperative to make universities more responsive to societal demands (Benneworth, Thomas, Iakovleva, Pinheiro, & Berg, 2022). This paper focuses on one kind of university transformation: universities oriented toward the entrepreneurial university model are now, largely as a result of external pressures, shifting to be heavily engaged in activities driven by or centred on sustainable development goals (SDGs), as articulated in the United Nations global policy framework (United Nations, 2015). Particularly we examine how universities enact organisational responses to the transition challenges in countries with different social and political systems and cultural traditions. This paper poses the following question: How do contextual factors lead to various tensions in the transition from entrepreneurial universities to sustainable entrepreneurial universities?

DESIGN / METHODOLOGY / APPROACH

To approach the research question, we first establish conceptual frameworks for understanding different forms of universities in terms of intra-organisational contexts and system-level governance structures and types of tensions in the transition. It is followed by our elaborations on the relations between the two typologies based on analysing relevant literature. Then, we testify the frameworks and our propositions in analysing two case universities in Brazil and China.

FINDINGS OR EXPECTED OUTCOMES

The paper is structured as follows. It starts with introducing the transition from entrepreneurial universities to sustainable entrepreneurial university, along with some key concepts in the transition process. It is followed by the methodology, which includes the method of conceptual framework building and that of case demonstration. The next two sections deal with two aspects of our conceptual understandings of the research question, respectively. First, we develop a novel conceptual framework for distinguishing university types in terms of organisation and governance, which are, to a large degree, determined by the social, political and cultural aspects of higher education systems. Second, we devise an analytical framework for unpacking – categorising and explaining – the tensions facing universities and the types of organisational responses during the transition to sustainable entrepreneurial universities. In the following section, we apply the aforementioned conceptual frameworks in examining university transformations in Brazil and China. In so doing, the influences of contextual factors (i.e. the types of universities mediated by system characteristics) on tensions in transitions towards sustainable entrepreneurial universities are empirically analysed. Finally, we conclude our research's scholarly contribution and practical implications.

ORIGINALITY / VALUE

The extant literature has implied that the patterns of transformation from entrepreneurial universities to sustainable entrepreneurial universities vary between different contexts (e.g. in terms of their organisational structures, managerial styles, profiles and demographics) that are often mediated (either amplified or reduced) by the social, political and cultural systems in which the universities are deeply embedded. Accordingly, universities adopt different strategies to mitigate the effects of the emerging tensions (Cai & Ahmad, 2021). However, the existing literature has failed to provide suitable frameworks for both distinguishing and making sense of the different tensions (explicit, latent, and emergent ones) and organisational responses. Even less research attention has been paid to the influence of higher education systems' characteristics (macro level) on the tensions and organisational responses in the context of university transformations (meso and micro levels).

This situation can easily be understandable, as the research exploring the post-entrepreneurial university era is relatively new and current studies are primarily aimed at identifying and conceptualising new models that replace entrepreneurial universities, often based on

the Western experiences, as demonstrated in the literature review by Cai and Ahmad (2021). Only a handful of studies has attempted to systemically identify universities' tensions when dealing with sustainability (e.g. Lattu & Cai, 2020) or in accounting for the underlying mechanisms underpinning tensions in the post-entrepreneurial era (e.g. Young & Pinheiro, 2022). However, none explores or compares the tensions and organisational responses across diverse national contexts. Nevertheless, the existing literature acknowledges that the differences in tensions and organisational responses are likely to be mediated by contextual factors (government policy, funding, etc.) affecting the organisation and governance of universities, yet the extent to which contextual differences (e.g. in terms of international organisation and system governance) affect observed outcomes (university transformation) remains largely underexplored, both empirically as well as conceptually.

This paper seeks to bridge the research gap mentioned above.

PRACTICAL / SOCIAL IMPLICATIONS

The theoretical conceptualization and empirical findings suggested by the study help policymakers and university managers to design relevant policies and strategies to facilitate university transformation in the context of developing innovation ecosystems.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The conceptual framework developed in the paper still needs to be further enhanced and verified in broad settings.

KEYWORDS (3-5)

Entrepreneurial university, Sustainable entrepreneurial university, Sustainability, Sustainable Development goal.

REFERENCES

- Benneworth, P. (2013). University engagement with socially excluded communities. Springer.
- Cai, Y., & Ahmad, I. (2021). From an Entrepreneurial University to a Sustainable Entrepreneurial University: Conceptualization and Evidence in the Contexts of European University Reforms. *Higher Education Policy*. <https://doi.org/10.1057/s41307-021-00243-z>
- Lattu, A., & Cai, Y. (2020). Tensions in the Sustainability of Higher Education—The Case of Finnish Universities. *Sustainability*, 12(5), 1941. <https://www.mdpi.com/2071-1050/12/5/1941>
- Young, M., & Pinheiro, R. (2022). The Post-entrepreneurial University: The Case for Resilience in Higher Education. In R. Pinheiro, M. L. Frigotto, & M. Young (Eds.), *Towards Resilient Organizations and Societies* (pp. 173-193). Palgrave.

3.10 Boosting students' entrepreneurial mindset: a challenge-based learning approach

Masoumeh Shahverdi¹, Lukasz Andrzej Derdowski¹, Tatiana Aleksandrovna Iakovleva¹, Timothy James Marshall¹

¹University of Stavanger, Norway.

PURPOSE

There is an ongoing debate in the literature on how university programs might enhance student's entrepreneurial mindset to ensure they become a future "agent of change" in their future working place. Growing focus on creativity and finding new approaches to teach students real life challenges in university setting is deeply related to the fulfilment of the University's fourth mission of addressing sustainable development goals for and with society through collaboration with regional and industrial actors (Ankrah et al., 2013). However, traditional teaching methods do not necessarily allow students to develop innovative and creative way of thinking to be able to address future societal challenges. There is a growing body of literature looking on new pedagogical tools- such as action-based learning (Lackeus & Middleton, 2011; Laukkanen, 2000), gamification (Adipat et al., 2021) and challenge-based learning (Abdul Jabbar & Felicia, 2015), that deemed to be suitable tools to enhance this mission.

This article addresses the question of how challenge-based educational programs affect the entrepreneurial mindset of students. There is a long-lasting debate in the literature about whether entrepreneurial behavior can be learned or not and how to boost the individual ability to learn and enhance self-confidence in generating and implementing innovative ideas. With reference to the theory of planned behaviour and the literature on entrepreneurship education, research has confirmed that students deliberately taking entrepreneurship programs do increase their competencies and strengthen their intention toward self-employment (Nabi et al., 2017; Mwasalwiba, 2010; Fayolle & Gailly, 2015). Thus, while it is acknowledged that an entrepreneurial mindset is beneficial for business (Wales et al., 2013; Ferreira et al., 2020) and it is important to build student's competencies in being proactive, innovative, and being able to take calculated risks (Bolton et al., 2012), the question remains how best to stimulate such competences in students irrespective of their interest to pursue a self-employment carrier.

Challenge-based learning (CBL) has recently been introduced as an approach to increase the creativity, innovativeness, and problem-solving competencies of participants. CBL is an emerging pedagogical model and practical approach that connects the classroom to the real-world issues. Research describes the benefits of CBL as a model that offers 'authentic, active learning; offering choice in problem solving and learning practices and enabling training in multidisciplinary teamwork and decision-making; as well as harnessing the desire of many students for a sense of meaning in their education'(Rådberg et al., 2020). Furthermore, CBL offers specific benefits because of its focus on innovation, and is described as an 'innovative pedagogy that actively engages students in relevant real-world problems' (Portuguez Castro & Gómez Zermelo, 2020). The relationship between CBL, innovation and practical application is further emphasized: 'CBL experiences, placed in a societal context, have benefited from, and driven the emergence of a new kind of learning environment, the 'social', or 'open innovation', lab.' (Rådberg et al., 2020).

The purpose of this study is to explore how challenge-based learning can develop students' entrepreneurial mindset defined here as innovativeness, risk-taking, and proactiveness. In other words, this article investigates the following research question: To what extent does the CBL method affect students' entrepreneurial mindset?

DESIGN / METHODOLOGY / APPROACH

This study adopts an exploratory research design with a purposive sampling approach. Data will be collected from students and teachers in a medium-sized regional University in Norway. CBL approach was practiced in the University of Stavanger in different courses, and in this article, we will utilize insights from two intra-curricular courses that applies CBL. We started data collection autumn 2022 and continue this process spring 2023. So far, a focus group interview was conducted with 7 students participated in elective course in autumn. We additionally use student's reflective notes about the course. Feedback from teachers and teaching assistants also collected through interviews. These interviews and reflections are used as insights to

develop a questionnaire that will be distributed to 53 students enrolled in CBL in the spring course. The survey will be distributed in two ways – pre and post course, to capture changes in the entrepreneurial mindset of students as will also allow to evaluate what elements of the CBL approach were most influential.

FINDINGS OR EXPECTED OUTCOMES

Potential results deriving from arranged focus groups are expected to follow a growing strand of research into CBL, and as such explore the value of challenge-based learning methods on building students' entrepreneurial mindset (i.e., their innovativeness, risk-taking preferences, and proactiveness). It is expected that student's motivation to take the course will have a moderating effect on the degree of changes.

ORIGINALITY / VALUE

Challenge-based learning is an emerging pedagogical model that can be applied in any study field and is used more and more within higher education in Europe. Our research contributes to the existing literature by presenting the effects of this new pedagogical model on student's mindset. Moreover, with this study, we contribute to the debate on entrepreneurial mindset (Neck and Corbett, 2018; Piperopoulos, and Dimov, 2015) by extending the existing lines of research to include not only entrepreneurship programs and students seeking self-employment carriers, but also all types of students and learning programs. In Fact, entrepreneurial characteristics are important for students' education, and so we emphasize the fact that CBL has the potential to trigger these skills.

PRACTICAL / SOCIAL IMPLICATIONS

Educating students in any field to be creative, innovative, and entrepreneurial is an important task to universities to find innovative solutions to global challenges and to contribute to achieving sustainable development goals. CBL represents an innovative pedagogical approach that connects students' learning to real-life problems. While working on their projects with self-identified challenge providers' (e.g., businesses, or private/public institutions) students are not only given opportunities to strengthen their problem-solving and collaboration skills, but also key transferable professional skills. CBL's close relationship to the innovation and creativity domain equips students with skills and competencies that are highly desirable for future employment. On top of that, CBL provides benefits for not only students and educators, but also for external stakeholders who, through participation in CBL projects, may gain valuable ideas and expertise specific to their organizations as well as an insight into the pool of highly engaged potential future employees.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This paper is proposed as a start point for future research on the link between challenge based-learning approach and its effect on entrepreneurial number of students who have participated in CBL projects within courses. In addition, the effect of Challenge-based learning projects on entrepreneurial characteristics can be tested longitudinally. As well as this work aims to be a point of reflection for universities and policymakers to improve and foster challenge-based learning framework in entrepreneurship programs. Like any research this one has limitations. A limited number of students were studied relying on a focus group interview and questionnaire. We suggest further research could be useful to examine the larger number of students in different field of study.

KEYWORDS (3-5)

CBL, entrepreneurial mindset, risk taking, innovation, and proactiveness.

REFERENCES

Abdul Jabbar, A. I., & Felicia, P. (2015). Gameplay Engagement and Learning in Game-Based Learning: A Systematic Review. *Review of Educational Research*, 85(4), 740–779. <https://doi.org/>

org/10.3102/0034654315577210

Adipat, S., Laksana, K., Busayanon, K., Ausawasowan, A., & Adipat, B. (2021). Engaging Students in the Learning Process with Game-Based Learning: The Fundamental Concepts. *International Journal of Technology in Education*, 4(3), 542–552. <https://doi.org/10.46328/ijte.169>

Ankrah, S. N., Burgess, T. F., Grimshaw, P., & Shaw, N. E. (2013). Asking both university and industry actors about their engagement in knowledge transfer: What single-group studies of motives omit. *Technovation*, 33(2–3), 50–65. <https://doi.org/10.1016/j.technovation.2012.11.001>

Bolton, Dawn Langkamp, and Michelle D. Lane. "Individual entrepreneurial orientation: Development of a measurement instrument." *Education+ Training* (2012).

Fayolle, A., & Gailly, B. (2015). The impact of entrepreneurship education on entrepreneurial attitudes and intention: Hysteresis and persistence. *Journal of small business management*, 53(1), 75-93.

Ferreira, Jorge, Arnaldo Coelho, and Luiz Moutinho. "Dynamic capabilities, creativity and innovation capability and their impact on competitive advantage and firm performance: The moderating role of entrepreneurial orientation." *Technovation* 92 (2020): 102061.

Lackéus, M., & Middleton, K. W. (2011). *Venture Creation Programs: Entrepreneurial education through real-life content*.

Laukkanen, M. (2000). Exploring alternative approaches in high-level entrepreneurship education: Creating micromechanisms for endogenous regional growth. *Entrepreneurship & Regional Development*, 12(1), 25–47. <https://doi.org/10.1080/089856200283072>

Nabi, G., Liñán, F., Fayolle, A., Krueger, N., & Walmsley, A. (2017). The impact of entrepreneurship education in higher education: A systematic review and research agenda. *Academy of Management Learning & Education*, 16(2), 277-299.

Neck, H. M., & Corbett, A. C. (2018). The scholarship of teaching and learning entrepreneurship. *Entrepreneurship Education and Pedagogy*, 1(1), 8-41.

Piperopoulos, P., & Dimov, D. (2015). Burst bubbles or build steam? Entrepreneurship education, entrepreneurial self-efficacy, and entrepreneurial intentions. *Journal of small business management*, 53(4), 970-985.

Wales, W. J., Gupta, V. K., & Mousa, F. T. (2013). Empirical research on entrepreneurial orientation: An assessment and suggestions for future research. *International small business journal*, 31(4), 357-383.

3.11 Fostering Entrepreneurial Activity: A graduate perspective of bridging university education and support

Lurdes Duarte Patrício¹, João Ferreira¹

¹University of Beira Interior, Portugal

PURPOSE

It is time for universities to examine the role played by entrepreneurial education (Ent_Edu) in shaping the Ent_Uni models to explore and exploit its entrepreneurial benefits (Gianiodis and Meek, 2020). Ent_Uni stand out as catalysts of regional and national economic and social development (Etzkowitz et al., 2000; Gianiodis and Meek, 2020). As knowledge providers, the Ent_Uni has to deploy an entrepreneurial organizational culture characterized by flexibility and openness to change, that encourages entrepreneurship and provides more proactive and engaged responses to solving problems or otherwise helping society (Audretsch and Belitski, 2022; Etzkowitz, 2016), and driving entrepreneurial ecosystems (Ent_Eco) forward (Audretsch and Belitski, 2022). Ent_Uni act as capability aggregators (Audretsch et al., 2019), bridging innovation and Ent_Eco (Autio et al., 2014) and play a preminent role in establishing the framework and conditions for Ent_Eco through entrepreneurial education (GEM, 2022). The adequacy of the HEInnovate self-assessment tool, in accordance with graduates who undertook entrepreneurial projects, underpin the formulation of the following research questions: How relevant are the HEInnovate dimensions - Entrepreneurial Teaching and Learning, Preparing and Supporting Entrepreneurs, and Digital Transformation and Capability - for further developing entrepreneurial activity? And what aspects are missing from a graduate-centered perspective?

The proposed framework visualises the articulation in the various research propositions (RP) formulated. Thus, the findings provide practical guidelines for rendering HEI more robust in terms of Ent_Edu. Thirdly and finally, based on the empirical evidence and in response to the research questions established, this sets out a framework enabling the illustration of the articulation in these themes and their positioning in the mutualism of Triple Helix (TH) dynamics.

DESIGN / METHODOLOGY / APPROACH

Based on several interviews with graduate entrepreneurs, this study reveals the multiple different aspects involved in the university entrepreneurial structures approached by the dimension of the HEInnovate scale. This study discusses how Ent_Uni may train their graduates to develop entrepreneurial activities through investment in entrepreneurial education and a strong link between theoretical and practical aspects, thereby incorporating greater cooperation with industry and the government.

FINDINGS OR EXPECTED OUTCOMES

The findings convey how entrepreneurial graduates are aware of the need for university-industry collaboration and the dependence on government policy and funding. The findings generate implications.

ORIGINALITY / VALUE

This study contributes for theory and practice as well as a framework illustrating the articulation among formulated research propositions and underlining their positioning within the mutual engagement of triple-helix dynamics.

PRACTICAL / SOCIAL IMPLICATIONS

The findings convey how entrepreneurial graduates are aware of the need for university-industry collaboration and the dependence on government policy and funding. Policymakers are in a position that, in recognizing Ent_Uni as catalysts of economic and social development, they must prioritize investment in Ent_Edu and advance the Ent_Eco. The findings suggest the need for more funding to enable HEI to successfully deploy digital transformation. The results also convey how, rather than coping with digitalization, it is essential to acknowledge the future is undoubtedly digital and the crucial nature of developing a digital culture that nurtures digital competencies in staff and students, enabling digital affordances. University-industry cooperation essential given the potential to generate new knowledge and interactions between the contents taught in the classroom with experience in industry, thus strengthening problem-solving capacities. Promoting cooperation between industry and academia requires

structuring according to entrepreneurial dynamics contextualized within ecosystem contexts.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

We focus on a single self-assessment institutional evaluative framework – HEInnovate – that may be a factor of limitation. Eventually, we might benefit from comparatively analyzing institutional evaluative frameworks (as in the work of Etzkowitz, 2016). Had we taken this approach, we might have commented on eventual improvements and which were most suitable according to the reality of each interviewee. Furthermore, as this study investigates graduate entrepreneurs in a single culture, it is essential to recognize and analyze how context-specific factors influence theorization and delimit the context and impact of its findings. The role of context on the theoretical, managerial and policy implications of entrepreneurial innovation has been widely studied and reporting stimulating and significant effects on the outcomes of entrepreneurial innovation (Autio et al., 2014).

KEYWORDS (3-5)

Entrepreneurial University, Entrepreneurial Ecosystem, Entrepreneurial Activity, University Support for Entrepreneurship, University Digital Capacity.

REFERENCES

- Abreu, M., Demirel, P., Grinevich, V. and Karataş-Özkan, M. (2016), "Entrepreneurial practices in researchintensive and teaching-led universities", *Small Business Economics*, Vol. 47 No. 3, pp. 695– 717.
- Audretsch, D.B. and Belitski, M. (2022), "A strategic alignment framework for the entrepreneurial university", *Industry and Innovation*, Vol. 29 No. 2, pp. 285–309.
- Audretsch, D.B., Cunningham, J.A., Kuratko, D.F., Lehmann, E.E. and Menter, M. (2019), "Entrepreneurial ecosystems: economic, technological, and societal impacts", *Journal of Technology Transfer*, Vol. 44 No. 2, pp. 313–325.
- Autio, E., Kenney, M., Mustar, P., Siegel, D. and Wright, M. (2014), "Entrepreneurial innovation: The importance of context", *Research Policy*, Vol. 43 No. 7, pp. 1097–1108.
- Etzkowitz, H. (2016), "The Entrepreneurial University: Vision and Metrics", *Industry and Higher Education*, Vol. 30 No. 2, pp. 83–97.
- Etzkowitz, H., Webster, A., Gebhardt, C. and Terra, B. (2000), "The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm", *Research Policy*, Vol. 29, pp. 313–330.
- GEM. (2022), *Global Entrepreneurship Monitor 2021 / 2022 Global Report - Opportunity Amid Disruption*. Gianiodis, P.T. and Meek, W.R. (2020), "Entrepreneurial education for the entrepreneurial university: a stakeholder perspective", *Journal of Technology Transfer*, Vol. 45 No. 4, pp. 1167–1195.

3.12 Advancing Higher Education Sustainability: An Assessment of the Sustainable Entrepreneurial Universities Framework

Siro Pina¹, Junaid Kajee¹, Bernardo Sfredo¹, Mattia Quinteri¹, Pamela Maldini¹, Fernando Castellanos¹, Karol Wiktor¹

¹Tampere University, Finland.

PURPOSE

The integration of the dimension of sustainable development into Triple-Helix based innovation systems marks the advent of the post-entrepreneurial university era. In response to this development, a growing body of literature has proposed new models for universities, such as civic universities (Goddard and Vallance 2013; Goddard et al. 2016), engaged universities (Benneworth 2013), ideas of a university ecology (Wright 2016), responsible university (Sørensen et al. 2019), university 4.0 (Giesenbauer and Müller-Christ 2020), and sustainable entrepreneurial university (SEU) (Cai & Ahmad, 2021). Among those, the SEU model offers the most comprehensive set of indicators for understanding unique features of SEU in comparison to the previously prevailing models of entrepreneurial and ivory tower universities (Cai & Ahmad, 2021). Despite the promise of the SEU model, its framework remains at a conceptual level, and the dimensions used to capture its unique features require further refinement through critical examination in empirical contexts. Moreover, there is a significant lack of quantifiable measures for the SEU model, in contrast to the more advanced development of quantitative indicators for entrepreneurial universities, such as HEInnovate and Metrics of the entrepreneurial university. However, the metrics of entrepreneurial universities pay limited attention to the crucial aspect of sustainability emphasized in the SEU model. This research endeavors to fill in the existing lacunae by investigating the following queries:

- 1) What is the effectiveness of Cai and Ahmad's conceptual framework in evaluating the convergence of universities towards SEU?
- 2) In what ways can the theoretical construct be further developed?

DESIGN / METHODOLOGY / APPROACH

We approach our research questions through

- 1) qualitative analysis of six Finnish universities' strategies and 2) synthesizing relevant literature.

FINDINGS OR EXPECTED OUTCOMES

Our expected outcomes are as follows:

- 1) Verified usefulness of the Social Entrepreneurial Universities (SEU) framework proposed by Cai and Ahmad (2021) in analyzing how the Finnish universities' strategies steer institutional development towards the SEU model.
- 2) Enhanced SEU framework by refining and augmenting the indicators to more effectively capture the distinctive features of SEU.
- 3) Proposed metric for SEU that enables (future) qualitative assessment of sustainability and innovation potential of universities.

ORIGINALITY / VALUE

Our study aims to contribute to the field of sustainability and innovation in universities. We critically assess the SEU framework proposed by Cai and Ahmad (2021) and explore the potential of incorporating indicators in line with the 17 Sustainable Development Goals (SDGs) set forth by the United Nations. Our findings will give universities an analytical framework to evaluate their strategies for enhancing sustainability practices and contribute to the development of higher education (HE) frameworks that promote economic, social, and environmental sustainability. Furthermore, our study aims to ensure that the general trend of steering institutional development toward the SEU model yields equitable benefits to all stakeholders.

PRACTICAL / SOCIAL IMPLICATIONS

The practical and social implications of this research are far-reaching. By verifying the usefulness of the SEU framework and enhancing its indicators, we provide universities with a robust tool to evaluate their sustainability and innovation progress. This will allow universities to identify areas for improvement and create a roadmap toward creating a more sustainable, equitable, and socially responsible HE system. Our study will also provide HE stakeholders with a valuable set of lenses to assess the sustainability and innovation potential of universities and design fruitful initiatives. The results of this study could potentially contribute to the realization of the SDGs.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Building upon the findings of the present study, future researchers could consider expanding the scope to include universities from different regions and countries for a deeper understanding of global trends and challenges in analyzing institutional convergence to SEU. Additionally, exploring the relationship between the SEU framework and existing higher education policies and regulations would provide insights into the potential barriers and opportunities for implementation. Furthermore, studying the impact of the SEU approach on various stakeholders, such as students, faculty, and surrounding communities, would help assess the outcomes and benefits of this transformation toward a more sustainable and equitable HE environment.

The present study has several limitations that should be acknowledged. The sample size of the study is limited to six Finnish universities, which means that the findings may not be generalizable to other universities outside Finland. Additionally, the proposed SEU framework and proposed additions are still in the early stages of development and may require further cross-cultural adaptation to establish their transferability. The complexity of sustainability and innovation is also a limitation to consider, as these topics are multi-dimensional and may be challenging to capture through documental analysis.

KEYWORDS (3-5)

Sustainable Entrepreneurial University; institutional change; sustainability; strategic plans; Finland.

REFERENCES

- Benneworth, P. (2013) University engagement with socially excluded communities. Dordrecht; London: Springer.
- Cai, Y., & Ahmad, I. (2021). From an entrepreneurial university to a sustainable entrepreneurial university: Conceptualization and evidence in the contexts of European university reforms. *Higher Education Policy*, 1-33, doi:10.1057/s41307-021-00243-z.
- Goddard, J., Hazelkorn, E., & Vallance, P. (Eds.). (2016). *The civic university: The policy and leadership challenges*. Edward Elgar Publishing.
- Giesenbauer, B. and Müller-Christ, G. (2020) University 4.0: Promoting the Transformation of Higher Education Institutions toward Sustainable Development. *Sustainability* 12(8): 3371
- Goddard, J., and Vallance, P. (2013) *The university and the city*. Edited by Gillian Bristow. 63 vols, Regions and Cities. London and New York: Routledge.
- Sørensen, M. P., Geschwind, L., Kekäle, J., & Pinheiro, R. (2019). *The responsible university: Exploring the Nordic context and beyond* (p. 318). Springer Nature.
- Von Schomberg, R. (2012). Prospects for technology assessment in a framework of responsible research and innovation. *Technikfolgen abschätzen lehren: Bildungspotenziale transdisziplinärer Methoden*, 39-61.
- Wright, S. (2016) Universities in a knowledge economy or ecology? *Policy, contestation and abjection. Critical Policy Studies* 10(1): 59–78. <https://doi.org/10.1080/19460171.2016.1142457>

3.13 Entrepreneurial and Obsessive Scientific Passion in Academia: How Role Models and Perceived Entrepreneurial Climate Influence the Passion Orchestra

Malte Stulgies¹

¹RWTH Aachen, Germany

PURPOSE

In today's world, entrepreneurship is not only key in business but also relevant in academia – extending universities' purpose of teaching and researching to fostering entrepreneurship (Grimaldi et al., 2011) and creating a positive societal impact (Siegel & Wright, 2015). This tension of mixed objectives is captured by the interplay of entrepreneurial and obsessive scientific passion, also known as the "passion orchestra" (Huyghe et al., 2016). Previous studies have focused on potential outcomes of passion, such as entrepreneurial intention and behavior (Wang et al., 2022; Obschonka et al., 2018; Murnieks et al., 2014; Jain et al., 2009). Additionally, Fini et al. (2022) linked entrepreneurial behavior back to increased scientific productivity, underlining the importance for academia. But, although first studies focus on the development of identity as part of passion (Hayter et al., 2021) or on singular internal aspects of passion (Lex et al., 2022; Gielnik et al., 2017), research on the drivers for the emergence of passion across domains (entrepreneurship and academia) and dualistic types (harmonious and obsessive) remains scarce (Lex et al., 2022; Murnieks, Klotz, & Shepherd, 2020; Hmieleski & Powell, 2018; Cardon & Kirk, 2015). Specifically, the yet-to-be-detailed influence of academic institutional context on passion development (Perkmann et al., 2021; Siegel & Wright, 2015) offers promising complementary insights, considering that passion and its types (Robert J. Vallerand, 2015; Mageau et al., 2009) fluctuate, among others, depending on contextual factors (Lex et al., 2022; Murnieks, Cardon, & Haynie, 2020; Collewaert et al., 2016). Leveraging data from 1198 academics, this study aims at understanding the impact of entrepreneurial role models on the passion orchestra, as role models pose a key relational factor within the institutional context (Türk et al., 2020; Tartari et al., 2014; Brettel et al., 2013). We thus bridge institutional and identity theory by additionally including institutional characteristics, namely perceived entrepreneurial climate and affective organizational commitment as moderation and mediation.

DESIGN / METHODOLOGY / APPROACH

We conducted a web-based survey targeting individuals on three of Germany's "TU9" universities of science and technology, as they foster entrepreneurship and are at the forefront of policy making (TU9 German Institutes of Technology e.V., 2022; Greven et al., 2020). To reduce biases and increase representativeness, we draw on a diverse sample of academic employees and professors across STEM fields and medicine (Fini et al., 2020; Cohen et al., 2020; Perkmann et al., 2013). More than 17,000 participants were contacted in December 2022 for a total of 1,198 academics completing the survey (8% response rate). We conducted several tests to ensure reliability and validity of our findings, including tests for potential multicollinearity, non-response, and common method biases. Additionally, we adopted several measures to minimize potential biases and guarantee the robustness of our findings, e.g., relying on previously validated survey constructs (see Figure 1 in Appendix) and adding secondary data.

FINDINGS OR EXPECTED OUTCOMES

We base our hypotheses and findings on two major theories: (1) Identity theory (Stryker & Serpe, 1994), particularly its application regarding passion (Cardon et al., 2009) and (2) institutional theory (Powell & DiMaggio, 1991). In extension, we build upon the work on the passion orchestra by Huyghe et al. (2016) and on dualistic passion by Vallerand et al. (2003).

Leveraging prior work, we theorize a direct effect of entrepreneurial role models on the passion orchestra and a mediated effect through perceived entrepreneurial climate. First, we posit that having an entrepreneurial role model has (H1a) a positive effect on entrepreneurial passion and (H1b) a negative effect on obsessive scientific passion as it shows the validity of entrepreneurial behavior and reduces perceived tension between science and entrepreneurship (Vallerand, 2010). Contrary, for the indirect effect we expect a (H2a) positive effect on entrepreneurial passion, but also (H2b) a positive effect on obsessive scientific passion, as the perceived climate conflicts with scientific

behavior (Huyghe et al., 2016; Aschhoff & Grimpe, 2014). For a full overview see Table 1 in Appendix. Preliminary analysis supports our hypotheses for entrepreneurial passion, but, surprisingly, contradicts our hypotheses for obsessive scientific passion. Final results, including statistical tests, will be available for the Triple Helix 2023.

ORIGINALITY / VALUE

Our study provides novel empirical evidence adding to our understanding of the influence of institutional context as driver of passion across two domains and types (Murnieks, Cardon, & Haynie, 2020), hence bridging institutional, identity, and dualistic passion theory towards an integrated view. Academic entrepreneurship is particularly well-suited to extend existing knowledge and create generalizable findings, as it offers two diverging objectives within one organization (Fini et al., 2019).

PRACTICAL / SOCIAL IMPLICATIONS

For practitioners, we offer additional insights: We help policymakers to better understand the role of entrepreneurial role models, not only to foster entrepreneurial passion, but also to reduce obsessive feelings towards science in academia. Building upon this, our findings can help decision-makers to identify drivers of obsessive passion in more generic organizations with diverging objectives. Lastly, we enable entrepreneurial role models to better understand their influence on others and invite them to leverage this position, e.g., by spreading information about their entrepreneurial activities.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

As with all empirical research, this study bears some limitations, which, in turn, create avenues for additional research. First, as our respondents are academics affiliated with German Technical Universities, we recommend further research to replicate our study design in different settings within and outside academia. Second, as we leverage cross-sectional data, we cannot infer how the influence of entrepreneurial role models on passion changes over time – hence, we advocate for supplementary longitudinal studies to enhance the understanding of the emergence of passion. Third, with our study, we offer novel insights into one institutional aspect. By assessing, for example, role identity centralities (Murnieks, Cardon, & Haynie, 2020), perceived social norms (Obschonka et al., 2015) or university mission (Huyghe & Knockaert, 2015) as drivers for the passion orchestra, future studies can complement our findings.

KEYWORDS (3-5)

Academic Entrepreneurship; Passion Orchestra; Role Models; Institutional Theory; Identity Theory.

REFERENCES

- Aschhoff, B., & Grimpe, C. (2014). Contemporaneous peer effects, career age and the industry involvement of academics in biotechnology. *Research Policy*, 43(2), 367–381. <https://doi.org/10.1016/j.respol.2013.11.002>
- Brettel, M., Mauer, R., & Walter, T. (2013). High-profile employees at universities and their intentions of commercializing research results. *Journal of Business Economics*, 83(4), 357–382. <https://doi.org/10.1007/s11573-013-0659-3>
- Cardon, M. S., & Kirk, C. P. (2015). Entrepreneurial Passion as Mediator of the Self-Efficacy to Persistence Relationship. *Entrepreneurship Theory and Practice*, 39(5), 1027–1050. <https://doi.org/10.1111/etap.12089>
- Cardon, M. S., Wincent, J., Singh, J., & Drnovsek, M. (2009). The nature and experience of entrepreneurial passion. *Academy of Management Review*, 34(3), 511–532. <https://doi.org/10.5465/amr.2009.40633190>
- Cohen, W. M., Sauermann, H., & Stephan, P. (2020). Not in the Job Description: The Commercial Activities of Academic Scientists and Engineers. *Management Science*, 66(9), 4108–4117. <https://doi.org/10.1287/mnsc.2019.3535>
- Collewaert, V., Anseel, F., Crommelinck, M., Beuckelaer, A. de, & Vermeire,

- J. (2016). When Passion Fades: Disentangling the Temporal Dynamics of Entrepreneurial Passion for Founding. *Journal of Management Studies*, 53(6), 966–995. <https://doi.org/10.1111/joms.12193>
- Fini, R., Grimaldi, R., & Meoli, A. (2020). The effectiveness of university regulations to foster science-based entrepreneurship. *Research Policy*, 49(10), 104048. <https://doi.org/10.1016/j.respol.2020.104048>
- Fini, R., Perkmann, M., & Ross, J.-M. (2022). Attention to Exploration: The Effect of Academic Entrepreneurship on the Production of Scientific Knowledge. *Organization Science*, 33(2), 688–715. <https://doi.org/10.1287/orsc.2021.1455>
- Fini, R., Rasmussen, E., Wiklund, J., & Wright, M. (2019). Theories from the Lab: How Research on Science Commercialization can Contribute to Management Studies. *Journal of Management Studies*, 56(5), 865–894. <https://doi.org/10.1111/joms.12424>
- Gielnik, M. M., Uy, M. A., Funken, R., & Bischoff, K. M. (2017). Boosting and sustaining passion: A long-term perspective on the effects of entrepreneurship training. *Journal of Business Venturing*, 32(3), 334–353. <https://doi.org/10.1016/j.jbusvent.2017.02.003>
- Greven, A., Strese, S., & Brettel, M. (2020). Determining scientists' academic engagement: Perceptions of academic chairs' entrepreneurial orientation and network capabilities. *The Journal of Technology Transfer*, 45(5), 1376–1404. <https://doi.org/10.1007/s10961-019-09750-z>
- Grimaldi, R., Kenney, M., Siegel, D. S., & Wright, M. (2011). 30 years after Bayh-Dole: Reassessing academic entrepreneurship. *Research Policy*, 40(8), 1045–1057. <https://doi.org/10.1016/j.respol.2011.04.005>
- Hayter, C. S., Fischer, B., & Rasmussen, E. (2021). Becoming an academic entrepreneur: How scientists develop an entrepreneurial identity. *Small Business Economics*, 1–19. <https://doi.org/10.1007/s11187-021-00585-3>
- Hmieleski, K. M., & Powell, E. E. (2018). The Psychological Foundations of University Science Commercialization: A Review of the Literature and Directions for Future Research. *Academy of Management Perspectives*, 32(1), 43–77. <https://doi.org/10.5465/amp.2016.0139>
- Huyghe, A., & Knockaert, M. (2015). The influence of organizational culture and climate on entrepreneurial intentions among research scientists. *The Journal of Technology Transfer*, 40(1), 138–160. <https://doi.org/10.1007/s10961-014-9333-3>
- Huyghe, A., Knockaert, M., & Obschonka, M. (2016). Unraveling the "passion orchestra" in academia. *Journal of Business Venturing*, 31(3), 344–364. <https://doi.org/10.1016/j.jbusvent.2016.03.002>
- Jain, S., George, G., & Maltarich, M. (2009). Academics or entrepreneurs? Investigating role identity modification of university scientists involved in commercialization activity. *Research Policy*, 38(6), 922–935. <https://doi.org/10.1016/j.respol.2009.02.007>
- Lex, M., Gielnik, M. M., Spitzmuller, M., Jacob, G. H., & Frese, M. (2022). How Passion in Entrepreneurship Develops Over Time: A Self-Regulation Perspective. *Entrepreneurship Theory and Practice*, 46(4), 985–1018. <https://doi.org/10.1177/1042258720929894>
- Mageau, G. A. [Geneviève A.], Vallerand, R. J., Charest, J., Salvy, S.-J., Lacaille, N., Bouffard, T., & Koestner, R. (2009). On the development of harmonious and obsessive passion: The role of autonomy support, activity specialization, and identification with the activity. *Journal of Personality*, 77(3), 601–646. <https://doi.org/10.1111/j.1467-6494.2009.00559.x>
- Murnieks, C. Y., Cardon, M. S., & Haynie, J. M. (2020). Fueling the fire: Examining identity centrality, affective interpersonal commitment and gender as drivers of entrepreneurial passion. *Journal of Business Venturing*, 35(1), 105909. <https://doi.org/10.1016/j.jbusvent.2018.10.007>
- Murnieks, C. Y., Klotz, A. C., & Shepherd, D. A. (2020). Entrepreneurial motivation: A review of the literature and an agenda for future research. *Journal of Organizational Behavior*, 41(2), 115–143. <https://doi.org/10.1002/job.2374>
- Murnieks, C. Y., Mosakowski, E., & Cardon, M. S. (2014). Pathways of Passion: Identity Centrality, Passion, and Behavior Among Entrepreneurs. *Journal of Management*, 40(6), 1583–1606. <https://doi.org/10.1177/0149206311433855>
- Obschonka, M., Moeller, J., & Goethner, M. (2018). Entrepreneurial Passion and Personality: The Case of Academic Entrepreneurship. *Frontiers in Psychology*, 9, 2697. <https://doi.org/10.3389/fpsyg.2018.02697>
- Obschonka, M., Silbereisen, R. K., Cantner, U., & Goethner, M. (2015). Entrepreneurial Self-Identity: Predictors and Effects Within the Theory of Planned Behavior Framework. *Journal of Business and Psychology*, 30(4), 773–794. <https://doi.org/10.1007/s10869-014-9385-2>
- Perkmann, M., Salandra, R., Tartari, V., McKelvey, M., & Hughes, A. (2021). Academic engagement: A review of the literature 2011–2019. *Research Policy*, 50(1), 104114. <https://doi.org/10.1016/j.respol.2020.104114>
- 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(2), 423–442. <https://doi.org/10.1016/j.respol.2012.09.007>
- Powell, W. W., & DiMaggio, P. K. (1991). *The new institutionalism in organizational analysis*. Univ. of Chicago Press.
- Robert J. Vallerand. (2015). *The Psychology of Passion: A Dualistic Model*. In R. J. Vallerand (Ed.), *The psychology of passion: A dualistic model*. Oxford University Press. <https://oxford.universitypressscholarship.com/view/10.1093/acprof:oso/9780199777600.001.0001/acprof-9780199777600>
- Siegel, D. S., & Wright, M. (2015). Academic Entrepreneurship: Time for a Rethink? *British Journal of Management*, 26(4), 582–595. <https://doi.org/10.1111/1467-8551.12116>
- Stryker, S., & Serpe, R. (1994). Identity Saliency and Psychological Centrality: Equivalent, Overlapping, or Complementary Concepts? *Social Psychology Quarterly*, 57, 16–35.
- Tartari, V., Perkmann, M., & Salter, A. (2014). In good company: The influence of peers on industry engagement by academic scientists. *Research Policy*, 43(7), 1189–1203. <https://doi.org/10.1016/j.respol.2014.02.003>
- TU9 German Institutes of Technology e.V. (2022). *TU9-Positionspapier: Transfer neu denken – Ein Innovationsökosystem auf nationaler und europäischer Ebene*. https://www.tu9.de/media/download/tu9-pp_2022-02_innovationsoekosystem_de.pdf
- Türk, S., Zapkau, F. B., & Schwens, C. (2020). Prior entrepreneurial exposure and the emergence of entrepreneurial passion: The moderating role of learning orientation. *Journal of Small Business Management*, 58(2), 225–258. <https://doi.org/10.1080/00472778.2019.1659678>
- Vallerand, R. J. (2010). Chapter 3 - On Passion for Life Activities: The Dualistic Model of Passion. In *Advances in Experimental Social Psychology* (Vol. 42, pp. 97–193). Academic Press. [https://doi.org/10.1016/S0065-2601\(10\)42003-1](https://doi.org/10.1016/S0065-2601(10)42003-1)
- Vallerand, R. J., Blanchard, C., Mageau, G. A. [Geneviève A.], Koestner, R., Ratelle, C., Leonard, M., Gagne, M., & Marsolais, J. (2003). Les passions de l'ame: On obsessive and harmonious passion. *Journal of Personality and Social Psychology*, 85(4), 756–767. <https://doi.org/10.1037/0022-3514.85.4.756>
- Wang, M., Soetanto, D., Cai, J., & Munir, H. (2022). Scientist or Entrepreneur? Identity centrality, university entrepreneurial mission, and academic entrepreneurial intention. *The Journal of Technology Transfer*, 47(1), 119–146. <https://doi.org/10.1007/s10961-021-09845-6>

3.14 Embedding Sustainability at a Liberal Arts University

Silvia Carnini Pulino¹

¹John Cabot University, Italy.

PURPOSE

In recent years sustainability, has become one of the focal points tertiary education, receiving significant attention from entrepreneurial ecosystems, business and government. However, while the curricular offer has been increased to include a plethora of courses on environmental, economic and social sustainability, there are fewer examples of developing a sustainability mindset (SM) across disciplines in a liberal arts environment. This paper builds on an earlier paper on the process model to embed entrepreneurship in a similar context (Carnini Pulino, 2021), and showcases the experience of John Cabot University, an accredited American liberal arts university in Italy, in promoting a sustainability mindset across the board, clearly showing that an SM can be established intentionally, through a carefully crafted strategy that rests on building synergistic relationships and authenticity within the university, and between the university and the business and governmental communities. The model consists of a first phase of exploration of internal opportunities, which in turn examines the university's resources and objectives, leading to the construction of basic building blocks; the second phase consists of external connectivity and validation, when the basic building blocks are layered with internal and external connections – leveraging academics and existing interest groups, including the entrepreneurial, business and governmental communities, and finally achieving institutionalization of a SM within the institution. The paper then adapts Gibb's framework for building a university-wide entrepreneurial education strategy from synergistic exploration (Gibb, 2012), to qualitatively measure the outcomes of this experience in terms of: knowledge transfer, exchange and support; mission, governance and strategy; stakeholder engagement; internationalization; and sustainability education.

DESIGN / METHODOLOGY / APPROACH

The paper is based on a thorough review of the background literature, and extensive primary research, in the form of in-depth interviews with the director of the School of Business, the Chair of the Business Administration Department, the Coordinator of the Sustainability Project, other relevant faculty in various departments (e.g. Communications, Political Science, International Affairs, Studio Art), participating students, participating organizations, and university alumni involved in the project design. Quantitative data was obtained from the School of Business', the Department's and the university's official records. Extensive primary research - in-depth interviews with the main players.

FINDINGS OR EXPECTED OUTCOMES

The university has grown and matured on the basis of strong values, leadership support, a firm belief in the benefits of an SM, and a concerted effort that maps well onto best practices identified by modern academic research. It is evidence that a liberal arts institution can create a thriving environment for a SM, overcoming constraints through intentionality, creativity and collaboration, and leveraging a tradition of liberal arts education and interdisciplinarity. It is possible to embed a SM throughout the university by leveraging and developing new relationships with business and governmental organizations.

ORIGINALITY / VALUE

The experience points to a model that can be adapted and replicated in other institutions to develop a culture of sustainability that goes beyond a specific course and embraces the whole academic community, as well as the business and social fabric surrounding it. Furthermore, as this is the second instance of application of the model, it shows that it can be applied to other characteristics a university wishes to embed, such as diversity and inclusion, or a culture of student academic scholarship, or a multicultural outlook.

PRACTICAL / SOCIAL IMPLICATIONS

the model can be a powerful vehicle of change. Today's students will shortly become young adults, choosing whether to focus on their own personal achievements or to become active citizens who can correct

irresponsible behavior and social injustice through values modeled, developed and put into practice at their educational institution.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This experience also presents some limitations: the project, while reaching extraordinary results in just one year, is still in its infancy; the university represents a small size sample, which may detract from the robustness of the outcomes; the assessment of impact is only indicative, and does not attempt to measure SM; in addition, while the discipline of scarcity may have led to a creative approach, greater access to financial and human resources may accelerate the process.

KEYWORDS (3-5)

Sustainable mindset, embedding culture, values-driven education.

REFERENCES

- Adams, Richard, Stephen Martin, and Katy Boom. "University culture and sustainability: Designing and implementing an enabling framework." *Journal of cleaner production* 171 (2018): 434-445.
- Bae, T.J., Qian, S., Miao, C. and Fiet, J.O., 2014. The relationship between entrepreneurship education and entrepreneurial intentions: A meta-analytic review. *Entrepreneurship theory and practice*, 38(2), pp.217-254.
- Barnett, M. L.; Salomon, R. M. Does it pay to be really good? Addressing the shape of the relationship between social and financial performance. *Strateg. Manag. J.* 2012, 33(11), 1304- 1320.
- Bazan, C., Shaikh, A., Frederick, S., Amjad, A., Yap, S., Finn, C. and Rayner, J., 2019. Effect of memorial university's environment & support system in shaping entrepreneurial intention of students. *Journal of Entrepreneurship Education*, 22(1), pp.1-35.
- Boeve-de Pauw, Jelle, Niklas Gericke, Daniel Olsson, and Teresa Berglund. "The effectiveness of education for sustainable development."
- Cotterell, Debbie, Charles Arcodia, and Jo-Anne Ferreira. "Educating tourism students to have a sustainable mindset: A study into how universities can develop students' capabilities to have more complex understandings of sustainability." In *CAUTHE 2015: Rising Tides and Sea Changes: Adaptation and Innovation in Tourism and Hospitality: Adaptation and Innovation in Tourism and Hospitality*, pp. 436-439. Gold Coast, QLD: School of Business and Tourism, Southern Cross University, 2015.
- FAIRFIELD, KENT D. "EDUCATING FOR A SUSTAINABILITY MINDSET." *Journal of Management for Global Sustainability* 6 no. 1 (2018).
- Fayolle, A., 2018. Personal views on the future of entrepreneurship education. In a research agenda for entrepreneurship education. Edward Elgar Publishing.
- Galpin, Timothy, J. Lee Whittington, and Greg Bell. "Is your sustainability strategy sustainable? Creating a culture of sustainability" *Corporate Governance* (2015).
- Gibb, A., 2012. Exploring the synergistic potential in entrepreneurial university development: towards the building of a strategic framework. *Annals of Innovation & Entrepreneurship*, 3(1), p.16742.
- Godwyn, M., 2009. Can the Liberal Arts and Entrepreneurship Work Together?. *Academe*, 95(1), pp.36-38.
- Creating a culture of sustainability."
- Green, D., George Taylor, and Violet Ford. "Cultivating the entrepreneurial mindset in today's small liberal colleges and universities." *Journal of Entrepreneurship* 4, no. 1 (2020): 14-26.
- Hermes, Jan, and Isabel Rimanoczy. "Deep learning for a sustainability mindset." *The International Journal of Management Education* 16, no.3 (2018): 460-467.
- Hines Jr, S.M., 2005. The practical side of liberal education: An overview of liberal education and entrepreneurship. *Peer Review*, 7(3), p.4.
- Hopkins, Charles, and Rosalyn McKeown. "Education for sustainability development: an international perspective." *Education and sustainability: Responding to the global challenge* 13 (2002): 13-24.
- Kassel, Kerul, Isabel Rimanoczy, and Shelley F. Mitchell. "A sustainability mindset model for management education." In *Developing a*

sustainability mindset in management education, pp. 3-37. Routledge, 2018.

Kassel, Kerul, Isabel Rimanoczy, and Shelley F. Mitchell. "The sustainable mindset: Connecting being, thinking, and doing in management education." In *Academy of management proceedings*, vol. 2016, no. 1, p. 16659. Briarcliff Manor, NY 10510: Academy of Management, 2016.

Kunrath, Kamila, and Devarajan Ramanujan. "Fostering sustainable mindsets in engineering education." *Proceedings of the Design Society 1* (2021): 1597-1606.

Laalo, H. and Heinonen, J., 2016. Governing the entrepreneurial mindset: Business students' constructions of entrepreneurial subjectivity. *European Educational Research Journal*, 15(6), pp.696-713.

McKeown, Rosalyn, Charles A. Hopkins, Regina Rizi, and Marianne Chrystalbridge. *Education for sustainable development toolkit*. Knoxville: Energy, Environment and Resources Center, University of Tennessee, 2002.

Moon, Christopher J., Andreas Walmsley, and Nikolaos Apostolopoulos. "Governance implications of the UN higher education sustainability initiative." *Corporate Governance: The international journal of business in society* (2018).

Panda, B.; Leepsa, N. M. Agency theory: Review of theory and evidence on problems and perspectives. *Indian J. of Corp. Gov.* 2017, 10(1), 74-95.

Rimanoczy, Isabel. *The sustainability mindset principles: A guide to develop a mindset for a better world*. Routledge, 2020.

Ruge, Gesa. "Sustainability mindset framework for educational developers supporting future-ready curricula and student learning." *ETH Learning and Teaching Journal* 2, no. 2 (2020): 432-436.

Shields, Deborah J., Slavko V. Šolar, and Wade E. Martin. "The role of values and objectives in communicating indicators of sustainability." *Ecological Indicators* 2, no. 1-2 (2002): 149-160.

Spence, M. Job market signaling, *Q. J. of Econ.* 1973, 87(3), 355-374.

Tavanti, Marco, and Elizabeth Wilp. "The Common Good Mindset: An Integrated Model for Sustainability and Leadership Management Education." *Sustainability mindset and transformative leadership* (2021): 1-18.

Trivedi, R., 2016. Does university play significant role in shaping entrepreneurial intention? A cross-country comparative analysis. *Journal of Small Business and Enterprise Development*.

Vare, Paul, and William Scott. "Learning for a change: Exploring the relationship between

education and sustainable development."

Journal of Education for Sustainable Development 1, no. 2 (2007): 191-198.

Worts, Douglas. "Fostering a culture of sustainability." *Museums & social issues* 1, no. 2 (2006): 151-172.

3.15 Entrepreneurial University and Innovation Environments: Entrepreneurship as a Basis for Development

Vanessa Aparecida Pereira Batista¹, Ester Almeida Reis¹, Francylara Miranda Castro¹, Jucelia Maria Lopes Maia Roberto¹, Adriana Ferreira de Faria¹

¹TecnoPARQ - Technological Park of Vicosa

PURPOSE

The objective of this study is to address the interaction between the Federal University of Vicosa and tecnoPARQ in the generation of new businesses in order to leverage the development of the regional ecosystem

DESIGN / METHODOLOGY / APPROACH

Entrepreneurship and education are two opportunities that need to be leveraged and interconnected to develop the human capital needed to build the societies of the future (VOLKMANN et al., 2009), since entrepreneurship is the engine that fuels innovation, generation employment and economic and social growth. According to Etzkowitz (2006) for universities to become entrepreneurial, it is necessary to assume their third mission – in addition to teaching and research, the institution must promote social and economic development, through the interaction between university-government-business (Triple Helix). Based on mechanisms such as innovation environments, the teaching of entrepreneurship facilitates the development of individual skills and the ideal scenario for this is university education, based on an entire integrated ecosystem in favor of an entrepreneurial culture that creates strategies for local development, thus contributing to the increase of qualified jobs, the generation of innovations and the growth of cities (LINDH; THORGREN, 2016). The methodology adopted in this article comprises bibliographic research and document analysis, through secondary sources and data from the institution itself and the companies linked to it. The approach used is based on qualitative research, characterized by the use of qualitative analysis, and “by the non-use of statistical instruments in data analysis” (ZANELLA, 2013, p.)

FINDINGS OR EXPECTED OUTCOMES

The Technological Park of Vicosa (tecnoPARQ-UFV) aims to transform knowledge into wealth, with the permanent objective of promoting innovative entrepreneurship through research, stimulating the creation of new technology-based businesses and aiming to promote regional development. The programs developed at tecnoPARQ are intended to qualify participants and connect them to the latest high-impact business development methodologies. In addition to supporting the creation of startups and promoting a favorable environment for the development of technologies coming from the university in partnership with professors, laboratories and departments.

For this article, we bring the example of Rizoflora, a technology-based company residing at tecnoPARQ that seeks to promote innovation in line with its sustainable purposes. Rizoflora Biotecnologia LTDA was created in 2006 as a result of years of research by Professor Leandro Grassi de Freitas of the Department of Phytopathology at UFV and positions itself in the Brazilian agribusiness market as a supplier of high quality and effective biocompatible solutions in the fight against agricultural pests. The company develops the product Rizotec, a biological nematicide with high effectiveness in controlling nematodes in the field, used as part of an integrated management strategy, since this product replaces the use of pesticides, which are highly toxic and harmful to the environment. Sustainability is becoming more and more a question of attitude, strategy and innovation, since it brings the most varied benefits to the organization, such as cost, risk and waste reduction, job creation, improves the relationship with the consumer, and conveying an image of a reliable and environmentally sustainable company (DE OLIVEIRA et al, 2016).

This article is expected to demonstrate the importance of the practices developed by tecnoPARQ to leverage the development of new technology-based businesses arising from academic research, demonstrating the benefits of the interaction between entrepreneurial universities and innovation environments. In addition, we seek to inspire other innovation environments to work together with universities close to the places where they are located, aiming at local economic, sustainable and social development.

ORIGINALITY / VALUE

Entrepreneurship and education are two opportunities that need to be leveraged and interconnected to develop the human capital needed to build the societies of the future (VOLKMANN et al., 2009), since entrepreneurship is the engine that fuels innovation, generation employment and economic and social growth. This study addresses how the Technological Park of Vicosa, an innovation environment, acts in the generation of new technology-based businesses through the teaching of entrepreneurship, creating strategies for local development, thus contributing to the increase of qualified jobs, the generation of innovations and the growth of the local ecosystem.

PRACTICAL / SOCIAL IMPLICATIONS

Universities and other strategic partners have a relevant impact on the local reality and are fundamental for generating new business. One of the main functions of the entrepreneurial university is to generate economic activities from academic research and promote economic and social development (LOPES, 2012). Sustainability, when applied to an institution, as is the case of this investigation, which unites an entrepreneurial university and a technological park, has a perspective focused on the implementation of actions that regulate the interaction between society, environment and economy.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Despite being a very relevant and current theme, there are few works in the literature that focus on the actions developed by entrepreneurial universities in conjunction with innovation environments with the purpose of generating new businesses. The literature addresses a lot about the importance of interaction between the sectors and its benefits, but there is a lack of success stories that demonstrate this practice.

KEYWORDS (3-5)

Technological Base – Ecosystem – Sustainability – Startups.

REFERENCES

- DE OLIVEIRA, Magsuel Miranda et al. Sustainable development in organizations as an opportunity for new business. *Valore Magazine*, vol. 1, n. 1, p. 42-66, 2016.
- ETZKOWITZ, H. Triple Helix: University-Industry-Government: Innovation in Action. Porto Alegre: EDIPUCRS, 2009.
- ETZKOWITZ, H.; ZHOU, C. Triple Helix twins: innovation and sustainability. *Science and Public Policy*, vol. 33, no. 1, p.77-83, 2006. Available at: https://www.researchgate.net/publication/248159922_Triple_Helix_twins_Innovation_and_sustainability. Accessed on 16 Jan. from 2023.
- LINDH, I.; THORGREN, S. Entrepreneurship education: the role of local business. *Entrepreneurship & Regional Development*. Luleå, Sweden. v. 28, no. 5-6, p. 313-336, 2016. Available at: <https://www.tandfonline.com/doi/full/10.1080/08985626.2015.1134678>. Accessed on: 20 Jan. from 2023.
- LOPES, V. F. The Insertion of the Federal University of Sergipe (Ufs) in the Innovation and Local Development Process: Intention and Practice. 2012, 177 f. Thesis (Doctorate in Production Engineering). Graduate Program in Production Engineering. Federal University of Pernambuco.
- SIERRA, L. M. P.; VILLAZUL, S. J. J. University-industry linkage and technology transfer management: A quantitative study of an entrepreneurial university. *Journal of Management Development*. v. 37, n. 7, p. 573-585, 2018. Available at: <https://www.emeraldinsight.com/doi/full/10.1108/JMD-06-2017-0203>. Accessed on 12 Jan. from 2023.
- VOLKMANN, C.; WILSON, K.E.; MARIOTTI, S.; RABUZZI, D.; VYAKARNAM, S.; SEPULVEDA, A. Education the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st century. A Report of the Global Education Initiative. Switzerland: World Economic Forum, 2009. Available from: <http://www.heqco.ca>.

3.16 Modelling the industry perspective of university research commercialisation

Aleksandra Szulczewska-Remi¹

¹Poznan University of Economics and Business, Poland.

PURPOSE

The current challenges posed to science by the global market are largely related to the transfer of ideas, scientific and technical knowledge to the economy and the creation of products, as well as the development of technologies and processes for Social, Economic and Sustainable Development. For this reason, the discussion on stimulating research commercialisation as well as university - industry cooperation, as a part of universities' third mission, continues. In the light of these considerations, the first objective of this research was to conceptualize and formulate a definition of the universities' research commercialisation. The second objective concerned a critical assessment of the research commercialisation models developed so far, and then conceptualization and operationalization of the model, in accordance with the adopted process approach and empirical research.

DESIGN / METHODOLOGY / APPROACH

The commercialisation of scientific research is a complex, multi-stage process, related to the implementation of tasks that are characterized by a certain repetition in subsequent stages of its course. Therefore, scientists dealing with research on commercialisation have developed various types of graphical models. Most of them are described in relation to the innovation process in enterprises, in which commercialisation is an integral part, because it provides the opportunity to achieve appropriate income from the implementation of innovations. An example of this are numerous works in which the described models are focused on the possibility of identifying the market value of scientific discoveries or realizing their potential in the context of building added value and a business model (Viale and Etzkowitz, 2010). Significantly fewer studies have been devoted to research on universities' commercialisation models, hence the aim of this research is to answer the following research question: what is the model approach to universities' research commercialisation from the perspective of enterprises? When answering the research question, extensive literature studies were conducted using systematic literature review and SALSAs (Search, Appraisal, Synthesis, Analysis) methodology, as well as empirical research applying a dedicated questionnaire in computer-assisted telephone interviews (CATI) with several Polish companies. For the purpose of ordering the companies, the aggregated profitability index was constructed and principal component analysis (PCA) was selected as it reduces the dimensionality of a dataset while preserving the maximum amount of information (IBM, 2021). The above procedure resulted in having companies from 19 different sectors (ranged from the most profitable company, to the least profitable one within a sector). Next, from each sector 3 companies were included in the study: one representing high-profitability companies, one representing average-profitability, and one representing low-profitability. Therefore 57 companies were initially included, representing all the sectors studied and all the profitability levels established.

Building on the concept of the knowledge spillover theory of entrepreneurship, the research refers to the approach in which knowledge that spillovers from universities are a strategic lever through which firms distribute innovation and have profound implications for the regions' Social, Economic and Sustainable Development (Audretsch and Keibach, 2007).

FINDINGS OR EXPECTED OUTCOMES

The research enriches our understanding of universities' commercialisation process that support knowledge spillovers and entrepreneurship. When developing universities' commercialisation model, the focus was on concepts that largely refer to entrepreneurial universities and triple helix, especially in terms of university - industry cooperation (Etzkowitz and Leydesdorff, 2000). The expected outcomes will allow to graphically present universities' commercialisation model supplemented by a descriptive component. It has been assumed that the cause is a specific structure in which various interactions between the variables described in this model play

an important role.

ORIGINALITY / VALUE

The paper attempts to fulfil the research gap concerning the conceptual representation of universities' commercialisation process. In terms of theoretical implication, detailed literature studies about universities' research commercialisation and university - industry cooperation were preceded using Salsa method. The research contributes to management literature by complementing triple helix concept (Etzkowitz and Leydesdorff, 2000) and knowledge spillover theory of entrepreneurship (Acs et al., 2013).

PRACTICAL / SOCIAL IMPLICATIONS

The research enriches our understanding of universities' research commercialisation process and highlights most important barriers in university - industry cooperation indicated by respondents. Therefore, some recommendations for policymakers arise from this study, especially in the area of supporting university - industry cooperation.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The research allowed enough data to be gathered to answer the research questions. However, future research validating the results in quantitative study is suggested. Also, some limitations in the research process were highlighted, such as a lack of personal contact with respondents and the number of surveyed enterprises due to their frequent lack of experience in cooperation with universities.

KEYWORDS (3-5)

Research commercialisation model, university - industry collaboration, triple helix, knowledge spillover theory of entrepreneurship.

REFERENCES

- Acs, Z.J., Audretsch, D.B., Lehmann, E.E. (2013). The knowledge spillover theory of entrepreneurship. *Small Business Economics*, 41(4), 757-774. doi:10.1093/acprof:oso/9780195183511.003.0003.
- Audretsch, D.B., Keibach, M. (2007). The theory of knowledge spillover entrepreneurship. *Journal of Management Studies*, 44(7), 1242-1254.
- 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.
- IBM (2021). Principal component analysis (PCA). <https://www.ibm.com/docs/en/db2oc?topic=procedures-principal-component-analysis-pca>.
- Viale, R., Etzkowitz, H. (2010). *The Capitalization of Knowledge*. Cheltenham: Edward Elgar Publishing.

The research is co-financed from the state budget from the Education and Science Ministry programme entitled "Science for the Society". Project number NdS/543640/2021/2022, the amount of co-financing PLN 3.000, total value of the project PLN 699.200.

3.17 The role of entrepreneurial universities in the creation of spin-offs: a systematic literature review

Juliana de Souza Corrêa¹, Carlos Marcelo Faustino da Silva¹, Ronaldo David Viana Barbosa¹, Clarissa Stefani Teixeira¹

¹Universidade Federal de Santa Catarina, Brazil

PURPOSE

This research aims to investigate the directions of research on academic spin-offs related to the concept of entrepreneurial universities in the literature.

DESIGN / METHODOLOGY / APPROACH

For this, a systematic review of the literature was carried out. By searching the Scopus database, with the string "entrepreneurial universit*" AND "spin-off*" OR "spin off*" affecting only "title", "abstract" and "keywords", the full abstracts were read and 29 articles were disregarded. So, 42 articles have been fully read.

FINDINGS OR EXPECTED OUTCOMES

Spin-offs creation has become one of the pillars of universities' entrepreneurship strategies (Rodeiro-Pazos et al., 2017), playing an important role (Renault et al., 2016), assisting universities in their mission to transfer knowledge and technology (Segui-Mas et al., 2018). Huszár et al. (2016) claim that the guarantee of jobs and the desire to demonstrate the practical relevance of their research has driven those who want to create spin-offs. This is corroborated by D'Este & Perkmann (2010) who identified that often researchers are looking for ways to increase opportunities for their research.

Liboreiro & Corradi (2021) show that the physical infrastructure, samples and qualified people enabled the spin-offs. In this sense, Schneider et al. (2021) reveal that the university environment plays a decisive role.

For Benković et al. (2022) entrepreneurial orientation plays a statistically significant role in business results. Research by Odei & Novak (2022) shows that patents played a significant mediating role in spin-offs creation. Likewise, proximity to the university is an aspect of equal importance, with factors such as research orientation, entrepreneurial orientation and market hostility encouraging spin-offs to maintain this proximity (Soetanto & Van Geenhuizen, 2019).

Davey & Galan-Muros (2020) present that less than 1% of academics are exclusively dedicated to spin-offs; however, most also engage in other entrepreneurial activities. On the other hand, spin-offs are dynamically involved in the knowledge spillover process and incorporated into the regional entrepreneurial ecosystem (Prencepe et al., 2020).

Therefore, a favorable institutional environment is a fundamental element (Markuerkiaga et al., 2016), in addition to elements such as entrepreneurial orientation, incubators or programs to support entrepreneurship and the efficiency of the goods market are factors that positively influence the creation of the spin-offs. (Montiel-Campos, 2018).

Furthermore, the characteristics and competences of universities, admittedly heterogeneous and diverse, influence students in the development of entrepreneurial competences and in the creation of companies (Beyhan & Findik, 2018).

However, Huszár et al. (2016) highlight that there are bureaucratic barriers that do not tolerate researchers in a position other than the academic one. In addition, Guerrero & Urbano (2013) points out that university managers also need to pay attention to favoring "intangible" assets such as entrepreneurial intentions and leadership. Van der Heide et al. (2010) suggests that universities recognize the impact of knowledge transfer through spin-offs, however, this does not seem to be a priority. Another challenge is brought by Harisson & Leitch (2009) who emphasize the importance of treating spin-offs with their specificities and not like startups, and suggest that a wrong treatment harms their spread.

Toledano et al. (2022) proved that there is a need for university administrators to improve support for spin-offs in terms of managing the new business, instead of prioritizing the difficulties encountered at launch. Still, the awareness of professors to the importance of finding an adequate balance between technical and management skills, in order to improve the possibilities of business success is also pointed out by the authors. It follows that, more than creating, it is necessary to pay attention to the survival of these companies (Rodeiro-Pazos et al., 2017).

According to Leitner et al. (2021), heads with business experience positively influence the acquisition of third-party resources and the production of patents for the entire department, thus, the basis of spin-offs is taken advantage of by these experiences. Pérez-Hernández et al. (2021) identify four major challenges that universities in Mexico face: the lack of internal regulations and bureaucratic processes; training of specialists; complexities inherent to the topic and the authority of the decision maker.

Additionally, Baldini (2010) points out the tension between the functions of a researcher like the division between scientific publications and spin-offs creation.

Lazzeretti & Tavoletti (2005) in turn, through a case study, shows that local economic relevance and international excellence are not incompatible. In fact, Guerrero et al. (2014) and Mavi (2014) state that universities should boost spin-offs due to their potential to positively impact society.

In this sense, Brettel et al. (2013) state that some of the activities of universities to overcome this involve raising awareness of personal development interests in terms of self-realization and long-term impact. Pazos et al. (2011) state that partnerships with industry and the existence of incubation services can help. Formica (2002) also concludes that the financial return on research is an incentive.

Abereijo (2015) reiterates the role of universities in implementing mechanisms that facilitate the commercialization of knowledge. Leydesdorff & Meyer (2010) defend the inclusion of spin-offs as institutional evaluation indicators to encourage their creation. Aguirre et al. (2006) suggest that programs of spin-offs creation should focus their attention on market gaps.

In line with the vision of intangible assets that influence the creation of spin-offs highlighted by Guerrero & Urbano (2013), the case study developed by Berggren (2011) demonstrates that it is necessary to have an entrepreneurial culture focused on impact on individuals.

ORIGINALITY / VALUE

The research made it possible to visualize which university activities encourage the creation of spin-offs and what challenges these institutions face in this regard.

PRACTICAL / SOCIAL IMPLICATIONS

One of the premises of entrepreneurial universities is the transfer of knowledge. This can occur through the creation of academic spin-offs (Etzkowitz, 2013), which become important tools to boost researchers (D'Este & Perkmann, 2010) and impact society (Guerrero et al., 2014; Mavi, 2014).

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Future research can approach how university management can further foster entrepreneurial initiatives such as spin-offs.

KEYWORDS (3-5)

Entrepreneurial university; spin-off; creation.

REFERENCES

- Abereijo, I. O. (2015). Transversing the "valley of death": Understanding the determinants to commercialisation of research outputs in Nigeria. *African Journal of Economic and Management Studies*.
- Aguirre, I. D. P., Parellada, F. S., & Campos, H. M. (2006). University spin-off programmes: How can they support the NTBF creation?. *International Entrepreneurship and Management Journal*, 2, 157-172.
- Baldini, N. (2010). University spin-offs and their environment. *Technology Analysis & Strategic Management*, 22(8), 859-876.
- Berggren, E. (2011). The entrepreneurial university's influence on commercialisation of academic research—the illustrative case of Chalmers University of Technology. *International Journal of Entrepreneurship and Small Business*, 12(4), 429-444.
- Benković, S., Milosavljević, M., Spasenić, Ž., & Jovanović, A. (2022). Antecedents of University Entrepreneurship: Empirical Evidence from Serbian Public Universities. *Croatian Journal of Education*:

- Hrvatski časopis za odgoj i obrazovanje, 24(2.), 397-427.
- Beyhan, B., & Findik, D. (2018). Student and graduate entrepreneurship: Ambidextrous universities create more nascent entrepreneurs. *The Journal of Technology Transfer*, 43(5), 1346-1374.
- Brettel, M., Mauer, R., & Walter, T. (2013). High-profile employees at universities and their intentions of commercializing research results. *Journal of Business Economics*, 83, 357-382.
- D'este, P., & Perkmann, M. (2010). Why do academics engage with industry? The entrepreneurial university and individual motivations. *The journal of technology transfer*, 36, 316-339.
- Etzkowitz, H. (2013). Anatomy of the entrepreneurial university. *Social science information*, 52(3), 486-511.
- Formica, P. (2002). Entrepreneurial universities: the value of education in encouraging entrepreneurship. *Industry and Higher Education*, 16(3), 167-175.
- Fuster, E., Padilla-Meléndez, A., Lockett, N., & del-Águila-Obra, A. R. (2019). The emerging role of university spin-off companies in developing regional entrepreneurial university ecosystems: The case of Andalusia. *Technological Forecasting and Social Change*, 141, 219-231.
- Guerrero, M., & Urbano, D. (2013). Academics' start-up intentions and knowledge filters: An individual perspective of the knowledge spillover theory of entrepreneurship. *Small Business Economics*, 43, 57-74.
- Guerrero, M., Cunningham, J. A., & Urbano, D. (2014). Economic impact of entrepreneurial universities' activities: An exploratory study of the United Kingdom. *Research Policy*, 44(3), 748-764.
- Harrison, R. T., & Leitch, C. (2009). Voodoo institution or entrepreneurial university? Spin-off companies, the entrepreneurial system and regional development in the UK. *Regional Studies*, 44(9), 1241-1262.
- Huszár, S., Prónay, S., & Buzás, N. (2016). Examining the differences between the motivations of traditional and entrepreneurial scientists. *Journal of Innovation and Entrepreneurship*, 5(1), 1-22.
- Krabel, S. (2018). Are entrepreneurs made on campus? The impact of entrepreneurial universities and graduates' human capital on graduates' occupational choice. *Journal of International Entrepreneurship*, 16(4), 456-485.
- Krishna, V. V. (2019). Universities in the national innovation systems: Emerging innovation landscapes in Asia-Pacific. *Journal of Open Innovation: Technology, Market, and Complexity*, 5(3), 43.
- Lazzeretti, L., & Tavoletti, E. (2005). Higher education excellence and local economic development: The case of the entrepreneurial University of Twente. *European Planning Studies*, 13(3), 475-493.
- Leitner, K. H., Bergner, S., & Rybnicek, R. (2021). The role of heads of departments in the commercialization of university research. *Journal of Business Economics*, 91, 353-378.
- Leydesdorff, L., & Meyer, M. (2010). The decline of university patenting and the end of the Bayh-Dole effect. *Scientometrics*, 83(2), 355-362.
- Liboreiro, K. R., Corradi, A. A., & Rapini, M. S. (2022). The role of the university research laboratory in technology transfer to firms in Brazil: Two case studies in biotechnology. *Industry and Higher Education*, 36(4), 398-414.
- Markuerkiaga, L., Caiazza, R., Igartua, J. I., & Errasti, N. (2016). Factors fostering students' spin-off firm formation: An empirical comparative study of universities from North and South Europe. *Journal of Management Development*, 35(6), 814-846.
- Mascarenhas, C., Marques, C. S., Galvão, A. R., & Santos, G. (2017). Entrepreneurial university: towards a better understanding of past trends and future directions. *Journal of Enterprising Communities: People and Places in the Global Economy*, 11(03), 316-338.
- Mavi, R. K. (2014). Indicators of entrepreneurial university: Fuzzy AHP and Fuzzy TOPSIS Approach. *Journal of the Knowledge Economy*, 5, 370-387.
- Miranda, F. J., Chamorro, A., & Rubio, S. (2017). Determinants of the intention to create a spin-off in Spanish universities. *International Journal of Entrepreneurship and Innovation Management*, 21(4-5), 299-317.
- Montiel-Campos, H. (2018). University spin-offs creation in the Latin American region: An exploratory study. *Journal of Entrepreneurship in Emerging Economies*, 10(3), 386-408.
- Odei, M. A., & Novak, P. (2022). Determinants of universities' spin-off creations. *Economic Research-Ekonomska Istraživanja*, 1-20.
- Pazos, D. R., López, S. F., González, L. O., & Sandiás, A. R. (2011). A resource-based view of university spin-off activity: New evidence from the Spanish case. *Revista Europea de Dirección y Economía de la Empresa*, 21(3), 255-265.
- Pérez-Hernández, P., Calderón, G., & Noriega, E. (2021). Generation of university spin off companies: challenges from Mexico. *Journal of technology management & innovation*, 16(1), 14-22.
- Prencipe, A., Corsi, C., Rodríguez-Gulías, M. J., Fernández-López, S., & Rodeiro-Pazos, D. (2020). Influence of the regional entrepreneurial ecosystem and its knowledge spillovers in developing successful university spin-offs. *Socio-Economic Planning Sciences*, 72, 100814.
- Riviezzo, A., Santos, S. C., Liñán, F., Napolitano, M. R., & Fusco, F. (2019). European universities seeking entrepreneurial paths: the moderating effect of contextual variables on the entrepreneurial orientation-performance relationship. *Technological Forecasting and Social Change*, 141, 232-248.
- Renault, T., Carvalho de Mello, J. M., de Araújo Fonseca, M. V., & Yates, S. (2016). A chip off the old block: Case studies of university influence on academic spin-offs. *Science and public policy*, 43(5), 594-600.
- Rodeiro-Pazos, D., Rodríguez-Gulías, M. J., & Fernández-López, S. (2017). The effectiveness of entrepreneurial universities at creating surviving firms: An exploratory analysis. *Journal of Enterprising Communities: People and Places in the Global Economy*, 11(03), 339-353.
- Schneider, N., Blaese, R., & Liebig, B. (2021). Conditions for spin-off creation at Swiss universities of applied sciences—a gender sensitive approach. *International Journal of Gender and Entrepreneurship*, 13(4), 373-393.
- Seguí-Mas, E., Oltra, V., Tormo-Carbó, G., & Sarrión-Viñes, F. (2018). Rowing against the wind: how do times of austerity shape academic entrepreneurship in unfriendly environments?. *International Entrepreneurship and Management Journal*, 14, 725-766.
- Soetanto, D., & van Geenhuizen, M. (2019). Life after incubation: The impact of entrepreneurial universities on the long-term performance of their spin-offs. *Technological Forecasting and Social Change*, 141, 263-276.
- Toledano, N., Gessa, A., & Sanchez-Herrera, R. (2022). Rethinking the Resources and Responsibilities of University Spin-Offs: Critical Factors in Times of Global Crisis. *Sustainability*, 14(19), 12628.
- Van der Heide, S., van der Sijde, P., & Terlouw, C. (2010). Exploring 'transnational' university cooperation in knowledge transfer: A European perspective. *Industry and Higher Education*, 24(1), 17-27.

3.18 Innovating bilateral cooperation to promote a net-zero future in cities

Semida Silveira¹, Ricardo Luders², Paolo Monti³, Alessandra Holmo⁴, Keiko Fonseca², Walter Shima⁵

¹Cornell University, USA, ² Federal Technological University of Paraná Brazil, ³Chalmers, Sweden, ⁴Swedish-Brazilian Research and Innovation Centre, Brazil, ⁵ Federal University of Paraná, Brazil.

PURPOSE

International cooperation has increased significantly over decades, evolving from security aspects to multiple realms, for example, the global environmental agenda, trade, health, and exploration of space, to name a few¹. This has resulted in increased interest in understanding and creating mechanisms to improve international cooperation. For example, the tight schedule to achieve the goals of the Paris Agreement require increased cooperation to deploy new technologies, accelerate the energy transition and build a netzero future. However, while there is broad consensus on the goals of the international climate agenda, the implementation of a timely and impactful climate agenda remains a challenge. Actions are needed at multiple levels and cities and have an important role to play².

Bilateral forms of cooperation are established as a way in which countries cooperate through diplomatic, business, and academic relations. This paper focuses on the development of bilateral cooperation agendas focused on cities and involving multiple stakeholders including government, private sector, academia, and the civil society. Our starting point is the transdisciplinary cooperation established between Swedish and Brazilian stakeholders around the City of Curitiba. The cooperation focuses on the development of new concepts for urban planning and sustainable development. It has lasted for ten years with changing government administrations, stakeholder involvement and a dynamic agenda. "Smart cities" is one of the areas focused on bilateral cooperation for innovation between Sweden and Brazil, a cooperation model intertwined with a triple-helix model.

The rational choice approach is a commonly used theoretical framework for analysis of international politics. Such a theoretical framework allows the identification of factors beyond a specific case study, which can then be used to develop cooperation models that are valid in other contexts. One problem with this framework is that the state is considered a unitary actor, meaning having a homogeneous agenda³. However, the different levels of government have important implications in how the cooperation evolves over time. What does that mean for the stakeholders involved? What does that mean for the capacity of such cooperation to produce results and impact? The stakeholders participating or funding such cooperation have different motivations to build or participate in its implementation. These motivations relate not only to national goals, but also to the local and institutional roles the stakeholders play. They also operate under different governance rules given the different country contexts. How can common ground be found to define goals and coordinate actions? What will guarantee continuity within a democratic agenda? How can impact be achieved? What is the role of academic organizations in these types of cooperation? What can this type of cooperation deliver in the global climate agenda?

DESIGN / METHODOLOGY / APPROACH

Our analysis starts from the experience acquired through the new model of Swedish-Brazilian cooperation for innovation established since 2009, and how it has played out in the context of urban areas, more specifically the cooperation with the City of Curitiba. We relate this experience with other models of cooperation used by Sweden in

other contexts. We also look at experiences from the Brazilian side. We look at the stakeholder composition and dynamics, but address in particular the changing role that academic organizations play in these cooperations. More specifically, we discuss (i) the systems orientation of the cooperation model, (ii) the shared and individual motivation and objectives of the stakeholders involved, (iii) the challenges, opportunities, and barriers to project implementation, (iv) outcomes, and (v) future perspectives for transdisciplinary projects.

FINDINGS OR EXPECTED OUTCOMES

We aim to extract lessons that can guide bilateral cooperation in a transdisciplinary triple-helix format and engage stakeholders in other urban contexts. We also aim at insightful reflections of the role of academic partners in this type of cooperation.

Finding new models of cooperation is important for accelerating the energy transition and the climate agenda. The Swedish-Brazilian experiences cast light and bring lessons on opportunities for democratic countries to cooperate bilaterally in ways that bring new value to diplomatic relations and contribute to actions that promote economic development and global environmental agendas.

ORIGINALITY / VALUE

This paper builds upon experience of 10 years cooperation between Swedish and Brazilian organizations. It relates that experience to theoretical frameworks to contribute to the literature on bilateral relations, transdisciplinarity and triple-helix platforms in the context of increasing demands for cooperation to accelerate the implementation of global environmental agendas, particularly climate change.

PRACTICAL / SOCIAL IMPLICATIONS

Finding new models for cooperation is necessary to engage multiple stakeholders and accelerate the energy transition and the climate agenda. Urban areas play a central role in that process. Engaging urban areas across the world will be decisive for achieving the goals of the Paris Agreement as well as the SDGs.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Explore how the use of the lessons drawn from this experience can be used in other urban and country contexts. In fact, the Swedish model is now being tested in other contexts. It has now been initiated from a new level of knowledge after the lessons learnt in Curitiba.

KEYWORDS (3-5)

Bilateral cooperation, urban, climate agenda, Sweden, Brazil.

REFERENCES

In addition to the footnotes

Przeworski, A. and Vreeland, J. A statistical model of bilateral cooperation. In *Political Analysis*, vol 10, no.2, pp. 101-112. Cambridge University Press. 2002 <https://www.energy.kth.se/energy-systems/completed-projects/smart-city-concepts-in-curitiba-innovation-for-sustainable-mobility-and-energy-efficiency-1.561109> <https://www.vinnova.se/en/p/smart-city-concepts-in-curitiba---innovation-for-mobility-and-energy-efficiency/> <https://www.vinnova.se/en/p/smart-city-concepts-in-curitiba/> <https://www.vinnova.se/en/p/smart-city-concepts-in-curitiba---low-carbon-transport-and-mobility-in-a-digital-society/>

1 Aoki, S. Models for Cooperation: Bilateral and Multilateral Agreements. Presentation at 10th UN Space Law Workshop, 2016. Available at https://www.unoosa.org/pdf/SLW2016/Panel4/3_Aoki_10th_UN_Space_Law_WS_S_Aoki7_Sept_2016Panel4.pdf

2 United Nations. Cities: a "cause of and solution to" climate change. Available at <https://news.un.org/en/story/2019/09/1046662> <https://unhabitat.org/topic/climate-change>

3 Hassler, B. Gains from bilateral cooperation – a tentative research agenda. <https://www.diva-portal.org/smash/get/diva2:526011/FULLTEXT01.pdf>

3.19 Is it a difficult situation or is it truly deserved? ESG Information Disclosure and Green Innovation Performance of Enterprises: Empirical Evidence from Chinese Enterprises

Luo Kai¹, Yibo Wang¹

¹Wuhan Textile University, China.

Is environmental, social, and governance (ESG) disclosure driving the innovation performance of Chinese firms a difficult sentiment or a deserved one? This study selected a sample of Chinese A-share listed companies from 2011 to 2020 to empirically examine the relationship between ESG disclosure and corporate innovation performance, investigate the moderating role of media attention, and analyze the influence mechanism of government R&D subsidies. Based on social responsibility and signaling theories, the findings show that ESG information disclosure is more likely to push firms to improve the quantity of innovation, but there is no significant difference in the impact on the quality of innovation. This suggests that companies are in a "bubble" of innovation performance, with patents characterized by "quantity over quality" in order to meet market preferences. Media attention plays a moderating role in the impact of ESG disclosure on corporate innovation performance. Further research found that the relationship between ESG disclosure and corporate innovation performance is characterized by a 'quantity rather than quality' approach in companies with highly competitive and digitalized markets. The study not only demonstrates the shortcomings of soft market regulation in environmental and economic distress but also suggests that ESG disclosure is subject to external contextual factors and has a differential impact in facilitating the transition from quantitative to qualitative corporate innovation. This study highlights the positive role of ESG disclosure and provides a reference for improving ESG disclosure regulatory policies in China.

04

BOOSTING ECOLOGICAL TRANSITION WITH TH STRATEGIES

4.1 Analyzing benefits and trade-offs of innovative nutrient recovery solutions from different sanitation systems guided by the SDGs

Verena Germann¹

¹University of Natural Resources and Life Sciences Vienna, BOKU (then expected: Swedish University of Agricultural Sciences, SLU), Austria.

PURPOSE

With the objective to foster a paradigm shift from currently linear approaches of the water- agri-food system towards circular nutrient flows between urban and rural areas and to develop new governance solutions for the transition to innovative nutrient recovery solutions from different sanitation systems the P2Green project started recently (<https://p2green.eu/about/>). The project applies a transdisciplinary approach including diverse consortium of actors from academia and research, technology providers, farmers, innovation brokers, fertilizer industry, public administration, NGOs and civil groups. One of its aims, that is the focus of the research presented here, is to develop an approach to assess and validate the sustainability and impacts (benefits and trade-offs) of innovative circular systems to recycle nitrogen (N) and phosphorus (P) from human sanitary waste demonstrated in 3 pilot regions and understand bottlenecks on the sustainable transition towards circular use of nutrients.

DESIGN / METHODOLOGY / APPROACH

Different tools exist for the assessments of technological innovation within the sanitation sector (see e.g., Spuhler et al. 2022). Yet, as analyzed in Lima et al. (2022) some adjustments will be necessary, especially for the consideration of life cycle aspects, existing infrastructure, local ownership and public assessment. The rationale of these tools is that they feed into a broader structured decision-making process, for which a transdisciplinary discussion of potential innovations at the local level will be key as sustainability depends on the interests and needs in different contexts. In the realm of the SDGs, the broad acknowledgment of a highly needed shift to a more systemic perspective is reflected in the SDG 6 Targets, covering the whole water cycle rather than basic access to water and sanitation as formulated in the preceding Millennium Development Goals (MDGs) and its interactions and particularly synergies with several other SDGs (Germann et al. 2023; UN Water 2021, Larsen et al 2021). A more holistic evaluation approach of sanitation systems could be guided along the SDG Targets as a variety of methods has been developed to systematically analyze interactions (synergies and trade-offs) along the framework of the SDGs (Horvath et al. 2022). These method' suitability depends on the scale of the application case, the need for practicability and other criteria assessed in Horvath et al. (2022). Yet, the selected methods also depend highly on the type of innovation (e.g., introducing a novel technology, a new element in the decision-making and planning process, both or other aspects) and also in the local context, as the local people, community, capacities and conditions is in the end what make an innovation sustainable (Germann and Langergraber 2022; Pham-Truffert et al. 2020). Hence an approach based on existing methods and adapted for the context of the project will be developed. Ideally it will combine the outcomes of existing assessment tools, LCA or similar system modelling approaches with the expertise on gamification of sanitation planning or with other participatory methods, to understand the governing narratives, interests and to achieve the necessary ownership for sustainable sanitation. In the end, fostering transformative innovation in the sanitation sector will require to rethink the whole system and take users (in particular vulnerable groups), planners, decision-makers and people implementing and maintaining the system on the journey - from the start.

FINDINGS OR EXPECTED OUTCOMES

As outcome an approach to scientifically assess and validate the sustainability and impacts of innovative circular N & P systems demonstrated in the 3 pilot regions guided by the SDGs shall be developed and discussed. The developed approach aims to gain insights on bottlenecks on the sustainable transition towards circular use of nutrients and to enable comparison of systems and support decision-making.

ORIGINALITY / VALUE

The overall objective of the project is to present novel governance approaches for innovative circular sanitation systems, which the

presented approach to assess these systems' sustainability will significantly contribute to.

PRACTICAL / SOCIAL IMPLICATIONS

The P2Green project tests its approaches in three pilot regions (P2Green pilot regions) on a north-south trajectory from the Baltic Sea region via the metropolitan area of Hamburg-Hannover to the region of Axarquia in Southern Spain and by multiplying the impact via four follower regions in Hungary, Italy, France and Greece.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

To be defined.

KEYWORDS (3-5)

Trade-off analysis, sanitation, nutrient recycling, circular sanitation systems.

REFERENCES

- Germann, V., Borgwardt, F., Fischer, J., Fuchs-Hanusch, D., Regelsberger, M., Schubert, G., Uhmman, A., Langergraber, G., 2023. Development and Evaluation of Options for Action to Progress on the SDG 6 Targets in Austria. *J. Environ. Manage.* 325, 116487. <https://doi.org/10.1016/j.jenvman.2022.116487>.
- Germann, V., Langergraber, G., 2022. Going beyond Global Indicators - Policy Relevant Indicators for SDG 6 Targets in the Context of Austria. *Sustainability* 14, 1647. <https://doi.org/10.3390/su14031647>.
- Horvath, S.-M., Muhr, M.M., Kirchner, M., Toth, W., Germann, V., Hundscheid, L., Vacik, H., Scherz, M., Kreiner, H., Fehr, F., Borgwardt, F., Gühnemann, A., Becsi, B., Schneeberger, A., Gratzner, G., 2022. Handling a complex agenda: A review and assessment of methods to analyse SDG entity interactions. *Environ. Sci. Policy* 131, 160–176. <https://doi.org/10.1016/j.envsci.2022.01.021>.
- Larsen, T.A., Gruendl, H., Binz, C., 2021. The potential contribution of urine source separation to the SDG agenda – A review of the progress so far and future development options†. *Environ. Sci.: Water Res. Technol.* 7, 1161–1176. <https://doi.org/10.1039/d0ew01064b>.
- Lima, P.d.M., Lopes, T.A.d.S., Queiroz, L.M., McConville, J.R., 2022. Resource-oriented sanitation: Identifying appropriate technologies and environmental gains by coupling Santiago software and life cycle assessment in a Brazilian case study. *Sci. Total Environ.* 837, 155777. <https://doi.org/10.1016/j.scitotenv.2022.155777>.
- Pham-Truffert, M., Metz, F., Fischer, M., Rueff, H., Messerli, P., 2020. Interactions among Sustainable Development Goals: Knowledge for identifying multipliers and virtuous cycles. *Sustain. Dev.* 28, 1236–1250. <https://doi.org/10.1002/sd.2073>.
- Spuhler, D., Scheidegger, A., Lüthi, C., Eissner, A., 2022. SaniChoice: Informed Sanitation Technology and System Choice for Planning. Swiss Federal Institute of Aquatic Science and Technology (EAWAG), Dübendorf (Switzerland), Dübendorf (Switzerland).
- UN Water, 2021. Summary Progress Update 2021: SDG 6 - Water and sanitation for all, Geneva, Switzerland. https://www.unwater.org/publication_categories/sdg6-progress-reports/ (accessed 26 December 2021).
- United Nations, 2015. Transforming our World: The 2030 Agenda for Sustainable Development. <https://daccess-ods.un.org/access.nsf/Get?OpenAgent&DS=A/RES/70/1&Lang=E> (accessed 29 September 2022).

4.2 NICER Programme: Interdisciplinary collaboration for Circular Economy system change

Madeline Smith¹, Žaneta Muranko²

¹Innovation School, The Glasgow School of Art, United Kingdom, ²Business School University of Exeter, United Kingdom.

PURPOSE

The National Interdisciplinary Circular Economy Research (NICER) Programme was established in January 2021, with funding of £30M over four years from UKRI. The Programme is made up of five Circular Economy Research Centres (CECs), each focused on a specific resource flow and the co-ordinating Circular Economy Hub. The Programme aims to deliver research, innovation, and the evidence base to move the UK towards a resilient circular economy. The programme is delivered in collaboration with industrial organisations, the Department for Environment, Food and Rural Affairs (DEFRA) and other national and local government partners, to ensure research outcomes contribute to the delivery of industrial implementation and government policy.

The CE Hub is led from Exeter University and aims to coordinate across the programme to showcase, amplify and accelerate understanding and adoption of Circular Economy approaches. The team has developed leading CE capability, acting as a global university partner, with industry and policy collaborators and notably with the Ellen McArthur Foundation to deliver a step change in Circular Economy implementation.

DESIGN / METHODOLOGY / APPROACH

The focus of the NICER programme is to drive forward the capability and capacity in Circular Economy (CE). The European Parliament defines CE as, “a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible.” (European Parliament 2022)

The NICER Programme aims:

- To establish a national integrated interdisciplinary research and innovation community for Circular Economy research,
- to accelerate understanding and solutions to enable circularity of specific resource and waste streams,
- to provide national leadership, coordination, and knowledge exchange across the programme as a whole and with policy, consumer, and business stakeholders, and - to ensure that this research is embedded with stakeholders by involvement of business, policy, consumers, and society at every part of the programme.

This is delivered across the centres and the hub through interdisciplinary and triple helix research collaborations, engagement with businesses and government departments, knowledge sharing platforms and events and education opportunities.

The CECs and the CE Hub continuously collaborate with businesses and policy makers to ensure knowledge and technologies developed through the programme are relevant and adopted in practice, a practical demonstration of innovation as a result of a non-linear interactive process among firms, universities and public institutions (Edquist 1997). The CE Hub are also supporting the programme to evidence and capture the impact of such a programme, both for individual projects, but also at a centre and programme level, building on leading practice on collaborative innovation evaluation (Wilson et al 2022).

FINDINGS OR EXPECTED OUTCOMES

Evidence of the research being undertaken by the CECs and Hub, individually and collectively, demonstrates how the programme is accelerating understanding of the different value drivers and circularity strategies for specific products, resources and waste streams, through undertaking ground breaking research to overcome interlinked technical, scientific, industry, behavioural and policy challenges. This includes new material flow and value chain analysis, technological development to extend service life of certain materials, and feasibility studies into new circular economy opportunities.

The programme is providing national leadership to coordinate and facilitate knowledge exchange including establishing an active and engaged community of over 2000 representatives from business, government and academia, recognition of research findings within major government and industry-facing publications and media coverage of research outcomes. In addition, webinars, seminars,

and an annual national showcase help share learning and good practice, shifting the narrative from CE as recycling to whole system perspectives.

A Common Framework for Impact and Evaluation has been developed by the CE-Hub and is now being adopted by other CECs as a programme wide approach. This has included a series of Theory of Change (Funnell and Rogers 2011) workshops to help embed evaluative practices and evidence formation.

The programme is half way through delivery and focus is now on accelerating the value creation opportunity, ensuring that whole system research is translated into adoption and implementation through feasible transformation pathways. Work is also underway to ensure the maximum legacy from the NICER programme investment.

ORIGINALITY / VALUE

The NICER Programme is the largest investment in the UK Circular Economy to date, with a particular emphasis on linking with policy and industry to address system challenges and move towards adoption. It addresses the challenge of looking deeply at diverse resource flows (rare earth metals, mineral based construction materials, chemicals etc.) whilst also identifying common areas and challenges (e.g. use and rigour of data, roadmapping and taxonomy, SME engagement). The programme and system approach is ensuring that research is being embedded across the value chain including collaboration with over 300 businesses, engagement with UK and devolved governments and departments, international government partners, local and regional councils and NGOs.

PRACTICAL / SOCIAL IMPLICATIONS

The NICER programme has already delivered some significant outputs, including:

- Nine new externally funded projects have provided use cases to test CE systems modelling and measurement and accelerate interdisciplinary collaboration and innovative solutions in circular product design and behaviour.
- The establishment of the Knowledge Hub as a source of research, case studies and information, including a series of ‘demystifying’ Circular Economy reports.
- The CE policy cluster has been a highly effective mechanism to bring together diverse voices on CE policy.
- The CE-hub has funded eight new projects through its flexible fund to explore feasibility of new opportunities.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The NICER programme has a further two years to run and aims to increase the impact of the investment during that time. At a programme level taking forward common areas such as data, behavioural change, influencing policy, as well as evidencing impact, will maximise the value of the NICER Programme investment.

KEYWORDS (3-5)

Circular economy, system change, impact, collaboration, interdisciplinary.

REFERENCES

- Edquist, C. (1997) Systems of Innovation: Technologies, Institutions, and Organizations. London/New York: Pinter Publishers/Cassell Academic
- European Parliament (2022), Circular economy: definition, importance and benefits, www.europarl.europa.eu. Updated 15/12/2022.
- Funnell, S.C. and Rogers, P.J (2011) Purposeful Program Theory: Effective Use of Theories of Change and Logic Models, Research Methods for the Social Sciences, Wiley
- Wilson, J., Wise, E. & Smith, M. Evidencing the benefits of cluster policies: towards a generalised framework of effects. Policy Sci 55, 369–391 (2022). <https://doi.org/10.1007/s11077-022-09460-8>

4.3 Lagoon of Venice – Coastal restoration under changing climate conditions and high human pressure

Christiane Gebhardt¹

¹University of Edinburgh, England.

PURPOSE AND DESIGN / METHODOLOGY / APPROACH

Application of Triple Helix Twins - Sankey Analysis - SDG and EU taxonomy integration in a place-based analysis Discussion of nature-based solutions (NBS).

FINDINGS OR EXPECTED OUTCOMES

The Lagoon of Venice is the largest wetland in the Mediterranean Basin of around 550 square kilometers. Currently, the lagoon consists out of 8% land, including the city Venice itself and 118 islands both natural and constructed, while 11% of the area is permanently covered by open water or dredged channels. About 80% of the lagoon consists of mud flats, tidal shallows and salt marshes (imagesofvenice 2022; Molinaroli et al., 2019; UNESCO 2022).

As a coastal marshland of interconnected estuaries, the Lagoon of Venice has a constantly changing morphology. The complex river and sea interaction mechanism is an essential element of the dynamic evolutionary development of the marsh land (Tommasini et al., 2019).

A main feature in the Veneto is the long history of large human interventions and anthropocentric pressure impacting the lagoon (Crain et al., 2009; Lotze, Coll and Dunne, 2011). Since Roman times nearshore fishing, river redirections for freshwater supply and sediment removal to clear shipping ways as well as land reclamation for settlements have endangered the intactness of the fragile salt marsh ecosystem. Over centuries dramatic overfishing has contributed to depletion of 98% of traditional resources to 50% of former abundance. Today, 11% of fauna and flora species are extirpated, among them are kelp, red corals, bottle-nosed dolphins, murex snails, and flamingos and many endemic invertebrates (Lotze, Coll and Dunne, 2011). At the same time frequent interventions addressing the restoration and maintenance of ecosystem services have taken place after disturbances. Among these mediation efforts are the introduction of the river Po sewage treatment after heavy eutrophication in the 60s, the introduction of fishing quotas in the 80s (Barbier et al., 2011; Rossella Boscolo et al., 2022; Tommasini et al., 2019; Facca et al., 2014), the establishment of fragmented Marine Protection Areas MPA (EEA 2021) and last but not least the establishment of the Mo.S.E flood barrier system in the 2020s to prevent floodings in Venice (Mel et al., 2021).

Although populations of single species have sometimes recovered after these actions, there are predictions that multidimensional and synergistic effects of climate change (sea level rise and storms) and long-term effects of industrial pollution (Pellegrini et al., 2017) might bring the coastal ecosystem near its tipping point in the near future (Scheffer et al., 2012; Gallina et al., 2019).

In our study we integrate different aspects of society and environmental studies in the field of political ecology and apply the Triple Helix Twins as a meta-theory to discuss pathways of transformation. The study applies key concepts of the IPCC (Intergovernmental Panel on Climate Change) and IBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) and in the new EU taxonomy of biodiversity with its objective 6: The protection and restoration of biodiversity and ecosystems and conserving, restoring, or protecting ecosystem services are fundamental to human and animal welfare.

ORIGINALITY / VALUE

Own research.

PRACTICAL / SOCIAL IMPLICATIONS

I discuss the relevance of the specific coastal ecosystem and critically assess the relative importance of current and future threats for the coastal ecosystem Lagoon of Venice in a framework that relates ecosystem risk and socio-economic stressors and show their synergistic and antagonistic effects (Fuldauer et al., 2022). The analysis provides evidence that current conservation efforts must be revised and better integrated for coastal areas related to urban agglomerations with high population density.

Policy Recommendation for the Sendai Framework for Disaster Risk Reduction 2015-2030 and EU Green Deal (Natural Accounting).

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The research will be part of a comparative study at the University of Edinburgh (Master) in 2023/2024.

KEYWORDS (3-5)

Triple Helix Twins, Sustainable Development Goals (SDGs); coastal management; flood defense; assessment framework; sustainability; climate resilience; climate change adaptation; nature-based solution; Transformation Pathways, Political Ecology.

REFERENCES

- OECD (2020) OECD - FAO Agricultural Outlook, Fisheries pp. 184-195.
- Barbier, E. B., Hacker, S. D., Kennedy, C., Koch, E. W., Stier, A. C. and Silliman, B. R. (2011) 'The value of estuarine and coastal ecosystem services', *Ecological monographs*, 81(2), pp. 169-193.
- Berghe, E. V., Worm, B., Tittensor, D. P., Jetz, W., Mora, C., Lotze, H. K. and Ricard, D. (2010) 'Global patterns and predictors of marine biodiversity across taxa', *Nature (London)*, 466(7310), pp. 1098-1101.
- Bertocchi, D. and Visentin, F. (2019) "'The overwhelmed city": Physical and social over-capacities of global tourism in Venice', *Sustainability (Basel, Switzerland)*, 11(24), pp. 6937.
- Billah, M. M., Bhuiyan, M. K. A., Islam, M. A., Das, J. and Hoque, A. T. M. R. (2022) 'Salt marsh restoration: an overview of techniques and success indicators', *Environmental science and pollution research international*, 29(11), pp. 15347-15363.
- Cheung, W. W. L., Lam, V. W. Y., Sarmiento, J. L., Kearney, K., Watson, R. and Pauly, D. (2009) 'Projecting global marine biodiversity impacts under climate change scenarios', *Fish and fisheries (Oxford, England)*, 10(3), pp. 235-251.
- Crain, C. M., Halpern, B. S., Beck, M. W. and Kappel, C. V. (2009) 'Understanding and Managing Human Threats to the Coastal Marine Environment', *Annals of the New York Academy of Sciences*, 1162(1), pp. 39-62.
- Dite, Z., Suvada, R., Elias, P., Pis, V. and Dite, D. (2019) 'Salt marsh vegetation on the Croatian coast: plant communities and ecological characteristics', *Plant systematics and evolution*, 305(10), pp. 899-912.
- Duda, A. M. (1993) 'Addressing nonpoint sources of water pollution must become an international priority', *Water science and technology*, 28(3-5), pp. 1-11.
- Facca, C., Ceoldo, S., Pellegrino, N. and Sfriso, A. (2014) 'Natural Recovery and Planned Intervention in Coastal Wetlands: Venice Lagoon (Northern Adriatic Sea, Italy) as a Case Study', *TheScientificWorld*, 2014, pp. 968618-15.
- Fuldauer, L. I., Thacker, S., Haggis, R. A., Fuso-Nerini, F., Nicholls, R. J. and Hall, J. W. (2022) 'Targeting climate adaptation to safeguard and advance the Sustainable Development Goals', *Nature communications*, 13(1), pp. 3579-3579.
- Gallina, V., Torresan, S., Zabeo, A., Rizzi, J., Carniel, S., Sclavo, M., Pizzol, L., Marcomini, A. and Critto, A. (2019) 'Assessment of climate change impacts in the North Adriatic coastal area. Part II: Consequences for coastal erosion impacts at the regional scale', *Water (Basel)*, 11(6), pp. 1300.
- Howarth, R. W. (2008) 'Coastal nitrogen pollution: A review of sources and trends globally and regionally', *Harmful algae*, 8(1), pp. 14-20.
- Lockwood, J., Hoopes, M. and Marchetti, M. (2013) *Invasion Ecology*. 2. Aufl. edn. Hoboken: Wiley-Blackwell.
- ISTAT (2022) <https://www.istat.it/it/popolazione-e-famiglie> accessed 23.10.2022
- Lotze, H. K., Coll, M. and Dunne, J. A. (2011) 'Historical Changes in Marine Resources, Food-web Structure and Ecosystem Functioning in the Adriatic Sea, Mediterranean', *Ecosystems (New York)*, 14(2), pp. 198-222.
- Mel, R. A., Viero, D. P., Carniello, L., Defina, A. and D'Alpaos, L. (2021) 'The first operations of Mo.S.E. system to prevent the flooding of Venice: Insights on the hydrodynamics of a regulated lagoon', *Estuarine, coastal and shelf science*, 261, pp. 107547. Neumann, B., Vafeidis, A.

- T., Zimmermann, J. and Nicholls, R. J. (2015) 'Future coastal population growth and exposure to sealevel rise and coastal flooding - A global assessment', *PloS one*, 10(3), pp. e0118571-e0118571.
- Pellegrini, E., Petranich, E., Acquavita, A., Canário, J., Emili, A. and Covelli, S. (2017) 'Mercury uptake by halophytes in response to a long-term contamination in coastal wetland salt marshes (northern Adriatic Sea)', *Environmental geochemistry and health*, 39(6), pp. 1273-1289.
- Petranich, E., Acquavita, A., Covelli, S. and Emili, A. (2016) 'Potential bioaccumulation of trace metals in halophytes from salt marshes of a northern Adriatic coastal lagoon', *Journal of soils and sediments*, 17(7), pp. 1986-1998.
- Pieraccini, M., Coppa, S. and De Lucia, G. A. (2017) 'Beyond marine paper parks? Regulation theory to assess and address environmental non-compliance', *Aquatic conservation*, 27(1), pp. 177-196.
- Pinsky, M. L., Selden, R. L. and Kitchel, Z. J. (2020) 'Climate-Driven Shifts in Marine Species Ranges: Scaling from Organisms to Communities', *Annual review of marine science*, 12(1), pp. 153-179.
- Poloczanska, E. S., Burrows, M. T., Brown, C. J., Molinos, J. G., Halpern, B. S., Hoegh-Guldberg, O., Kappel, C. V., Moore, P. J., Richardson, A. J., Schoeman, D. S. and Sydeman, W. J. (2016) 'Responses of marine organisms to climate change across oceans', *Frontiers in Marine Science*, 3(MAY).
- Rice, J., Moksness, E., Attwood, C., Brown, S. K., Dahle, G., Gjerde, K. M., Grefsrud, E. S., Kenchington, R., Ring Kleiven, A., McConney, P., Ngoile, M. A. K., Næsje, T. F., Olsen, E., Ritchie&Roser (2021) <https://ourworldindata.org/fish-and-overfishing> accessed 23.10.2022
- Olsen, E. M., Sanders, J., Sharma, C., Vestergaard, O. and Westlund, L. (2012) 'The role of MPAs in reconciling fisheries management with conservation of biological diversity', *Ocean & coastal management*, 69, pp. 217-230.
- Rossella Boscolo, B., Alessandra, F., Federica, C., Emanuele, P., Adriano, S., Piero, F., Matteo, L., Paolo, P., Bruno, M., Nicola, B., Valerio, V., Luigi, M. and Andrea, B. (2022) 'Conservation actions for restoring the coastal lagoon habitats: Strategy and multidisciplinary approach of LIFE Lagoon Refresh', *Frontiers in ecology and evolution*, 10.
- Scarton, F. (2010) 'Long Term Decline of a Common Tern (*Sterna hirundo*) Population Nesting in Salt Marshes in Venice Lagoon, Italy', *Wetlands (Wilmington, N.C.)*, 30(6), pp. 1153-1159.
- Scheffer, M., Carpenter, S. R., Lenton, T. M., Bascompte, J., Brock, W., Dakos, V., van de Koppel, J., van de Leemput, I. A., Levin, S. A., van Nes, E. H., Pascual, M. and Vandermeer, J. (2012) 'Anticipating Critical Transitions', *Science (American Association for the Advancement of Science)*, 338(6105), pp. 344-348.
- Tognin, D., D'Alpaos, A., Marani, M. and Carniello, L. (2021) 'Marsh resilience to sea-level rise reduced by storm-surge barriers in the Venice Lagoon', *Nature geoscience*, 14(12), pp. 906-911.
- Tommasini, L., Carniello, L., Ghinassi, M., Roner, M. and D'Alpaos, A. (2019) 'Changes in the wind-wave field and related saltmarsh lateral erosion; inferences from the evolution of the Venice Lagoon in the last four centuries', *Earth surface processes and landforms*, 44(8), pp. 1633-1646.
- UNEP (2020) Coastal zone management <https://www.unep.org/explore-topics/oceans-seas/what-we-do/working-regional-seas/coastal-zone-management> accessed 23.10.2020
- UNESCO (2022) Venice and its Lagoon <https://whc.unesco.org/en/list/394/> accessed 23.10.2020

05

THE FOURTH INDUSTRIAL REVOLUTION, INNOVATION MEGA
TRENDS AND NEW CHALLENGES THROUGH TH APPROACHES

5.1 Planet4 experience: an Erasmus+ project filling the gap between Industry and Academia in the context of Industry 4.0

Anna Carreras Coch¹

¹La Salle- URL, Spain.

PURPOSE

The project approach is cross-disciplinary and focuses on both hard skills in AI and ML, IoT, and cloud and edge computing technologies, and soft competencies needed to manage the changes introduced in the industrial ecosystem. Moreover, the project gives academics the possibility to gather needs and requirements from the industrial world, allowing the adaptation of AI, IoT and CC/EC teaching to better fit the real-world industrial pains and needs. This work has been funded by the European Commission under the Erasmus+ program.

https://www.researchgate.net/publication/365889522_Towards_a_Taxonomy_of_Industrial_Challenges_and_Enabling_Technologies_in_Industry_40/stats

DESIGN / METHODOLOGY / APPROACH

The Planet4 project involves partners from Industry and Academia from Spain, Italy, Poland, Greece, Lithuania, Romania, and Germany. In Phase 1, the project develops a training needs analysis for Industry 4.0, elaborates a taxonomy to formalize industrial processes and problems, and designs 4.0 Innovation and Change Management training workshop (soft skills). In Phase 2, the project focuses on the collection of best practices based on real scenarios related to AI, IoT and cloud and edge computing for I4.0 applications, and on the design of training materials for a b-learning course. Finally, Phase 3 implements the Planet4 learning course, which is composed of training in the theory of AI, IoT and EC/CC, and two different typologies of practical workshops: the first type of workshop is based on I4.0 Innovation and Change Management methodologies and is aimed at developing the necessary skills for understanding how to include disruptive innovation within a company; and the second type of workshop is based on the taxonomy developed in Phase 1 and aimed at solving real industrial cases provided by companies. The final output of the project will be the validated version of all the training materials and the handbook for replicating the course.

FINDINGS OR EXPECTED OUTCOMES

The project has produced many interesting outcomes, being the two most relevant ones: a taxonomy for Industry 4.0 needs and enabling technologies to help learners in solving real industry challenges with the most innovative and relevant technologies, and a b-learning course for transmitting knowledge on enabling technologies and disruptive thinking for I4.0 challenges.

ORIGINALITY / VALUE

This work can be seen as a Triple Helix action, where the Administration (EC) is supporting by means of the Erasmus+ funding program the collaboration between Academics and Industry in the context of Industry 4.0. Currently, in this context, there is a clear gap between the innovative technologies taught by universities and their application in real scenarios, and Planet4 is a cross-disciplinary initiative contributing in filling this gap.

PRACTICAL / SOCIAL IMPLICATIONS

This work intends to improve the quality of education in Europe while addressing SDG 9 on Building resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

From a scientific perspective, in the future we intend to convert the taxonomy developed within the project into an ontology in order to bring more flexibility and semantics to the tool. From a social point of view, and in line with the Triple Helix approach, it would also be important to enhance the Administration role of this type of initiatives in order to include the developed training materials in the official portfolio of European education programs.

KEYWORDS (3-5)

Industry 4.0, taxonomy, Erasmus+, AI, IoT.

REFERENCES

<https://www.planet4project.eu/>

<http://taxonomy.planet4project.eu/>

5.2 Design and application of a Twin Transition assessment framework for the sustainable digitalization of SMEs

Arjen Van de Walle¹

¹Vrije Universiteit Brussel, Belgium.

PURPOSE

When aiming for sustainable development, societies must overcome the intensifying effects of climate change, rapid urbanization and resource depletion (World Economic Forum, 2021). As business activities form a major cause of - and a potential solution to - these global pressures, the green transition towards sustainable business operations is seen as a crucial societal objective. Moreso, a second major business transition currently being witnessed is the digitalization of business activities, more specifically through the recent increase of AI applications. The European Commission (EC) urged for the “twinning” of both business transitions, increasing the capacity of these transitions to reinforce one another. Moreso, the EC notes that the successful participation of small- and medium-sized companies (SMEs) is crucial for the outcome of this twin transition to be successful (EC, 2022). The purpose of this research is to develop a comprehensive framework for the assessment of the sustainable digitalization of SMEs in the Brussels Capital Region in Belgium, through a process of co-creation between the Vrije Universiteit Brussel, Brussels SMEs and the regional government, and apply the framework on SME members of the local European Digital Innovation Hub.

DESIGN / METHODOLOGY / APPROACH

A practice-based approach to the development of this framework will be applied, in which sustainability assessments will be conducted on digital innovations among SME members of the European Digital Innovation Hub in the Brussels region. Sustainability will be considered from a triple bottom line perspective (incorporating environmental, social and economic considerations). A co-creation process between universities (Vrije Universiteit Brussel and Université libre de Bruxelles), these businesses and the regional government (triple helix) will allow for the growth of an initial theoretical framework constructed at the university into a comprehensive assessment framework, that finally will be turned into an online dashboarding tool (Leydesdorff & Etkowitz, 1998). After a number of in-depth interviews, the assessment of approximately 100 SMEs in the Brussels Capital Region will take place in the period leading up to the Triple Helix Conference. Next to triple bottom line sustainability considerations, additional emphases will be put on problem-structuring with relevant stakeholders, value incorporation through materiality analyses and connecting the resulting framework with common sustainability reporting frameworks and the United Nation's Sustainable Development Goals.

FINDINGS OR EXPECTED OUTCOMES

This research aims at obtaining a comprehensive assessment framework for the sustainable digitalization of SMEs and provide a methodological understanding of the co-creation of such frameworks by academia, businesses, and public organizations. Insights will be gained on the challenges and opportunities for the sustainable implementation of digital technologies in SMEs and the influence of SME business models on the transition. Finally, this research will provide policy recommendations to the regional, national, and European governments on the sustainable digital transformation of businesses and act as a strong basis for future research on the matter.

ORIGINALITY / VALUE

To the author's knowledge, no comprehensive frameworks exist yet for the assessment of twin transitions in business contexts. Next to being a crucial economic driver and source of employment, SMEs amount to more than half of industrial carbon emissions globally (Denicolai et al., 2021). As such, effective sustainability assessments of SMEs are crucial to achieving societal sustainability. Moreso, it has been argued that there is a strong research need on the application and barriers to the application of sustainability management tools for SMEs (Johnson & Schaltegger, 2016).

PRACTICAL / SOCIAL IMPLICATIONS

Over the course of the months leading up to the Triple Helix Conference, continuous interactions between SME managers, academia and public

organizations will add to a common understanding of the sustainable digitalization of SMEs and the barriers to a twin transition.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

As of yet, the limitations of this practical case have not yet been fully explored. It is expected that resource and time limitations for SME managers will have an impact on the extent to which holistic sustainability assessments and stakeholder participation can be executed. Furthermore, we expect that enterprise size, differing levels of corporate professionalization and other identification and financial characteristic of enterprises are expected to play an explanatory role in the execution and extent of execution of these types of assessments. Future research can expand on the occurrence and relative importance of these factors on sustainability.

KEYWORDS (3-5)

Sustainable digitalization; business innovation; sustainable business models.

REFERENCES

1. Denicolai, S., Zucchella, A., & Magnani, G. (2021). Internationalization, digitalization, and sustainability: Are SMEs ready? A survey on synergies and substituting effects among growth paths. *Technological Forecasting and Social Change*, 166, 120650.
2. EC (2022). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL 2022. Strategic Foresight Report Twinning the green and digital transitions in the new geopolitical context.
3. Johnson, M. P., & Schaltegger, S. (2016). Two decades of sustainability management tools for SMEs: How far have we come? *Journal of Small Business Management*, 54(2), 481-505.
4. Leydesdorff, L., & Etkowitz, H. (1998). The triple helix as a model for innovation studies. *Science and public policy*, 25(3), 195-203.
5. World Economic Forum (2021). The Global Risks Report 2021. 16th Edition. <http://wef.ch/risks2021>

06

INNOVATION ECOSYSTEMS FOR URBAN, ECONOMIC, AND
SOCIAL DEVELOPMENT

6.1 Revitalizing forgotten spaces through local leadership and social entrepreneurial ecosystems: the case of Muszyna commune, Poland

Marta Gancarczyk¹, Jacek Gancarczyk¹

¹Jagiellonian University, Poland.

PURPOSE

This paper aims to identify the mechanisms of resurgence and industrial path renewal of a formerly forgotten and underdeveloped territory by exploring the case of the Muszyna commune in Southern Poland. The current revitalization and successful development of the commune over 2004-2020 can be described as bottom-up and based on local leadership that formed a social entrepreneurial ecosystem (SEE) (Broadhurst, Ferreira, & Berkeley, 2021; Thompson, Purdy, & Ventresca, 2018) including the quadruple helix components (Carayannis & Campbell, 2009; Edquist, 2011).

As a theoretical background, we integrated the concepts of social entrepreneurial ecosystems (Thompson et al., 2018; Villegas-Mateos & Vázquez-Maguirre, 2020) and quadruple helix systems (Carayannis & Campbell, 2009). The case study also uses a conceptual lens of co-evolution (Gancarczyk, Najda-Janoszka, Gancarczyk, & Hassink, 2022; Gong & Hassink, 2019) and industrial path dynamics (Asheim, 2019; Hassink et al., 2019) in regional development.

DESIGN / METHODOLOGY / APPROACH

We adopted a longitudinal case study method of the Muszyna commune in the multi-scalar context of the EU, national, and regional cohesion policies after Poland's EU accession in 2004 till 2020 (Yin, 2018). This case is representative of local leadership mechanisms as determinants of the emergence of SEE, quadruple helix system, and territorial transformation in the face of external opportunities but low internal capabilities (Ma & Hassink, 2014).

Primary data sources included interviews with local government representatives held from January 2022 to April 2022, and participant observation. The interviews were semi-structured and comprised a total of six hours (Piekkari & Welch, 2018). Participant observation was performed by one of the authors who has been involved in the cyclical research on the local government performance since 2008. The notes from the interviews and participant observation amounted to around 100 normalized pages. To ensure triangulation, secondary evidence included public statistics and evaluation reports, commune records, media and Internet sources (Silverman, 2015; Wright et al., 2020). These items covered around 3000 normalized pages.

FINDINGS OR EXPECTED OUTCOMES

The Muszyna commune belongs to one of the industrial specializations of the Malopolska region of Southern Poland, that is, tourism and health resorts (MRDO, 2015; MRGO, 2015), as well as extraction of mineral water. However, throughout the economic and political transformation of Poland, economic performance and public support were inferior in this territory compared to other communes with similar specialization (Statistics Poland, 2021).

Our findings reveal how the selected projects of local government leaders involved stakeholders, developed particular dimensions of the SEE, innovation helix, and related institutions of collective action, and how they contributed to the revitalization of the territorial and industrial path. The projects demonstrate a consistent pathway, from basic and tangible infrastructures (e.g., water and sewage system), to more advanced investments tailored at industrial specialization and quality of life (e.g., sports and recreation facilities), to creative and innovative instruments directed at local differentiation (e.g., local symbolic identity).

The increasing innovativeness of the projects were also associated with the development and creation of SEE and innovation system dimensions. These progressed from a predominantly economic dimension to social and cultural dimensions, to collaboration with academia, and finally to the institutional dimension. The latter component is a learning outcome from the projects, which rules, and routines were further conducive to collective action. Moreover, our research has revealed six routines derived from the local government's experience in implementing projects and involving the community. Ultimately, we have proposed an analytical generalization – a framework of local resurgence mechanisms by creating SEE and

innovation helix.

ORIGINALITY / VALUE

First, this research contributes to the literature to social entrepreneurial ecosystems, and to local quadruple helix systems, by extending the knowledge of how these systems emerge through place-based leadership (Broadhurst et al., 2021; Carayannis & Campbell, 2009; Edquist, 2011; Thompson et al., 2018). Our study emphasizes how leaders co-create entrepreneurial communities (Van de Ven, 1993; Wurth et al., 2021) through process approach, namely, by implementing sets of related projects (Lowe & Feldman, 2017).

Second, the paper adds to the industrial path literature and co-evolutionary strand in regional studies, by broadening the knowledge of how the interactions of local agents generate an industrial path renewal (Asheim, 2019; Gancarczyk et al., 2022; Hassink et al., 2019; Pushkarskaya, Fortunato, Breazeale, & Just, 2021).

PRACTICAL / SOCIAL IMPLICATIONS

This study is also informative for local policy makers in peripheral and forgotten spaces with institutional voids. It provides knowledge of the drivers and barriers in industrial path renewal and of the mechanisms underlying territorial resurgence, as framed by the concept of the social entrepreneurial ecosystem and innovations systems (Edquist, 2011; Feldman & Lowe, 2018).

Moreover, this study points to the advantages of local leadership and its underlying institutional conditions (Broadhurst et al., 2021). Besides following formal institutions demanded by law, local leaders can gain awareness and use the value of creating their own internal collaborative rules and routines to complement and specify formal institutions (Zukauskaite, Trippel, & Plechero, 2017). These observations and conclusions are relevant for the transformation of spatial units in CEE countries, and, in particular, for forgotten spaces, which often overly substitute their own SEE with central government intervention (Loewen & Schulz, 2019; OECD, 2019).

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Considering limitations, we primarily interviewed the local government leaders and employees; however, the knowledge is normally dispersed over a wider range of actors such as citizens and enterprises (Piekkari & Welch, 2018; Wright et al., 2020). We addressed this deficiency by data triangulation and using secondary research material (Boje & Rosile, 2020). Future studies can expand the interview groups to other actors, based on the knowledge of collective mechanisms from our case study.

We have described how particular SEE dimensions emerged in the transformation process. The set of dimensions is relevant in the context of a peripheral local unit in a given development phase. However, these dimensions cannot be treated as exhaustive, since they are unique to particular units (Brown & Mason, 2017). Consequently, our research calls for future multiple case studies that would match local units at different levels of SEE and innovation system, and initial socioeconomic conditions.

KEYWORDS (3-5)

Muszyna-Southern Poland, social entrepreneurial ecosystems, quadruple helix, territorial transformation, place-based leadership.

REFERENCES

- Asheim, B. T. (2019). Smart specialisation, innovation policy and regional innovation systems: What about new path development in less innovative regions? *Innovation: The European Journal of Social Science Research*, 32(1), 8–25.
- Boje, D., & Rosile, G. A. (2020). How to use conversational storytelling interviews for your dissertation. Edward Elgar Publishing.
- Broadhurst, K., Ferreira, J., & Berkeley, N. (2021). Collaborative leadership and place-based development. *Local Economy*, 36(2), 149–163.
- Brown, R., & Mason, C. (2017). Looking inside the spiky bits: A critical

- review and conceptualisation of entrepreneurial ecosystems. *Small Business Economics*, 49(1), 11–30.
- 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(3–4), 201–234.
- Edquist, C. (2011). Design of innovation policy through diagnostic analysis: Identification of systemic problems (or failures). *Industrial and Corporate Change*, 20(6), 1725–1753.
- Feldman, M., & Lowe, N. (2018). Policy and collective action in place. *Cambridge Journal of Regions, Economy and Society*, 11(2), 335–351.
- Gancarczyk, M., Najda-Janoszka, M., Gancarczyk, J., & Hassink, R. (2022). Exploring Regional Innovation Policies and Regional Industrial Transformation from a Coevolutionary Perspective: The Case of Małopolska, Poland. *Economic Geography*, 1–30. <https://doi.org/10.1080/00130095.2022.2120465>
- Gong, H., & Hassink, R. (2019). Co-evolution in contemporary economic geography: Towards a theoretical framework. *Regional Studies*, 53(9), 1344–1355.
- Hassink, R., Isaksen, A., & Tripl, M. (2019). Towards a comprehensive understanding of new regional industrial path development. *Regional Studies*.
- Loewen, B., & Schulz, S. (2019). Questioning the convergence of cohesion and innovation policies in Central and Eastern Europe. In *Regional and Local Development in Times of Polarisation* (pp. 121–148). Palgrave Macmillan, Singapore.
- Lowe, N. J., & Feldman, M. P. (2017). Institutional life within an entrepreneurial region. *Geography Compass*, 11(3), e12306.
- Ma, M., & Hassink, R. (2014). Path dependence and tourism area development: The case of Guilin, China. *Tourism Geographies*, 16(4), 580–597.
- OECD. (2019). *Local entrepreneurship ecosystems and emerging industries: Case study of Malopolskie*. Piekkari, R., & Welch, C. (2018). The case study in management research: Beyond the positivist legacy of Eisenhardt and Yin. *The SAGE Handbook of Qualitative Business and Management Research Methods*, 345–358.
- Pushkarskaya, H., Fortunato, M. W.-P., Breazeale, N., & Just, D. R. (2021). Enhancing measures of ESE to incorporate aspects of place: Personal reputation and place-based social legitimacy. *Journal of Business Venturing*, 36(3), 106004.
- Silverman, D. (2015). *Interpreting qualitative data*. Sage.
- Thompson, T. A., Purdy, J. M., & Ventresca, M. J. (2018). How entrepreneurial ecosystems take form: Evidence from social impact initiatives in Seattle. *Strategic Entrepreneurship Journal*, 12(1), 96–116.
- Van de Ven, H. (1993). The development of an infrastructure for entrepreneurship. *Journal of Business Venturing*, 8(3), 211–230.
- Villegas-Mateos, A., & Vázquez-Maguirre, M. (2020). Social entrepreneurial ecosystems: A regional perspective of Mexico. *International Journal of Entrepreneurship*, 24(1).
- Wright, A. L., Middleton, S., Hibbert, P., & Brazil, V. (2020). Getting on with field research using participant deconstruction. *Organizational Research Methods*, 23(2), 275–295.
- Wurth, B., Stam, E., & Spigel, B. (2021). Toward an entrepreneurial ecosystem research program. *Entrepreneurship Theory and Practice*, 1042258721998948.
- Yin, R. K. (2018). *Case study research and applications*. Sage.
- Zukauskaitė, E., Tripl, M., & Plechero, M. (2017). Institutional thickness revisited. *Economic Geography*, 93(4), 325–345.

6.2 A-Place Project: Placemaking in L'Hospitalet

Angel Martín Cojo¹

¹School of Architecture of La Salle (ETSALS), Spain.

PURPOSE

The A-Place project aimed to bring together students, teachers, artists, administration and community members to explore the concept of place and collective identity in the city of L'Hospitalet. Educational and creative activities were utilized to facilitate this collaboration over the course of the last three years. The final purpose of this collaboration is to create or reinforce the links between the inhabitants and certain places underused or ignored in their neighbors. As result of these processes, it is expected that the livability of those places improves, in terms of security, social activity, cohesion and resiliency.

DESIGN / METHODOLOGY / APPROACH

The project follows a placemaking methodology which has been described as 'a collaborative process by which we can shape our public realm in order to maximize shared value. More than just promoting better urban design, placemaking facilitates creative patterns of use, paying particular attention to the physical, cultural, and social identities that define a place and support its ongoing evolution.'ⁱ This generic scheme of placemaking was adapted to the specific objectives of the A-Place Project, developing the following three phases:

- Mapping of the sociophysical territory carried out onsite and online (urban walks, digital maps) with diverse media (texts, photographs, videos).
- Pedagogic activities in public spaces, public facilities and online environments.
- Interventions in public space (design and building artistic interventions)

FINDINGS OR EXPECTED OUTCOMES

The more tangible result of the sequence of activities organized in L'Hospitalet has been the celebration of the first ES_CULTURA: Public art festival, in November 2022.



A-Place Festival on Twitter's dissemination post: shorturl.at/mvB19 -

The goal of the festival was to continue the efforts to revitalize public spaces in L'Hospitalet, which began in 2021, with the installation of artwork created by artists, local school students, and architecture students in collaboration with the L'Hospitalet council.

The festival received 42 proposals, and a jury selected 10 to be built and installed in an underutilized square in the Bellvitge neighborhood. The festival featured a two-day event that included music, dance, painting, and sculpture, bringing together community members, artists, and students to collectively transform the public space.

It is expected that new editions of the festival will be organized in the future, either by the administration or by different agents independently, without the involvement of A-Place members. The ultimate aim is to foster a network of interactions and events that positively affect the use and perception of shared public spaces in the long term.

ORIGINALITY / VALUE

The A-Place project successfully employed a blended and integrative approach, combining online and in-person activities, local and international interactions, and participants from different

generations and cultures. The project's actions, activities, and events spanned a variety of disciplines, including art, urban design, and social events. Notably, the artistic activities proved to be particularly effective in fostering unexpected interactions and shared outcomes among the diverse range of participants and spectators, including both community members and visitors.

PRACTICAL / SOCIAL IMPLICATIONS

The success of this kind of placemaking projects depends very much of the strength of the social network that has been created. Placemaking is an open and creative process that need to be maintained over a certain period of time to achieve meaningful results, especially with the community members of the intervention area.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The added value that this kind of processes create depends on the capacity of the placemakers to motivate the different actors involved on it and to maintain the communication in between all of them. In this regard, it is necessary to develop effective communication means (graphic tools, mapping, digital tools) to support and communicate the analysis of a certain area and also the results of the different actions realized onsite.

The ultimate goal of A-Place is to enhance the livability of a location by strengthening the connections between individuals and the space, as well as the connections between individuals themselves. To achieve this, it is crucial to establish strong networks and alliances through regular events, meetings, projects, and associations. These activities must be carefully planned and executed to ensure that the connections continue to be maintained over time, thus promoting a sense of community and belonging.

Additionally, the organization of ad-hoc art events involving a diverse range of participants, from professionals to students and community members, can promote spontaneity and unexpected interactions. This not only enhances the value of public spaces but also supports the local arts scene by providing opportunities for exposure and engagement.

KEYWORDS (3-5)

Creative Placemaking, Participation, Public Space, Social Urbanism.

REFERENCES

Project for Public Spaces accessed January 24, 2023, <https://www.pps.org/category/placemaking>

6.3 Ecosystem Integration Labs as Responsible Innovation-Led Entrepreneurial University Transformation Centres – an example of the RiEcoLab project

Paweł Głodek¹, T. Bartosz Kalinowski¹, Małgorzata Żak-Skwierczyńska¹, Magdalena Wiśniewska¹

¹University of Lodz, Poland.

PURPOSE

The main objective of the article is to analyse the process and the conditions of building the Ecosystem Integration Labs (EIL) embedded to develop a novel way R&D is being performed in Higher Education Institutions (HEIs) to ensure immediate commercialization (spinoffs) and involvement of a large number of internal stakeholders (academic and non-academic staff, students) with social and environmental responsibility. Such an approach complies with sustainable development goals (SDGs) and environmental, social, and corporate governance (ESG).

The creation of Ecosystem Integration Labs is based on the Living Labs concept. Their creation is made possible by making use of existing infrastructure, such as research support offices and technology transfer centres, among others. Taking into account the specific characteristics of an organization, EILs are developed on a bespoke basis and based on an assessment of the needs of each university. EIL can be characterized as a packaging unit containing R&D support units and technology transfer offices that coordinate all R&D work, including commercialization.

DESIGN / METHODOLOGY / APPROACH

The analysis of the process of building and the conditions for the operation of Ecosystem Integration Labs will be based on the cases of the University of Lodz in Lodz (Poland) and Yasar University (Turkey). There, new structures are being created according to the same strategic assumptions, which result from the participation of both entities in the implementation of the RiEcoLab project supported by EIT Manufacturing.

FINDINGS OR EXPECTED OUTCOMES

The analysis presented refers to the following aspects of the practice:

1. Structures that have been developed:
 - EILs as hybrid start-up support in HEI.
 - Improvement and renewal of already existing Technology Transfer Office.
 - Mandatory training for academic and non-academic staff and students.
 - Improvement of advisory boards, including public-private investors.
 - Improvement of internal financing schemes for potential spinoffs.
2. Actions that have been undertaken:
 - Regional hotspots of start-up support.
 - Support from public authorities.
 - Further funding to continue the activities.

ORIGINALITY / VALUE

The originality and novelty of analysis are directly linked with the scope and dimensions of RiEcoLab practice as it presents the multifacetedness of embedding EILs in HEIs with the use of responsible research and innovation approach via the inclusion of internal and external quadruple helix actors, involvement of stakeholders through co-creation, participatory processes, citizen science, and open science principles. The findings support HEIs trying to effectively introduce approaches such as responsible research and innovation – similar to/ complying with SDGs and ESG into their strategy and operational activity.

PRACTICAL / SOCIAL IMPLICATIONS

Implications relating to the implementation of EIL by HEIs refer to strengthening the entrepreneurial and innovation capacity of HEIs by facilitating capacity building and changing the mindset of academic and non-academic HEI staff to become a more successful entrepreneurial university.

Implementation of EIL should enforce the cocreation and mix of internal staff (academic and non-academic) with external quadruple helix staff resulting in a better understanding of the innovation, commercialization, and entrepreneurship landscape while also leading to enabling citizen science, open science, participatory engagement and responsibility during all R&D phases – as assumed in ESG and pushing HEIs to become more engaged in sustainable, circular and

responsible regional growth and fostering the creation of jobs via spinoffs/start-ups/scaleups and technology transfer – which is in line with SDGs.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The literature and policy show a conviction among relevant stakeholders that innovation needs the inclusion of end users, as well as public and private actors, but it is not common to do that yet (Lubberink et al., 2019). Therefore, further in-depth studies of similar activities of HEIs need to be undertaken. Thereby, systematic development of scholarship on responsible innovation and co-creation in Living Lab formats is necessary.

Another problem that needs deeper investigation is good practices in ensuring that the innovation developed within HEI leads to the market (i.e. start-up/scale-up) which, among others, means the provision of sufficient financing. What is more, it is essential to explore the mechanisms that allow financial support for innovations that produce a social or environmental impact (positive change in society). Therefore, the investment discussion moves towards the impact investment concept in compliance with SDGs and ESG.

KEYWORDS (3-5)

Sustainable development goals; environmental, social, and corporate governance; responsible research and innovation; university; living lab.

REFERENCES

- Boyer, B., Cook, J.W. and Steinberg, M. (2011). Recipes for Systemic Change, Sitra/Helsinki Design Lab, Helsinki (Finland).
- GIIN, 2021a, Impact Investing, accessed 10/01/2023 via: <https://thegiin.org/impact-investing/>
- Glencross, J., Bogglid, L., Bishop, M., Manwaring, S., Harrison, J.P., and Leytes Brenda Plante, M., (2017). The Impact Investing Guidebook for Foundations, Purpose Capital, Philanthropic Foundations Canada and Community Foundations of Canada, accessed 11/01/2023 via: <https://missioninvestors.org/sites/default/files/resources/Impact-Investing-Guidebook-Foundations-v16-Linked.pdf>
- Hossain, M., Leminen, S., & Westerlund, M. (2019). A systematic review of living lab literature. *Journal of cleaner production*, 213, 976-988.
- Kupper, F., Klaassen, P., Rijnen, M., Vermeulen, S., Broerse, J. (2015). D1.3 Report on the quality criteria of Good Practice Standards in RRI, RRI-Tools. Athena Institute, VU University Amsterdam: Amsterdam. The Netherlands.
- Leminen, S. (2015) Q&A. What Are Living Labs. *Technology Innovation Management Review*. 5. 29-35.
- Lubberink, R., Blok, V., Van Ophem, J., Omta, O. (2019). Responsible innovation by social entrepreneurs: an exploratory study of values integration in innovations, *Journal of Responsible Innovation*, 6:2, 179-210.
- Owen, R., Stilgoe, J., Macnaghten, P., Gorman, M., Fisher, E., & Guston, D. (2013). A framework for responsible innovation. *Responsible innovation: managing the responsible emergence of science and innovation in society*. London: John Wiley & Sons.
- Von Schomberg, R. (2013). A vision of responsible research and innovation. in: R. Owen, J. Bessant, M. Heintz (Eds.), *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, Wiley, London, 51-74.

6.4 A System Dynamics Model to Analyze Development of Innovation Districts

Jorge A. Durán E.¹, Carina A. Rapetti², Josep M. Piqué², Didier Grimaldi²

¹Universidad Popular Autónoma del Estado de Puebla, México, La Salle – Ramón Llull University, Spain.

PURPOSE

This work aims to examine the holistic interaction of an innovation district indicators through a System Dynamics (SD) approach. The development of innovation districts is a highly complex system, and understanding its dynamic structure is the most effective way to approach it. Using SD, we build causal loops and simulate those interactions to understand the relationships between these indicators and anticipate how an action taken in one indicator may impact another. The study associates the role of the Triple Helix actors, Government, Industry, and Academia with the activation of those indicators along the different phases of development of an industrial district: inception, launching, growth, and maturity. Thus, the simulation will contribute to understanding the decision-making processes in which those actors participate at different phases of the evolution of an innovation district.

DESIGN / METHODOLOGY / APPROACH

System Dynamics (SD) is an adequate method to understand the behavior of complex systems such as an innovation district, by identifying and simulating the structure that underlies behavior. Given the highly complex interactions of actors and processes that generally surround urban issues, SD allows us to understand these complexities and reveal some guidelines for the decision-making of the main actors involved. Firstly, we integrate the results of Dematel into the SD, mainly the network diagrams showing the interrelationships among indicators in an ID. Then, we develop the SD model and describe the proxies related to the model variables at this stage using the SD tools and language. Finally, the model is validated with the experiences of the 22@Barcelona and Porto Digital innovation districts.

FINDINGS OR EXPECTED OUTCOMES

This work complements the research line of the authors by contributing to observe in a dynamic context the development of an innovation district, from inception to maturity. In previous studies the authors provided an understanding of the importance of different indicators in developing an innovation district in the urban context area, validated through an international panel of experts using the Fuzzy-Delphi method. A similar panel examined these indicators of the urban, economic, social, and governance dimensions with the Dematel method to determine their relationships as causes and influences.

ORIGINALITY / VALUE

This is the first attempt to apply System Dynamics to the evolution of an innovation district considering the whole complexity of the dimensions involved and participating actors.

PRACTICAL / SOCIAL IMPLICATIONS

From the simulation results, we made recommendations for public policies that may promote performance, indicating the role of crucial TH actors in impacting results. The recommendations consider those more effective factors for directing and obtaining the desired performance and results.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The result of this research will suggest the application of a similar model to the experiences of other innovation districts and identify those elements of the simulation model that require further description and analysis.

KEYWORDS (3-5)

Innovation District, System Dynamics, Triple Helix.

REFERENCES

Boix-Domenech, R., Galletto, V., and Sforzi, F. 2018. Place-based innovation in industrial districts: the long-term evolution of the iMID effect in Spain (1991–2014). *European Planning Studies* 27(10), 1940–1958.

Chaminade, C., Bellandi M., Plechero, M., and Santin, E. 2019. Understanding processes of path renewal and creation in thick

specialized regional innovation systems. Evidence from two textile districts in Italy and Sweden. *European Planning Studies*, 27(10), 1978–1994.

Dangelico, R. M., Garavelli, A.C., and Petruzzelli, A.M. 2010. A system dynamics model to analyze technology districts' evolution in a knowledge-based perspective. *Technovation* 30, 142–153.

Duran-Encalada, J.A. and Alberto Paucar-Caceres, A. 2008. *System Dynamics Urban Sustainability Model for Puerto Aura in Puebla, Mexico*. Syst Pract Action Re, Springer.

Forrester, J. 1961. *Industrial Dynamics*. Waltham, MT, USA: Pegasus Communications.

Marshall, A. 1920. *Principles of Economics*. 8th ed. London: Macmillan and Co., Ltd. Library of Economics and Liberty.

Radzicki M.J. and Seville D.A. 1993. *An institutional dynamics model of sterling, Massachusetts: indicative planning at the local level*. *J Econ Issues* XXVII(2): 481–492

Rapetti, C., Pique, J., Berbegal-Mirabent, J. & Figlioli, A., 2022b. Performance Indicators for the Evolution of Areas of Innovation - Porto Digital Case -. *Journal of Evolutionary Studies in Business*, Volume Forcoming.

Rapetti, C., Pique, J., Pareja-Eastaway, M. & Grimaldi, D., 2022a. Understanding the development of innovations districts through indicators - 22@Barcelona Case -. *Journal Of Evolutionary Studies in Business*, Volume Forcoming.

Richardson, G.P. and Pugh, A.L. 1989. *Introduction to System Dynamics Modeling*. Waltham MA: Pegasus Communications.

Sanders, P. and Sanders, F. 2004- Spatial urban dynamics. In: *Proceedings of the 2004 international system dynamics conference*, Oxford, UK

Stave, K.A. 2002. Using system dynamics to improve public participation in environmental decisions. *Syst Dyn Rev* 18(2):139–167

Sterman, J. 2000. *Business Dynamics, Systems Thinking and Modeling for a Complex World*. USA: Irwin McGraw-Hill.

Winz, I. , and Brierley, G. 2007. The use of system dynamics simulation in integrated water resources management. In *Proceedings of the system dynamics conference 2007*. The University of Auckland.

Yigitcanlar, T., Adu-McVie, R. & Erol, I., 2020. How can contemporary innovation districts be classified? A systematic review of the literature. *Land Use Policy*. Elsevier, Volume 95.

6.5 NGOs: core actors for green innovations

Ferretti Marco¹, Cannavale Chiara¹, Maria Cristina Pietronudo¹, Lorenza Claudio¹

¹Parthenope University of Naples, Italy.

PURPOSE

The paper aims to explore the role of non-governmental organisations (NGOs) in the green innovation process. Green innovation requires collaboration between a wide range of stakeholders among whom is the civil society (Gouvea, Kassiech and Montoya, 2013). The extension of the innovation network has been theorised by Carayannis, Barth and Campbell (2012) and Carayannis & Rathmatullin (2014) through concepts of quadruple and quintuple helix inviting core innovation actors (government, university, corporation) to also include the society and the environment. Their suggestion has been fully embraced for the development and diffusion of social innovation, with several evidence in the global south (Parthasarathy, Dey and Gupta, 2021) where ONGs contribute to the sustainable development playing the role of activists and advocates for social ideals and social practices (Spar and La Mure, 2003), auditors (Yaziji and Doh, 2009), architect of social capital (Schiller and De Wet, 2019) and bridge among core innovation actors and local communities. Less is known about the role of NGOs in green innovation, i.e., "hardware or software innovation that is related to green products or processes, including the innovation in technology process" (Chen et al., 2006, p. 332). Nguyen Dang et al., (2022) recognise the growing role of NGOs in environmental issues, mainly in ensuring the social impact of green initiatives. A stream of literature ascribes to NGOs a role less close to social aspects but fully engaged in environmental innovation. Winston (2010) claims the advisory role in offering consultation services to firms on adopting green practices. Yarahmadi et al., (2012) identify firms have utilised the services of NGOs to gain ideas and expertise in green values. Melander and Arvidsson (2022) consider NGO integrated in green innovation networks, mainly during the implementation and the institutionalisation phase of innovation. We contribute to this stream of literature, and we catch theoretical ideas by Melander and Arvidsson (2022) who claim empirical relevance in clarifying which actors are present in different stages of the green innovation process, what motivates them and how they interact into the innovation network. Our research questions are: how do NGOs contribute to green innovation? What role do they play beyond the implementation and the institutionalisation phase of innovation?

METHODOLOGY

To address the research question we propose a multiple case study (Yin, 2009). A qualitative approach seems to be the most suitable, since the general exploratory objective of this paper. We selected two innovation projects in which NGOs are involved. Projects show the intervention of NGOs to protect the natural environment and to promote sustainable development. Particularly, the first case study focuses on the activity of "The Ocean Clean Up" a non-profit foundation, which is specifically active in oceans' pollution. Their main goal is to develop technologies to get rid of plastics from the oceans, since it represents simultaneously an economic, a health and an environmental issue. The second case study concerns the innovation projects managed by "MIO-ECSDE", a non-for-profit organisation operating in climate change, biodiversity, nature and marine and coastal environment.

EXPECTED OUTCOMES

We expect the emergence of a broader role of NGOs within the innovation process: particularly, the existing literature argues that NGOs' role is limited to the implementation and institutionalisation's phase. However, the case studies should reveal how NGOs play a focal role also during i) the knowledge generation - including the idea conception and the design process - ii) the pilot and testing phase, due to their deep understanding of the context and people's needs; iii) the coordination and governance, since NGOs bring together distant and various actors.

ORIGINALITY / VALUE

The paper proposes NGOs as core actors for green innovation. The topic, although very interesting, is completely fragmented within the major literature. Indeed, in our opinion it is necessary to

deepen it, in order to provide the adequate knowledge to all actors involved and to transform the NGOs action into a best practice.

PRACTICAL IMPLICATIONS

The paper offers a reflection in terms of a more active role of some component of the civil society, inviting researchers and practitioners to consider it not as user innovation but as active player leading the generation of innovation.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Our study is at an embryonal stage and requires primary data to reinforce our expected results. However, it opens to further research on green innovation peculiarities and green innovation ecosystems that differ with respect to the type of actors involved and the role they play.

KEYWORDS (3-5)

NGOs; green innovation network; green innovation; case study.

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, 1-12.
- Carayannis, E. G., & Rakhmatullin, R. (2014). The quadruple/quintuple innovation helixes and smart specialisation strategies for sustainable and inclusive growth in Europe and beyond. *Journal of the Knowledge Economy*, 5, 212-239.
- Chen, Y. S., Lai, S. B., & Wen, C. T. (2006). The influence of green innovation performance on corporate advantage in Taiwan. *Journal of Business Ethics*, 67(4), 331-339.
- Gouvea, R., Kassiech, S., & Montoya, M. J. (2013). Using the quadruple helix to design strategies for the green economy. *Technological Forecasting and Social Change*, 80(2), 221-230.
- Melander, L., & Arvidsson, A. (2022). Green innovation networks: A research agenda. *Journal of Cleaner Production*, 131926.
- Nguyen Dang, H. A., Khan, A., Doan, A. T., & Ibbett, N. (2022). The social impact of green innovation: Towards a conceptual framework. *International Journal of Public Administration*, 45(5), 399-411
- Parthasarathy, B., Dey, S., & Gupta, P. (2021). Overcoming wicked problems and institutional voids for social innovation: University-NGO partnerships in the Global South. *Technological Forecasting and Social Change*, 173, 121104.
- Schiller, U., & De Wet, G. (2019). Non-governmental organisations as stakeholders in the implementation of community-based research by universities. *Southern African Journal of Social Work and Social Development*, 31(2), 20-pages.
- Spar, D. L., & La Mure, L. T. (2003). The power of activism: Assessing the impact of NGOs on global business. *California management review*, 45(3), 78-101.
- Winston, A. (2010). Transparency: The most powerful green NGO you've never heard of. *Harvard Business Review*
- Yarahmadi, M., Higgins, P. G., & Bigliardi, B. (2012). Motivations towards environmental innovation: A conceptual framework for multiparty cooperation. *European Journal of Innovation Management*, 15(4), 400-420.
- Yaziji, M., & Doh, J. (2009). *NGOs and corporations: Conflict and collaboration*. Cambridge University Press.
- Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). sage.

6.6 The role of entrepreneurial universities within quintuple helix innovation ecosystems. A system analysis

Canio Forliano¹, Paola De Bernardi¹, Alberto Bertello¹

¹Department of Management, University of Turin, Italy.

PURPOSE

This study applies systems mapping and network analysis techniques to investigate the performance of European innovation ecosystems, laying out the structural drivers and actor interrelationships in national and regional economies. In this context, within a quintuple helix model, entrepreneurial universities serve as key hubs for knowledge creation and outreach and for promoting economic and social growth. Indeed, besides the triple helix model proposed by Etzkowitz and Leydesdorff (2000) where governments, industry, and universities are all seen as active advocates of innovation and knowledge, a fourth and fifth ones have been increasingly recognized by scholars (Carayannis et al., 2019; Galvao et al., 2019) for including the bottom-up interactions and initiatives promoted by civil society (i.e., the fourth helix) within the natural environment (i.e., the fifth helix).

DESIGN / METHODOLOGY / APPROACH

To achieve our aim, we performed a two-step research for investigating the European Innovation Scoreboard (EIS), considered a relevant case to be analyzed for capturing the different themes and indicators characterizing the structure of European national innovation systems (European Commission, 2021). Indeed, since 2001 the EIS represents the annual observatory conducted by the European Commission to provide “a comparative assessment of the research and innovation performance of the EU Member States and selected third countries, and the relative strengths and weaknesses of their research and innovation systems” (European Commission, 2021, p. 6). So, adopting a five helices perspective, we first mapped the different indicators of the EIS and built a causal map to identify the different causal relationships emerging from the analysis of how each indicator and sub-indicator was built. Secondly, we converted the causal map into a directed unweighted graph and analyzed it through network analysis to identify the different leverage points characterizing the system.

FINDINGS OR EXPECTED OUTCOMES

The causal map showing the different intertwined relationships characterizing European national innovation systems is shown in Figure 1, where positive causal relationships are depicted in blue and negative causal relationships in red. Starting from the causal map shown in Figure 1, we were able to transpose it into an unweighted directed graph, which has been constructed and analyzed using Gephi. The resulting network included 79 nodes and 148 edges. Thus, to identify its different leverage points, we analyzed the model calculating both topological measures of the network and centrality measures of each variable. Considering, for example, the nodes' degree centrality several ones are not affected by other variables (low score of in-degree centrality) and only a few hubs are present (i.e., skilled and educated human capital, attractive research system, innovation capabilities), suggesting where specific policies could more probably produce results. In contrast, only one node has an out-degree of 0 (i.e., environmental sustainability) and one node has the maximum out-degree value of 8 (i.e., gross domestic product or GDP). For instance, this means that acting on GDP can impact large parts of the model. Conversely, environmental sustainability does not represent a good leverage point.

ORIGINALITY / VALUE

Although “systems” are often mentioned in the literature on innovation and national/regional economic growth, systems thinking and problem-structuring techniques are not used as frequently. Thus, operationally based mappings that connect the structure of innovation systems to behavior and potential policy leverage points (Meadows, 1999) leave innovation models under-theorized (Arthur et al., 2022; Maruccia et al., 2020). In order to fill this gap, this study applies a system mapping technique to investigate European innovation ecosystems. In this sense, we emphasize both the value of the process itself, which combined system mapping techniques and network analysis, as well as the identification of the different leverage points that characterize the way the European Commission assesses and

evaluates the performance of European national innovation systems.

PRACTICAL / SOCIAL IMPLICATIONS

Shedding light on the potential effects of specific actions to be planned, the methodology proposed in this work has the potential to be an effective decision-making tool. Hence, combining the mapping technique with network analysis might be particularly helpful in providing a holistic perspective of the different intertwined elements that characterize European innovation ecosystems. In this sense, the result of this study could pave the way for encouraging collaborative governance processes among the different stakeholders constituting the quintuple helix model of innovation, especially highlighting the role played by entrepreneurial universities. Furthermore, this study highlights how historical data can be used to implement effective performance management systems and used to identify leverage points that can be operated to effectively assess the relative strengths and weaknesses of each national innovation system, better-directing decisions and political agendas.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This study is not free from limitations that could pave the way for further developments. First, we developed the map considering the EIS framework, which represents a conceptual model used to assess the innovation performance of European countries. Hence, it could be interesting to test the model by performing different exploratory studies in both developed and developing countries. Furthermore, the framework does not consider how each innovation ecosystem can influence other ecosystems or is influenced by them. Thus, exogenous variables could be added to the model in future studies. Finally, the model offers a static representation of an innovation ecosystem, so it could be interesting to further advance the analysis by applying a system dynamics approach (Sterman, 2000), which could offer further insights by unveiling the different feedback loops that characterize the model and how it answers to the implementation of different policies leveraging the simulation possibility offered by stock and flow diagrams.

KEYWORDS (3-5)

Quintuple helix, innovation ecosystems, system thinking, network analysis.

REFERENCES

- Arthur, D., Moizer, J., & Lean, J. (2022). A systems approach to mapping UK regional innovation ecosystems for policy insight. *Industry and Higher Education*, 09504222221115977.
- Carayannis, E. G., Grigoroudis, E., Stamati, D., & Valvi, T. (2019). Social business model innovation: A quadruple/quintuple helix-based social innovation ecosystem. *IEEE Transactions on Engineering Management*, 68(1), 235–248.
- 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(2), 109–123.
- European Commission. (2021). *European Innovation Scoreboard*.
- Galvao, A., Mascarenhas, C., Marques, C., Ferreira, J., & Ratten, V. (2019). Triple helix and its evolution: a systematic literature review. *Journal of Science and Technology Policy Management*.
- Maruccia, Y., Solazzo, G., Del Vecchio, P., & Passiante, G. (2020). Evidence from Network Analysis application to Innovation Systems and Quintuple Helix. *Technological Forecasting and Social Change*, 161, 120306.
- Meadows, D. (1999). *Leverage Point: Places to Intervene in a System*. 1–19.
- Sterman, J. (2000). *Business dynamics. Systems Thinking and modeling for a complex world*. Irwin/McGraw Hill.

6.7 Societal engagement in the innovation eco-systems of e-health, industrial automation and construction to promote sustainable development

Andrea Porcari¹, Olmo Guagnetti¹, Kathrine Collin Hagan², Mette Simonsen², Sofie Nielsen², Agnes Mlicka², Nina Ritter Nielsen³, Kasper Vestentoft³, Izaskun Jimenez Iturriza⁴, Raúl Tabarés Gutiérrez⁴, Anna Aris⁵, Willemine Willems⁵, Cristina Paca⁶, Clara Boissenin⁶

¹Airi – Italian Association for Industrial Research, Italy, ²DBT – Danish Board of Technology, Denmark, ³DTI – Danish Technological Institute,

⁴Tecnalia – Fundacion Tecnalia Research & Innovation, Spain, ⁵Vrije Universiteit Amsterdam, Netherlands, ⁶Ecsite, EU.

PURPOSE

The goal was to discuss KETs innovations and their impact on societal expectations and concerns, and to promote more inclusive and collaborative approaches in their development and strategic planning.

DESIGN / METHODOLOGY / APPROACH

In the “SockETs Labs” we used a stepwise approach (exercise’s design, solutions’ prototyping, outcomes’ maturation), consisting of three workshops with interactions in-between.

We engaged research (e.g. academia, technology centers and clusters), industry (e.g. manufacturers and suppliers), institutions (governmental agencies, regions, cities, national and regional procurers of innovation activities), civil society organization, and citizens.

We realized six Labs across Europe:

- e-Health applications and wearable electronics (Denmark, Bulgaria, Serbia) addressing SDGs 3, 9 and 10;
- Artificial Intelligence in Industrial Automation systems (Spain) addressing SDGs 4, 8 and 9;
- circular economy (Italy, Estonia) addressing SDGs 11, 12 and 13.

FINDINGS

The main challenges emerged in e-health Labs was how to introduce (and finance) these novel products in the workflows of the healthcare system, how to network with healthcare players (e.g. hospital, healthcare professionals) along the value chain to enable effective use of e-health applications, and how to raise awareness of customers on pros and cons of these products.

Although enriching for all the participants, some discussed themes were considered too technical for citizens (DK), while a lack of trust on eHealth devices (RS) and some concerns on socio-ethical aspects of AI applications (BG) emerged. These issues were addressed in the last workshop, that discussed with citizens their views and opinions (DK), how to organize a successful societal engagement and media campaign on e-Health (RS), and co-created a vision for the next steps towards digital transformation of medical care (BG).

Main challenges in the circular economy Labs include lack of cooperation between local circular economy stakeholders (EE) and difficulties for SMEs in adapting to change (IT). How to design inclusive societal engagement activities (EE) and the development of future scenarios to introduce technological innovations within the building and construction sector (IT) were the themes discussed and agreed with stakeholders and citizens.

Main challenges in the industrial automation Lab include deskilling and reskilling processes, new needs in education and training, and socio-ethical dilemmas in the workplace regarding privacy or surveillance. Needs and expectations for future of jobs in artificial intelligence applications and the transition plan towards digital transformation of companies were discussed. Several concerns arose, e.g. the mental and physical health issues caused by AI in the workplace, the need of interdisciplinarity of employees in industry, the importance of training and accommodating personnel competences due to AI adoption.

ORIGINALITY / VALUE

The SockETs added value lies in the collected learnings from the Labs, that have been structured and summarized in the SockETs “Tech Industry’s Guide” to help research and industrial actors within specific innovation ecosystems to engage with quadruple helix actors, including civil society organizations and citizens, and discuss challenges, impacts and role of enabling technologies to address societal challenges.

PRACTICAL / SOCIAL IMPLICATIONS

These recommendations focus on creating the right environment and momentum, involving the right stakeholders, and the need to contextualise and tailor-made the societal engagement process.

First, the process should be iterative and agile (likely non-linear), where participants can develop networks and reflect on issues

that are not in their everyday agendas. It is also relevant to choose and create a safe space for participants to collaborate in a climate of trust, empathy, and cooperation; facilitators contribute offering a neutral view and considering the heterogeneity of stakeholders and cultural particularities. Second, the tools used need to be chosen and adopted depending on the needs of each specific process: their success depends on understanding the context. Besides, participatory processes cannot be steered in a particular direction: they require flexibility and a high degree of anticipation to react to unexpected issues. Third, a balance among the quadruple helix stakeholder is essential, based on an analysis of the innovation eco-system in which they operate. Ensuring representation of their interests and stakes is driver, and a motivation for their effective engagement. As import is participation of societal actors, civil society organizations and, through associations and organisations, citizens.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The most notable Labs’ limitations are that several technology developers and industrial stakeholders showed some reluctance to engage with citizens in technological development: they were more focused on testing their products with potential customers rather than on product or service co-creation. On the other hand, citizens showed a lack of confidence in their own skills and knowledge and perceived themselves as unable to engage in such cocreation processes.

Moreover, collaboration and discussion dynamics among different stakeholders need some more time to consolidate trust and enable a step forward towards specific product or service co-creation activities. On the other hand, we increased the knowledge of technologies among the ecosystem players, created new and wider networks, also including citizens, and start developing a common vision on the future of innovation: these are the bases to establish future collaborations aiming at SDGs between various stakeholders.

To strengthen these opportunities, SockETs will continue its dissemination actions, promoting the adoption of principles and guidelines developed by the ecosystem actors during the Labs, and sharing this experience as a case study for societal engagement and a model for innovation towards SDGs.

The panel will present all these aspects.

KEYWORDS (3-5)

Societal engagement, co-creation, Key Enabling Technologies, e-health, Industrial Automation, circular economy.

6.8 Exploring Regional Innovation Ecosystem: Theory and Evidence from China

Kaicheng LIAO¹, Yuchen ZHANG, Jingwen YI

¹School of Economics and Management, Tongji University, China,

Since the reform and opening up, China's second-mover advantage has contributed to its economic development and helped evolve unique regional innovation ecosystems. In this paper, we propose a concept of regional innovation ecosystems by integrating the operation characteristics of both natural and social ecosystems. Then we discuss its internal structure and dynamic operation mechanism from the perspective of coupling theory. Also, we use the SpVAR model to empirically investigate the dynamic operation mechanism and spatial effects of the internal structure of China's regional innovation ecosystems from 2007 to 2019. The results indicate that an embedded coupling mechanism exists within China's regional innovation ecosystems, and the operation mechanism has strong spatial interaction effects.

07

SUSTAINABLE CITIES & COMMUNITIES

7.1 Strategies and Impact Pathways to halt air pollution in Barcelona. Participative Governance for sustainable urban development

Christiane Gebhardt¹, Josep M. Piqué²

¹Drees & Sommer, Switzerland, ²La Salle Technova Barcelona, Spain.

PURPOSE

Discuss Urban development as wicked problem and show impact pathways as a new governance element.

DESIGN / METHODOLOGY / APPROACH

Urban case where the interaction between Triple Helix Twins and the Quadruple Helix stakeholder setting for empirical research make cities and human settlements inclusive, safe, resilient, and sustainable.

FINDINGS OR EXPECTED OUTCOMES

Air pollution is a complex issue affecting environment and human health. It became a common issue in megacities where population growth, density and emissions cause outdoor air pollution, which in turn constitutes a major health risk for vulnerable groups, leading to respiratory and cardiovascular mortality (Lelieveld and Muenzel, 2020; Lelieveld et al., 2019). Air pollution is related to childhood asthma, coronary and heart disease and premature deaths and years of life lost and is attributed to three main air pollutants; Nitrogen dioxide (NO₂), Particulate Matter (PM 2.5), and Black Carbon (BC). (EEA 2021, EEA 2022) (Barcelona: (Pierangeli et al., 2020).

Following the Paris climate agreement of a below 2.0-degree /1.5-degree target (IPCC 2018; UNFCCC 2016) urban policies recognize co-benefits from addressing problems related to both climate change and air pollution ((Markandya et al., 2018; Shayan et al., 2020). In Barcelona, programs address different sectors like transport, urban planning, power generation and industry (WHO 2021). Barcelona City and Barcelona Regionale have integrated higher shares of renewable energy technologies in energy systems, and incentivize green growth in order to decarbonize on all levels and in all sectors while trying to meet the growing energy demand of a prospering city (BarcelonaCity 2022). These policies are flanked by increasing efforts to establish new citizen science models to manage the problem in urban agglomerations with an inclusive governance approach (EU Cities-Health 2019; C40, 2022). Despite all efforts, the European Environment Agency reports concentrations of pollutants well above the latest WHO recommendations after economic recovery related to Covid 19 (EEA 2022).

Barcelona follows guiding principles of international organizations and is currently confronted with external influences like rising energy costs and the need for a faster energy transition. Health might silently disappear from the urban agenda. Unanticipated results of the impact pathway show that transparency and app-induced self-monitoring has already caused awareness of causal linkages between well-being, pollution and temperature. This has already spurred behavioral range shifts: Wealthy parts of the population moved to higher grounds and other districts and gentrification moved to new areas. Equally, the need to provide employment for a growing population has triggered unexpected, but important show-stoppers: concentrations of pollutants are well above the latest WHO recommendations after economic recovery related to Covid 19. (EEA 2022). Green growth must come faster

We discuss the issue of air pollution as a wicked problem for Barcelona City and show the heterogeneity of stakeholder interests, the importance of the urban heritage and political beliefs in respect to ecological and socioeconomic patterns (Liu et al., 2007). Causes and effects are illustrated in a problem tree (Chevalier and Buckles, 2016) and criteria of wicked problems (Rittel and Webber, 1973) are tested for the presented case to show the change dimension.

The research has policy implications for other cities.

ORIGINALITY / VALUE

New integration of theory (Triple Helix Twins and Quadruple Helix) application of Theory of Change ToC in urban development and governance.

PRACTICAL / SOCIAL IMPLICATIONS

For the discussion of the intervention, we employ the method Multifaceted Sufficient Interventions provided in the Theory of Change

(Mayne 2015; Funnel&Rogers 2011). Outlining the assumptions, linking them to causal activities will clarify supporting or blocking factors.

External influences and unexpected outcomes show the degree of control over the process and the expected time-to-impact. We discuss the probability of desired outcomes which is reduced air pollution and higher equality in terms of urban well-being in a crucial developmental stage of the city to find new implementation pathways and governance models.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The case is a pilot to initiative comparative research of other European city facing the same problem and can be seen as a preparation for an EU green deal application.

KEYWORDS (3-5)

Urban development, governance, wicked problems, transformation pathways, air pollution, quadruple helix, triple Helix twins, Barcelona, C40.

REFERENCES

- Aibar, E. and Bijker, W. E. (1997) 'Constructing a City: The Cerdà Plan for the Extension of Barcelona', *Science, technology, & human values*, 22(1), pp. 3-30.
- Balint, P. J., Stewart, R. E., Desai, A., & Walters, L. C. (2011). *Wicked environmental problems: managing uncertainty and conflict*. Island Press.
- Barcelona City (2022) Air Quality, real time monitor <https://ajuntament.barcelona.cat/qualitativa/en/> accessed 22.10.2022
- Buchner, B., Clark, A., Falconer, A., Macquarie, R., Meattle, C., & Wetherbee, C. (2019). *Global landscape of climate finance 2019*. C40 (2022) <https://ajuntament.barcelona.cat/agenda2030/en/latest/the-barcelona-superblock-model-reaches-the-c40-world-mayors-summit-1219228> accessed 29.10.2022
- Chevalier, J. M. and Buckles, D. (2016) *SAS2 : a guide to collaborative inquiry and social engagement / Jacques M. Chevalier & Daniel J. Buckles*. New Delhi: SAGE.
- Chilvers, J. and Kearnes, M. (2016) *Remaking participation : science, environment and emergent publics / edited by Jason Chilvers and Matthew Kearnes*. London ;; Routledge, Taylor & Francis Group.
- Climate Policy Initiative (2021) <https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2021/> accessed 29.10.2022
- Chloé, D. 2015. report of the first Urban Thinkers Campus - The city we need. Ateliers du foncier.
- Davies, C. and Laforteza, R. (2019) 'Transitional path to the adoption of nature-based solutions', *Land use policy*, 80, pp. 406-409.
- Meadows (1995) Dennis Meadows: Die Grenzen des Wachstums. Bericht des Club of Rome (1972). 1995.
- Depietri, Y., Kallis, G., Baró, F. and Cattaneo, C. (2016) 'The urban political ecology of ecosystem services: The case of Barcelona', *Ecological economics*, 125, pp. 83-100.
- European Energy Agency EEA (2022) <https://www.eea.europa.eu/themes/air/urban-air-quality> accessed 29.10.2022
- European Energy Agency EEA (2021) <https://www.eea.europa.eu/publications/air-quality-in-europe-2021/sources-and-emissions-of-air> <https://www.eea.europa.eu/publications/status-of-air-quality-in-Europe-2022> accessed 29.10.2022
- European Union EU (2019) Citizen Science Project on Urban Environment and Health (Cities-Health) <https://cordis.europa.eu/project/id/824484> accessed 29.10.2022
- Genc, K. O. R. A. Y., Turkay, O. G. U. Z. and Ulema, S. E. V. K. (2022) 'TOURISM GENTRIFICATION: BARCELONA AND VENICE', *Anuario turismo y sociedad*, 31, pp. 125-140.
- Gignac, F., Righi, V., Toran, R., Errandonea, L. P., Ortiz, R., Nieuwenhuijsen, M. J., Creus, J., Basagaña Flores, X. and Balestrini, M. (2022) 'Co-creating a local environmental epidemiology study: the case of citizen science for investigating air pollution and related health risks in Barcelona, Spain'.

- IPCC, 2022: Summary for Policymakers [H.-O.Pörtner, D.C.Roberts, E.S.Poloczanska, K.Mintenbeck, M.Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)]. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O.Pörtner, D.C.Roberts, M.Tignor, E.S.Poloczanska, K.Mintenbeck, A.Alegría, M.Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3–33, doi:10.1017/9781009325844.001.
- IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-24. <https://doi.org/10.1017/9781009157940.001>.
- International Association of Ports IAPH (2022) <https://sustainableworldports.org/clean-marine-fuels/about-our-cmf-working-group/> accessed 19.10.2022
- Langemeyer, J., Baró, F., Roebeling, P. and Gómez-Baggethun, E. (2015) 'Contrasting values of cultural ecosystem services in urban areas: The case of park Montjuïc in Barcelona', *Ecosystem services*, 12, pp. 178-186.
- Lelieveld, J., Klingmüller, K., Pozzer, A., Pöschl, U., Fnais, M., Daiber, A. and Münzel, T. (2019) 'Cardiovascular disease burden from ambient air pollution in Europe reassessed using novel hazard ratio functions', *European heart journal*, 40(20), pp. 1590-1596.
- Lelieveld, J. and Muenzel, T. (2020) 'Air pollution, the underestimated cardiovascular risk factor: The original manuscript published in EHJ from Jos Lelieveld and Thomas Munzel came in position 72 of the top 100 papers of the Altmetric Top 100 score for 2019. The Altmetric worldwide ranking was the result of tracking 62.5 million mentions of 2.7 million research outputs. The result highlights the popularity of the Lelieveld / Munzel article', *European heart journal*, 41(8), pp. 904-905.
- IEA (2022), Global Energy and Climate Model, IEA, Paris <https://www.iea.org/reports/global-energy-and-climate-model>, License: CC BY 4.0 accessed 29.10.2022
- Klein, H. (2004). Health inequality, social exclusion and neighborhood renewal: Can place-based renewal improve the health of disadvantaged communities? *Australian Journal of Primary Health*, 10(3), 110-119.
- Liu, J., Dietz, T., Carpenter, S. R., Alberti, M., Folke, C., Moran, E., Pell, A. N., Deadman, P., Kratz, T., Lubchenco, J., Ostrom, E., Ouyang, Z., Provencher, W., Redman, C. L., Schneider, S. H. and Taylor, W. W. (2007) 'Complexity of Coupled Human and Natural Systems', *Science (American Association for the Advancement of Science)*, 317(5844), pp. 1513-1516.
- Lopez-Gay, A., Sales-Fava, J., Solana-Solana, M., Fernandez, A. and Peralta, A. (2021) 'The spread of gentrification in Barcelona and Madrid, 2011-2019: socio-spatial analysis using an index of gentrification', *Estudios geográficos*, 82(291).
- Macintyre, H. L., Heavyside, C., Taylor, J., Picetti, R., Symonds, P., Cai, X. M. and Vardoulakis, S. (2018) 'Assessing urban population vulnerability and environmental risks across an urban area during heatwaves – Implications for health protection', *The Science of the total environment*, 610-611, pp. 678-690.
- Markandya, A., Sampedro, J., Smith, S. J., Van Dingenen, R., Pizarro-Irizar, C., Arto, I. and González-Eguino, M. (2018) 'Health co-benefits from air pollution and mitigation costs of the Paris Agreement: a modelling study', *The Lancet. Planetary health*, 2(3), pp. e126-e133.
- Mayne, J. (2015) 'Useful theory of change models', *Canadian journal of program evaluation*, 30(2), pp. 119-142.
- Meadows, D (1995) Dennis Meadows: Die Grenzen des Wachstums. Bericht des Club of Rome (1972), 1995).
- Neumark, D., & Simpson, H. (2015). Place-based policies. In *Handbook of regional and urban economics* (Vol. 5, pp. 1197-1287). Pierangeli, I., Nieuwenhuijsen, M. J., Cirach, M. and Rojas-Rueda, D. (2020) 'Health equity and burden of childhood asthma - related to air pollution in Barcelona', *Environmental research*, 186, pp. 109067-109067.
- Pique, J. M., Miralles, F. and Berbegal-Mirabent, J. (2019) 'Application of the Triple Helix Model in the Creation and Evolution of Areas of Innovation', *Lecture Notes in Civil Engineering*. Cham: Springer International Publishing, pp. 223-244.
- Port of Barcelona (2022) <https://www.portdebarcelona.cat/en/web/el-port/pmqa> accessed 29.10.2022
- Redondo Domínguez, E. and Moya Sala, J. n. (2015) 'Conversando con Oriol Bohigas', *EGA : revista de expresi3n gr3fica arquitect3nica*, 20(26), pp. 22-35.
- Rittel, H. W. J. and Webber, M. M. (1973) 'Dilemmas in a General Theory of Planning', *Policy sciences*, 4(2), pp. 155-169.
- Russo, A. P. and Scarnato, A. (2018) "'Barcelona in common": A new urban regime for the 21st-century tourist city?', *Journal of urban affairs*, 40(4), pp. 455-474.
- Shayan, S., Kim, K. P., Ma, T. and Nguyen, T. H. D. (2020) 'The first two decades of smart city research from a risk perspective', *Sustainability (Basel, Switzerland)*, 12(21), pp. 1-20.
- Sol3 Figueras, L. and Universitat Aut3noma de Barcelona. Departament de, G. 2019. An analysis of ecosystem services coproduction and access in the case of Barcelona's cruise ship tourism.
- The Barcelona Post (2018) <https://www.thenewbarcelonapost.com/en/consorci-zona-franca-is-transforming-into-powerhouse-industry-4-0-barcelona/> accessed 29.10.2022
- Tichavska, M., Tovar, B., Gritsenko, D., Johansson, L., Jalkanen, J. P., 2017. Air emissions from ships in port: does regulation make a difference? *Transp. Policy*. <https://doi.org/10.1016/j.tranpol.2017.03.003> (in press).
- UNCTAD, 2018. Review of Maritime Transport 2018. New York. October 2018. https://unctad.org/en/PublicationsLibrary/rmt2018_en.pdf ccessed 29.10.2022
- UNFCCC (no year) https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement?gclid=EAlaIqobChMI30031YKI-wlVPQIGAB3lcQ6iEAAYASAAEgImcvD_BwE accessed 29.10.2022
- Toscano, D. and Murena, F. (2019) 'Atmospheric ship emissions in ports: A review. Correlation with data of ship traffic', *Atmospheric Environment: X*, 4, pp. 100050.
- Vinci, S., Egidi, G., López Gay, A. and Salvati, L. (2022) 'Population Growth and Urban Management in Metropolitan Regions: the Contribution of Natural Balance and Migration to Polycentric Development in Barcelona', *Applied spatial analysis and policy*, 15(1), pp. 71-94.
- United Nations (2022) Act Now <https://www.un.org/en/actnow> accessed 29.10.2022
- Walters, L. C., Aydelotte, J. and Miller, J. (2000) 'Putting More Public in Policy Analysis', *Public administration review*, 60(4), pp. 349-359
- Wright, M. (Ed.). (2016). *Gower handbook of internal communication*. The Change Curve. 2009. CRC Press.
- World Health Organization WHO (2022) [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health) accessed 29.10.2022
- World Ports Sustainability Program (2021) <https://sustainableworldports.org/project/port-of-barcelona-air-quality-improvement-plan/> accessed 29.10.2022

7.2 Monitoring Citizen Science Performance towards Sustainable Development Goals

Aelita Skaržauskienė¹, Monika Mačiulienė¹, Margarita Angelidou², Christos Politis², Elli Roma- Athanasiadou²

¹Vilnius Gediminas Technical University, Lithuania, ²Aristotle University of Thessaloniki, Greece.

PURPOSE

This research paper aims to co-design a theoretical framework and methodological guidelines to monitor the performance, outcomes and impact of Citizen Science projects towards Sustainable Development Goals.

The Citizen Science (CS) phenomenon can be interpreted as a part of the wider open science movement, along with open access publishing, and open data standards. In the last 20 years, many CS initiatives (e.g. projects, labs, associations, hubs, centres) have been established, completed or ongoing while new projects are constantly emerging. Citizen Science projects may cover various scientific fields, such as biology, astronomy, medicine, computer science, statistics, psychology and engineering. They may also range from large international projects involving professional scientists and research institutions to small-scale projects by communities with a shared interest. Depending on the CS organisation, citizens and other QH stakeholders actively participate at different stages of the research process, collaborating with academics and the other actors involved in the production of science. In this regard, participation can span from being better informed about science to contribute to the scientific process by developing the research question, designing the methods, gathering and analysing data and communicating the results.

DESIGN / METHODOLOGY / APPROACH

The development of methodology adopted a pragmatic mixed-method research design. Firstly, analysis of the theoretical sources and available monitoring tools provided the basis for a conceptual framework and identification of measurement indicators. The rationale of the conceptual framework was based on the co-creation workshop with QH stakeholders and experts' interviews. The research workgroup consisted of distinguished researchers and practitioners who offered interdisciplinary insights to improve the monitoring tool.

FINDINGS OR EXPECTED OUTCOMES

The proposed methodology provides evaluators with definitions of monitoring dimensions, evaluation indicators and criteria and offers an overview of the state-of-art in the Citizen science ecosystem. The conceptual framework summarises the current research progress on the topic and the Citizen Science Performance Index composite condenses the complex and multi-dimensional realities for decision-makers and stakeholders.

ORIGINALITY / VALUE

The designed original methodology is a part of the three-year Horizon 2020 "Science with and for Society" project INCENTIVE (Grant Agreement No. 101005330) that brings on board four Research Performing and Funding Organizations: the University of Twente, the Autonomous University of Barcelona, the Aristotle University of Thessaloniki and the Vilnius Gediminas Technical University.

PRACTICAL / SOCIAL IMPLICATIONS

A proper monitoring framework can contribute to efficient project management and appropriate effects assessment. In particular, the values of the indicators could be compared with the targets set, with the respective values of other Citizen Science Hubs or to worldwide trends. Stakeholders could validate the evaluation results through surveys and a few interviews. By implementing monitoring, the strong and weak parts of the implemented approach will be identified, the specificities of each CS project will be understood, and evidence on the societal, scientific, economic and environmental impact will be collected.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The discussion of the results is limited in the absence of empirical data. Experimental evaluation would condition an increase in research data reliability and the validity of a newly constructed instrument. In addition, statistical inference and reliability of indicators measuring digital co-creation are not analysed enough for objective reasons. It is

expected that more scientific results will appear in this direction while implementing the INCENTIVE project and other researchers' activities. The findings and implications should be discussed and tested in the broadest possible context.

KEYWORDS (3-5)

Citizen Science; Quadruple Helix stakeholders; public engagement; co-creation.

08

THE ROLE OF UNIVERSITIES IN CONNECTING LOCAL
COMMUNITIES WITH GLOBAL KNOWLEDGE NETWORKS

8.1 Unlocking the potencial of digital co-creation between heis, ngos and citizens

Katrin Uude¹, Marie Isabel Schirmmacher¹

¹FH Münster University of Applied Sciences, Germany.

PURPOSE

Higher education institutions (HEIs) are increasingly engaged in society and therefore play a growing role in regional and social development (Klein & Pereira, 2021). Therefore, academic literature calls for more comprehensive knowledge on co-creation between HEIs, non-governmental organizations (NGOs), and citizens to improve its practical realization (e.g., Mooney et al., 2022). Nowadays, co-creation increasingly takes place in digital environments, as the physical distance between the actors in a global collaboration does not always allow for a face-to-face meeting (De Silva et al., 2021). However, to date, the collaboration between HEI and NGOs in the digital sphere has been somewhat neglected, leading to a lack of insights (Polese et al., 2021).

This research contributes to closing the prevalent knowledge gap by analyzing current success factors and barriers to digital co-creation and identifying appropriate platforms and methods for collaboration. The research also explores what digital skills are required for successful digital co-creation. Particularly, the following research question is set to be answered in this research: How can higher education institutions successfully co-create digitally with NGOs? This increases social impact, and at the same time, it makes a significant contribution to the research and development of successful digital co-creation.

DESIGN / METHODOLOGY / APPROACH

To contribute to the research question, a total of 80 semi-structured qualitative interviews were conducted with 45 digital co-creation experts from HEIs and 35 experts from NGOs. The interviews are part of the ERASMUS+ Strategic Partnership Project CoCreAid Kit 4.0. with a project consortium of five partners from five European countries.

FINDINGS OR EXPECTED OUTCOMES

The interviews confirmed that there are still high barriers to digital co-creation, including both external and internal factors. Frequently mentioned were, among others, a lack of digital competence, or a loss of interpersonal relationships. According to respondents, the lack of the social component in many cases leads to a decreased attention span and less engagement. At the same time, the study shows that these barriers can be reduced or even overcome with methods that promote engagement. Many respondents indicate that while they have a good understanding of basic functions and programs, they see their own digital skills as in need of improvement. It has also been shown that in some cases NGO partners lack even basic digital skills. In terms of platforms and methods, NGOs and HEIs use only a small selection of the available options. Due to limited availability, they often have no time to study new tools in-depth; thus, they only work with tools they are already familiar with.

PRACTICAL / SOCIAL IMPLICATIONS

The research contributes to the state of knowledge on digital co-creation. By identifying the success factors, barriers, and requirements, this provides a starting point for enhancing digital co-creation between HEIs and NGOs. It has been shown that there is a great variety of digital platforms, and the problem is rather the lack of knowledge on how to use this variety efficiently. Therefore, it is recommended to provide more guidance, advice, and training material to stakeholders for successful digital collaboration. In that, different levels of digital literacy must be adequately addressed.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Firstly, the data collection during the qualitative expert interviews was conducted with a focus on the perspectives of HEIs and NGOs in general and therefore did not focus on the sociodemographic background of the individual interviewee, including, for example, their country's level of digitalization. This is also related to the level of digitization of NGOs. The level of digitization can vary with the size of the NGO. We interviewed relatively small NGOs, but larger ones, like Greenpeace, have a more advanced level of digitization. Here, further

research needs to look deeper into the influence of the organization's level of digitalization on successful digital co-creation. Moreover, as the interviewees were researched from the partners' personal network, interviews were only conducted in four European countries, which does not allow for conclusions to be drawn on the overall European perspective.

KEYWORDS (3-5)

Digital co-creation, social innovation, transdisciplinary projects, third mission.

REFERENCES

- De Silva, M., Gokhberg, L., Meissner, D., & Russo, M. (2021). Addressing societal challenges through the simultaneous generation of social and business values: A conceptual framework for science-based co-creation. *Technovation*, 104, 102268. <https://doi.org/10.1016/j.technovation.2021.102268>
- Klein, S. B., & Pereira, F. C. M. (2021). Entrepreneurial university: conceptions and evolution of theoretical models. *Revista Pensamento Contemporâneo Em Administração*, 14(4), 20–35. <https://doi.org/10.12712/rpca.v14i4.43186>
- Mooney, L. A., van Willigen, M., & Clever, M. (2022). Understanding social problems (Eleventh edition). Cengage.
- Polese, F., Ciasullo, M. V., & Montera, R. (2021). Value co-creation in university-industry collaboration. An exploratory analysis in digital research projects. *Sinergie Italian Journal of Management*, 39(2), 117–134. <https://doi.org/10.7433/s115.2021.07>

8.2 Marketing strategies and research groups lost in connection: the voice of principal investigators

Rosa Vidal Tusal¹, Ercilia García Álvarez², Pep Simó Guzmán¹

¹Polytechnic University of Catalonia (UPC), Spain, ² Universitat Rovira i Virgili (URV), Spain.

PURPOSE

There is a strong pressure on universities to transfer their knowledge and technology to society as part of their "third mission" (Cunningham and Menter, 2020), accordingly, some studies argued that university policies and practices must be supported by the development of marketing strategies (Morgan et al., 2019; Sozuer et al., 2020). Nevertheless, despite the important incomes they can obtain from industry cooperation projects, marketing strategies that facilitated universities' approach to industries, have received limited attention (e.g., Thomas Baaken, 2003; Plewa et al., 2005). This means that university marketing strategies must attend to be designed with this objective in mind, so, they are likely to contribute to the development of a virtuous cycle of joint value creation, knowledge transfer, and financing (AL- Ghaswyneh, 2020).

So, the purpose of this study is to analyse how principal investigators deal with an institutional requirement involving marketing strategies to enhance cooperation between research groups and industry.

DESIGN / METHODOLOGY / APPROACH

This embedded case study (Yin, 2003) that examines in a public university 12 research groups accredited as transference champions, all of them configure our unit and sub-units of analysis (Guest et al., 1995). All have developed a marketing plan as a requirement for being awarded with a seal of innovation transference that differentiate them from the rest of research groups of the same university. Data was obtained by semi- structured interviews with principal investigators and secondary data. We developed a qualitative thematic analysis (Mayring, 2015).

FINDINGS OR EXPECTED OUTCOMES

Despite the focus of our research on marketing strategies, informants revealed that there are other factors that influence marketing effectiveness and transference. Our thematic analysis and cross case comparison identified them as the following:

Organizational Factors:

- Research groups: large groups adopt a more business-like structure, impossible for small ones, due to the lack of knowledge and financial support. However, the marketing plans they were required to develop helped them to improve their internal organizational structure.
- University: There is an excessive amount of bureaucracy associated with project management, a lack of generational relief, and projects don't receive much academic recognition. It is also challenging to combine teaching, research, and technology transfer due to changes in teaching methods.

Competitive Factors

- Internal: Research groups with a more cross-disciplinary focus argued they were in competition with groups of similar disciplines within the university. In this line, groups focused on a more specific discipline recognised they had a competitive advantage in industry cooperation.
- External: The presence of other research and technological organisations with significant government sponsorship within the same geographical region is perceived as a direct competitor for all participants. All participants felt that they were in a disadvantageous situation.

Contextual Factors

- Institutional: Innovation policies are not clearly defined, researchers claim a feeling of stability on the political front, as in the case of funding programs or as the case of internal promotions for PhD students or other contractual forms to prevent the loss of talent.
- Industrial sector: Informants pointed out that industries lack sufficient knowledge regarding public projects applications. In addition, they noted a lack of absorptive capabilities concerning the implementation of innovations developed by universities that add an additional effort to an effective transfer.

As one informant summarises: The problem is the definition of the game board. It's critical that everyone knows what role they must play there, what resources they have, who supports them, and what the administration wants. This is because it's not always clear what they want.

ORIGINALITY / VALUE

According to the results, three key factors are affecting the effectiveness of the research group's "third mission" despite their efforts to develop marketing capabilities. As a result, marketing plans and strategies are perceived as simply institutional requirements since most groups lack a business-like profile.

PRACTICAL / SOCIAL IMPLICATIONS

Organisational, competitive, and contextual factors cannot be ignored by policy makers because they determine the assumption of commercial feasibility and the need for marketing skills development among research groups.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Recognizing the heterogeneity of the groups as delineated by their principal investigators, and the impact of key factors on groups' cooperation with industry, would enhance the success of the third mission. Bottom-up knowledge from research groups -the bones of the innovation skeleton- are needed to align top- down policies and requirements of a strategic marketing approach and the definition of the game board of the triple helix to not get lost in connection.

KEYWORDS (3-5)

Marketing strategies, university research groups, case study, triple helix, university third mission.

REFERENCES

- AL-Ghaswyneh, O. F. M. (2020) 'Marketing universities' services role in providing financial resources', *Journal of Financial Services Marketing*. doi: 10.1057/s41264-020-00075-9.
- Baaken, T. (2003) 'Science Marketing', in *Applied Marketing*. doi: 10.1007/978-3-642-18981-4_92.
- Cunningham, J. A. and Menter, M. (2020) 'Micro-level academic entrepreneurship: a research agenda', *Journal of Management Development*.
- Guest, G., Bunce, A. and Johnson, L. (1995) 'How Many Interviews Are Enough? An Experiment with Data Saturation and Variability and a good number of journals in the', *Field Methods*, 18(1), pp. 59–82. doi: 10.1177/1525822X05279903.
- Mayring, P. (2015) 'Qualitative Content Analysis: Theoretical Background and Procedures'. Springer, Dordrecht, pp. 365–380. doi: 10.1007/978-94-017-9181-6_13.
- Morgan, N. A. et al. (2019) 'Research in marketing strategy', *Journal of the Academy of Marketing Science*. doi: 10.1007/s11747-018-0598-1.
- Plewa, C., Quester, P. and Baaken, T. (2005) 'Relationship marketing and university-industry linkages: A conceptual framework', *Marketing Theory*. doi: 10.1177/1470593105058824.
- Sozuer, S. et al. (2020) 'The past, present, and future of marketing strategy', *Marketing Letters*. doi: 10.1007/s11002-020-09529-5.
- Yin, R. K. (2003) Applications of case study research, *Case Study Research: Design and Methods*. doi: 10.1097/FCH.0b013e31822dda9e.

8.3 Towards the Development of a Strategic Framework for Entrepreneurial universities: A case of Botswana public universities

Lametse Nono Letsebe¹

¹Tshwane University of Technology, South Africa.

PURPOSE

To determine the relevance and or accuracy of the triple helix model in the transition of public universities into entrepreneurial universities in Botswana.

DESIGN / METHODOLOGY / APPROACH

A qualitative study with 30 participants from four (4) public universities was conducted with the use of a semi-structured interview. The sample was drawn from top management in each of the universities with the use of purposive and snowballing non-probability sampling techniques. Data was transcribed, coded and grouped into themes with the use of Atlas ti software version 22.

FINDINGS OR EXPECTED OUTCOMES

It was found out from the study that the triple helix model was a relevant and applicable model that public universities in Botswana can use to transform into entrepreneurial universities. The relationship between the academics, industry and government was found critical for the success of an entrepreneurial university. Although this was the case, a unique finding specific to the Botswana context was that the model lacked involvement of another key player which was identified as the community. Hence the study recommended a quadruple helix model. Due to the cultural context in Botswana, the community was positioned as a key player in the model and this was very interesting based on the fact that it was the community through crowd funding that built the first university of Botswana when government had to funds to do so.

ORIGINALITY / VALUE

The study was the first effort to examine the relevance of a triple helix model in the transformation of public university into entrepreneurial universities in Botswana. The addition of the community as a key player is a critical finding that emphasizes that the Botswana context is unique and requires specific research that will enable effective implementation of a model that is relevant to the context and the goals of transitioning into entrepreneurial universities. Recommendations were made to university decision and policy makers to forge and strengthen engagements with government, industry and community to support an entrepreneurship model in their universities.

PRACTICAL / SOCIAL IMPLICATIONS

This research improves knowledge in the systematic executions for developing strategies that are likely to influence and support the entrepreneurship model in Botswana's public universities.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The study is limited to the investigation of the relevance of triple helix model in the transition of Botswana public universities into entrepreneurial universities. The study focused on insights from senior management of public universities while this formed a good basis for this exploratory study, future studies may consider a quantitative study with other key players to validate these findings. Further research is therefore recommended amongst middle management and university students in the public universities.

KEYWORDS (3-5)

Triple helix model, relevance, public university, transformation, entrepreneurial university.

REFERENCES

Audretsch, D. B., & Belitski, M. (2021). Three-ring entrepreneurial university: in search of a new business model. *Studies in Higher Education*, 46(5), 977-987.

Badzińska, E. (2020). The entrepreneurial university: conceptualisation, models and challenges for operationalisation of the concept. In: *Contemporary organisation and management. Challenges and trends*. University of Lodz [Online], 443-459. Available from: <https://pdfs.semanticscholar.org/0226/64105dac57073f116f85d4905f851ca2c832.pdf>

Badzińska, E. & Timonen, L. (2020). Exploring the university-based Entrepreneurial activities in international collaboration: development cases of HEIs. *Journal of Intercultural Management [Online]*, 12:1-30. Available from:

https://www.researchgate.net/publication/342855998_Exploring_the_University_based_Entrepreneurial_Activities_in_International_Collaboration_Development_Cases_of_H_EIs

Bikse, V., Lusena-Ezera, I., Rivza, B., & Volkova, T. (2016). The transformation of traditional universities into entrepreneurial universities to ensure sustainable higher education. *Journal of Teacher Education for Sustainability*, 18(2), 75-88.

Bouhedjeur, R., Saadi, T., & Zebouchi, M. A. (2022). Towards an Algerian entrepreneurial university: a proposed model for transformation mechanisms and needed practices. *Journal of North African Economies ISSN*, 18(22), 43-54.

Budyldina, N. (2018). Entrepreneurial universities and regional contribution. *International Entrepreneurship and Management Journal*, 14:265-277.

Cai, Y. (2022). Neo-triple helix model of innovation ecosystems: integrating triple, quadruple and quintuple helix models. *Triple Helix*, 1(aop), 1-31.

Cai, Y., & Ahmad, I. (2021). From an Entrepreneurial University to a Sustainable Entrepreneurial University: Conceptualization and Evidence in the Contexts of European University Reforms. *Higher Education Policy*, 1-33.

Čapienė, A., & Ragauskaitė, A. (2017). Entrepreneurship education at university: Innovative models and current trends. *Research for rural development*, 2, 284-291.

Carayannis, E. G., & Campbell, D. F. (2022). Towards an Emerging Unified Theory of Helix

Architectures (EUTOHA): Focus on the Quintuple Innovation Helix Framework as the Integrative Device. *Triple Helix*, 1(aop), 1-11.

Cerver Romero, E., Ferreira, J. J., & Fernandes, C. I. (2021). The multiple faces of the entrepreneurial university: a review of the prevailing theoretical approaches. *The Journal of Technology Transfer*, 46(4), 1173-1195.

Clark, D. R., & Covin, J. G. (2021). International entrepreneurial orientation disposition: Insights into venture internationalization. In *Entrepreneurial Orientation: Epistemological, Theoretical, and Empirical Perspectives* (Vol. 22, pp. 87-120). Emerald Publishing Limited.

Coşkun, H. E., Popescu, C., Şahin Samaraz, D., Tabak, A., & Akkaya, B. (2022). Entrepreneurial University Concept Review from the Perspective of Academicians: A Mixed Method Research Analysis. *Sustainability*, 14(16), 10110.

Cunningham, J. A., & Menter, M. (2021). Transformative change in higher education: Entrepreneurial universities and high-technology entrepreneurship. *Industry and Innovation*, 28(3), 343-364.

Dalmarco, G., Hulsink, W., & Blois, G. V. (2018). Creating entrepreneurial universities in an emerging economy: Evidence from Brazil. *Technological Forecasting and Social Change*, 135, 99-111.

Dinh, V. T. (2020). Entrepreneurial universities and the development model for public universities in vietnam. *International Journal of Entrepreneurship*, 24(1), 1-16. Retrieved from <https://www.proquest.com/scholarly-journals/entrepreneurial-universities-development-model/docview/2425598788/se-2?accountid=15490>

Etzkowitz, H., Dzisah, J., & Clouser, M. (2022). Shaping the entrepreneurial university: Two experiments and a proposal for innovation in higher education. *Industry and Higher Education*, 36(1), 3-12.

Etzkowitz, H. (2022). Entrepreneurial university icon: Stanford and Silicon Valley as innovation and natural ecosystem. *Industry and Higher Education*, 36(4), 361-380.

Etzkowitz, H., Dzisah, J., & Clouser, M. (2022). Shaping the entrepreneurial university: Two experiments and a proposal for innovation in higher education. *Industry and Higher Education*, 36(1), 3-12.

Etzkowitz, H. (2003). Innovation in innovation: The triple helix of university-industry government relations. *Social Science Information*,

42(3):293-337.

Etzkowitz, H. (2004). The evolution of the entrepreneurial university. *International Journal of Technology and Globalisation*, 1(1):64-77.

Etzkowitz, H. (2011). The triple helix model. *Innovation*, 1(4):5-10.

Etzkowitz, H. (2012). Triple helix clusters: boundary permeability at university-industry government interfaces as a regional innovation strategy. *Environment and Planning C: Government and Policy*, 30(5):766-779.

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

Etzkowitz, h. & Zhou, C. (2006). Triple helix twins: innovation and sustainability. *Science and public policy*, 33(1):77-83.

Etzkowitz, h. & Zhou, C. (2008). Introduction to special issue building the entrepreneurial university: a global perspective. *Science and Public Policy*, 35(9):627-635.

Feola, R., Parente, R., & Cucino, V. (2021). The entrepreneurial university: How to develop the entrepreneurial orientation of academia. *Journal of the Knowledge Economy*, 12(4), 1787-1808.

Ferreira, J. J., Fayolle, A., Ratten, V., & Raposo, M. (2018). Introduction: The role of entrepreneurial universities in society. In *Entrepreneurial Universities*. Edward Elgar Publishing.

Finch, D.J., Hamilton, L.K., Baldwin, R. & Zehner, M. (2013). An exploratory study of factors affecting undergraduate employability', *Education and Training*, 55 (7):681-704.

Garcia-Aracil, A., Castro-Martinez, E., Jimenezsaez, F., & Arroyo Vazquez, M. (2013). What might an entrepreneurial university constitute? *Proceedings of the 2013 EU-SPRI Forum Conference*, Madrid 10-12 April. 1-31.20

Gibb, A. & Hannon, P. (2006). Towards the entrepreneurial university. *International Journal of Entrepreneurship Education*, 4(1):73-110.

Guerrero, M. & Urbano, D. (2012). The development of an entrepreneurial university. *The journal of technology transfer*, 37(1):43-74.

Guerrero, M., Urbano, D., Fayolle, A., Klofsten, M. & Mian, S. (2016). Entrepreneurial universities: emerging models in the new social and economic landscape. *Small Business Economics*, 47(3):551-563.

Genç, S. Y., Sesen, H., Castanho, R. A., Kirikkaleli, D., & Soran, S. (2020). Transforming Turkish universities to entrepreneurial universities for sustainability: From strategy to practice. *Sustainability*, 12(4), 1496.

Gibb, Allan, and Paul Hannon. (2006). "Towards the entrepreneurial university." *International Journal of Entrepreneurship Education* 4, no. 1: 73-110.

Hamdani, K. & Salah, K. (2021). The strategic planning of university transformation: the case of Moroccan public universities. *Projectics / Proyectica / Projectique*. [Online], 28. 51-68. Available from: https://www.researchgate.net/publication/349640856_The_strategic_planning_of_university_transformation_the_case_of_Moroccan_public_universities

Kang, S. P., Chen, Y., Svihla, V., Gallup, A., Ferris, K., & Datye, A. K. (2022). Guiding change in higher education: An emergent, iterative application of Kotter's change model. *Studies in Higher Education*, 47(2), 270-289.

Leydesdorff, L. & Etzkowitz, H. (2001). The Transformation of University Industry-Government Relations. *Electronic Journal of Sociology*, 5(4): 338-344. [Online]. Available from: https://www.researchgate.net/publication/248040198_The_transformation_of_university_industry-government_relations

Mavi, R. K. (2014). Indicators of entrepreneurial university: Fuzzy AHP and Fuzzy TOPSIS Approach. *Journal of the Knowledge Economy*, 5(2):370-387.

Pugh, R., Lamine, W., Jack, S., & Hamilton, E. (2018). The entrepreneurial university and the region: what role for entrepreneurship departments? *European Planning Studies*, 26(9), 1835-1855.

Ranga, M. & Etzkowitz, H. (2013). Triple Helix Systems: An Analytical Framework for Innovation Policy and Practice in the Knowledge Society. *Industry and Higher Education*, 27: 237-262.

Reyes, C. (2017). *Frames in the Institutionalisation of the Entrepreneurial University Model: The Case of National University of Singapore*. Tampere University Press, University of Tampere [Online], 1-237. Available from: <https://trepo.tuni.fi/bitstream/>

handle/10024/101862/978-952-03-0490-4.

Richter, C., Kraus, S., & Syrjä, P. (2015). The shareconomy as a precursor for digital entrepreneurship business models. *International Journal of Entrepreneurship and Small Business*, 25(1), 18-35.

Sultan, S. (2017). Moving from a traditional into an entrepreneurial university: Evidencing from Palestine. *International Journal of Business and Social Science*, 8(2):207-214

Vaivode, I. (2015). Triple helix model of university-industry-government cooperation in the context of uncertainties. *Procedia - Social and Behavioral Sciences [Online]*, 213:1063- 25 1067. Available from: <https://core.ac.uk/download/pdf/82733452.pdf>

Xu, X. Y. (2010). *America entrepreneurial university feature and success factors analysis-take massachusetts institute of technology as an example* (Order No. 10336404). Available from ProQuest One Academic. (1868176279). Retrieved from <https://www.proquest.com/dissertations-theses/america-entrepreneurial-university-feature/docview/1868176279/se-2?accountid=15490>

Yuli Kartika, D., Haniruzila, H., & Ai Ping, T. (2022). Helix Collaboration and Innovation for Start-Up Development: A Systematic Literature Review.

Zhou, C. & Peng, X. M. (2008). The entrepreneurial university in China: Nonlinear paths. *Science and Public Policy*, 35(9):637-646.

Zhuang, T. Zhou, Z. & Li, Q. (2021). University-industry-government triple helix relationship and regional innovation efficiency in China. *Growth and Change*, 52:349-370

8.4 Unlocking the potencial of digital co-creation between heis, ngos and citizens

Katrin Uude¹, Marie Isabel Schirmmacher¹

¹FH Münster University of Applied Sciences, Germany.

PURPOSE

Higher education institutions (HEIs) are increasingly engaged in society and therefore play a growing role in regional and social development (Klein & Pereira, 2021). Therefore, academic literature calls for more comprehensive knowledge on co-creation between HEIs, non-governmental organizations (NGOs), and citizens to improve its practical realization (e.g., Mooney et al., 2022). Nowadays, co-creation increasingly takes place in digital environments, as the physical distance between the actors in a global collaboration does not always allow for a face-to-face meeting (De Silva et al., 2021). However, to date, the collaboration between HEI and NGOs in the digital sphere has been somewhat neglected, leading to a lack of insights (Polese et al., 2021).

This research contributes to closing the prevalent knowledge gap by analyzing current success factors and barriers to digital co-creation and identifying appropriate platforms and methods for collaboration. The research also explores what digital skills are required for successful digital co-creation. Particularly, the following research question is set to be answered in this research: How can higher education institutions successfully co-create digitally with NGOs? This increases social impact, and at the same time, it makes a significant contribution to the research and development of successful digital co-creation.

DESIGN / METHODOLOGY / APPROACH

To contribute to the research question, a total of 80 semi-structured qualitative interviews were conducted with 45 digital co-creation experts from HEIs and 35 experts from NGOs. The interviews are part of the ERASMUS+ Strategic Partnership Project CoCreAid Kit 4.0. with a project consortium of five partners from five European countries.

FINDINGS OR EXPECTED OUTCOMES

The interviews confirmed that there are still high barriers to digital co-creation, including both external and internal factors. Frequently mentioned were, among others, a lack of digital competence, or a loss of interpersonal relationships. According to respondents, the lack of the social component in many cases leads to a decreased attention span and less engagement. At the same time, the study shows that these barriers can be reduced or even overcome with methods that promote engagement. Many respondents indicate that while they have a good understanding of basic functions and programs, they see their own digital skills as in need of improvement. It has also been shown that in some cases NGO partners lack even basic digital skills. In terms of platforms and methods, NGOs and HEIs use only a small selection of the available options. Due to limited availability, they often have no time to study new tools in-depth; thus, they only work with tools they are already familiar with.

PRACTICAL / SOCIAL IMPLICATIONS

The research contributes to the state of knowledge on digital co-creation. By identifying the success factors, barriers, and requirements, this provides a starting point for enhancing digital co-creation between HEIs and NGOs. It has been shown that there is a great variety of digital platforms, and the problem is rather the lack of knowledge on how to use this variety efficiently. Therefore, it is recommended to provide more guidance, advice, and training material to stakeholders for successful digital collaboration. In that, different levels of digital literacy must be adequately addressed.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Firstly, the data collection during the qualitative expert interviews was conducted with a focus on the perspectives of HEIs and NGOs in general and therefore did not focus on the sociodemographic background of the individual interviewee, including, for example, their country's level of digitalization. This is also related to the level of digitization of NGOs. The level of digitization can vary with the size of the NGO. We interviewed relatively small NGOs, but larger ones, like Greenpeace, have a more advanced level of digitization. Here, further research needs to look deeper into the influence of the organization's

level of digitalization on successful digital co-creation. Moreover, as the interviewees were researched from the partners' personal network, interviews were only conducted in four European countries, which does not allow for conclusions to be drawn on the overall European perspective.

KEYWORDS (3-5)

Digital co-creation, social innovation, transdisciplinary projects, third mission

REFERENCES

- De Silva, M., Gokhberg, L., Meissner, D., & Russo, M. (2021). Addressing societal challenges through the simultaneous generation of social and business values: A conceptual framework for science-based co-creation. *Technovation*, 104, 102268. <https://doi.org/10.1016/j.technovation.2021.102268>
- Klein, S. B., & Pereira, F. C. M. (2021). Entrepreneurial university: conceptions and evolution of theoretical models. *Revista Pensamento Contemporâneo Em Administração*, 14(4), 20–35. <https://doi.org/10.12712/rpca.v14i4.43186>
- Mooney, L. A., van Willigen, M., & Clever, M. (2022). *Understanding social problems* (Eleventh edition). Cengage.
- Polese, F., Ciasullo, M. V., & Montera, R. (2021). Value co-creation in university-industry collaboration. An exploratory analysis in digital research projects. *Sinergie Italian Journal of Management*, 39(2), 117–134. <https://doi.org/10.7433/s115.2021.07>

8.5 The Role of Universities in Pharmaceutical Networks in Brazil

Nathalia Alves¹, Marina Szapiro², Marco Vargas³

¹FGV-EAESP-FAPESP, Brazil, ² UFRJ, Brazil, ³ UFF, Brazil.

PURPOSE

Pharmaceutical innovation may be understood as a complex, cumulative, path-dependent, localized, context-specific and non-linear process that is increasingly supported by emergence of a dense network to access to external sources of knowledge and complementary assets, involving small and large companies, public laboratories, universities, hospitals, and other components of both Sectoral and National Systems of Innovation. This paper aims at providing an initial assessment of the role played by Brazilian Universities and Public Research Institutes in connecting Brazilian firms and Institutions to national and international pharmaceutical networks.

DESIGN / METHODOLOGY / APPROACH

The research is based upon a combined history friendly approach of the role of universities in pharmaceutical R,D&I activities in Brazil and a social networks analysis based upon a sample of 69 pharmaceutical and life science deals gathered from the Cortellis Deals Intelligence database, disclosed by Clarivate Analytics, . The analysis is complemented by an overlook on 243 university deals obtained from the Brazilian National Council for Scientific and Technological Development (CNPq) regarding the 2014-2016 period.

FINDINGS OR EXPECTED OUTCOMES

Brazil has a wide range of academic institutions with consolidated research groups in health sciences and biological sciences. The analyzed evidence points to some Brazilian universities - such as the University of São Paulo, the State University of Campinas, the Federal University of Rio de Janeiro, the Federal University of São Paulo and the Federal University of Minas Gerais – acting as worldwide references in S, T&I health and pharmaceutical research. These universities are highly connected nationally and internationally within pharmaceutical networks, operating as knowledge gatekeepers in Brazil. However, the data analyzed also indicates an underexplored potential of local S, T&I capabilities and linkages within the Health Economic Industrial Complex in Brazil.

Overall, the role of the Brazilian universities in pharmaceutical networks formation involves processes of knowledge spillovers and joint research developments that are intensive in learning processes and capabilities building considered key to the innovative capacity the firms nested within the Health Economic Industrial Complex in Brazil. The network formation involving academia gathers several components of both the National Innovation System and the Health Economic-Industrial Complex in Brazil, such as hospitals, governmental agencies, public laboratories and many others.

ORIGINALITY / VALUE

The study provides an assessment of university engagement in pharmaceutical R, D&I activities and network formation from a developing country perspective using a relatively underused database, providing new evidence and contributions to support global south developmental studies.

PRACTICAL / SOCIAL IMPLICATIONS

The emergence of the Covid-19 pandemic constitutes a historical landmark, which has highlighted the centrality of the dialogue between economy, development, and health. The covid-19 pandemic has unveiled historical and structural bottlenecks, amplified global inequalities and highlighted critical technological and productive asymmetries among global north and south countries. Within such context, the strengthening of the national science and technology capabilities required to engage in pharmaceutical innovation networks emerged as key conditions to promote economic development and to guarantee the population's access to essential health goods and services.

The social networks approach applied to study the role of the universities in pharmaceutical network formation in Brazil contributes to identifying S&T Institutions that are central to the networks structures and that operate as structural bridges or knowledge

gatekeepers connecting originally disconnected networks structures, nationally and internationally. As pharmaceutical R, D&I are knowledge-intensive activities, the capacity to access directly or indirectly external sources of knowledge – such as universities and research centers, other enterprises, users, producers, hospitals engaged in clinical trial procedures, political and regulatory agencies and other systemic components – are critical to firms' innovative capacity within Health Economic-Industrial Complex in Brazil. Also, the institutions that are more able to connect with many different types of firms and to operate as structural bridges are those more likely to support and enhance systemic integration within the Health Economic-Industrial Complex in Brazil.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

A major limitation of the study regards the fact that the Cortellis Deals Intelligence database is not specialized in academia relations, while the Brazilian National Council for Scientific and Technological Development (CNPq) database lacks recent data covering the 2016-2020 period. Therefore, a qualitative study constructed upon the results presented in this paper is highly recommended to overcome the research limitations.

KEYWORDS (3-5)

PHARMACEUTICAL NETWORKS, BRAZIL; UNIVERSITIES.

REFERENCES

- ARORA, A. GAMBARDILLA, A. The division of innovative labor in biotechnology. In: ROSEMBERG, N. et al (orgs). Sources of Medical Technology: Universities and Industry. Washington, DC: National Academy Press. p.188-208, 1995.
- BRITTO, J. VARGAS, M. A. A systemic innovation policy with an inclusive perspective: the evolution of the Brazilian policy to the pharmaceutical sector. In: 3th Globelics International Conference, 2015, Havana, Cuba. 2015.
- GADELHA, C.A.G. KAMIA, F. MOREIRA, J. MONTENEGRO, K. SAFATLE, L. NASCIMENTO, M. Dinâmica global, impasses do SUS e o CEIS como saída estruturante da crise. Cadernos do Desenvolvimento, Rio de Janeiro, vol. 16, n. 28, p. 281-302, jan.-abr. 2021.
- GADELHA, C.A.G. O Complexo Econômico-Industrial da Saúde 4.0: por uma visão integrada do desenvolvimento econômico, social e ambiental. Cadernos do Desenvolvimento, Rio de Janeiro, vol. 16, n. 28, p. 25-50, jan.-abr. 2021.
- GUIMARÃES, R. MOREL, C.M. ARAGÃO, E. PARANHOS, J. PALÁCIOS, M. GOLDBAUM, M. GADELHA, P. KROPF, S. Health Science, Technology and Innovation Policy (ST&I/H): an update for debate. Ciência & Saúde Coletiva, 26(12):6105-6116, 2021.
- MALERBA, F. OSENIKO, L. The evolution of the pharmaceutical industry. In: Business History, 2015. VARGAS, M. ALVES, N. MREJEN, M. Ciência, tecnologia e inovação em tempos de pandemia: implicações da Covid-19. Cadernos do Desenvolvimento, Rio de Janeiro, vol. 16, n. 28, p. 145-172, jan.-abr. 2021.

8.6 Enhancing Higher Education Institutions Engagement with Digital Water Smart Specialization Strategies for Sustainability: A study in selected European countries

Maria Lima-Toivanen¹

¹Sustainable Innovation Technologies Ltd - SITES, Ireland.

PURPOSE

This article aims to demonstrate different arrangements referring to smart water innovation ecosystems, the needs expressed by their actors for human skills to advance innovation and the constitution of an Alliance of Higher Education Institutions (HEIs) to foment skills development in the digital water sector to support smart specialization strategies for sustainable and inclusive growth (S4) in eight European countries.

DESIGN / METHODOLOGY / APPROACH

We apply a combination of desk research, stakeholder survey and interviews to identify smart water innovation ecosystems, or the lack thereof, in eight European countries: Czech Republic, Serbia, Malta, Turkey, Finland, the United Kingdom, Norway, Italy, in the context of the establishment of a HEIs Alliance to form a Digital Water Distributed Campus. The Campus will provide infrastructure, capacities and tools to support human capacity building in academic and research staff to provide innovative skilling program and reinforce the role of HEIs in local ecosystems development. Both, the campus and the HEIs Alliance are being implemented by the project "Transforming Advanced Water Skilling Through the Creation of a Network of Extended-Reality Water Emulative Centres" (WATERLINE), financed by the European Commission.

The theme of digital water reflects skilling, knowledge, and innovation in the theme of water, and the correlating energy dimension related to water production and water efficiency, since the sustainable water management is essential for European key sectors such as tourism, agriculture, energy, chemical, paper and food industry (European Commission, 2019). Digital Water is very much a cross-disciplinary theme with strong natural science, social science and applied science ramifications. Proper skilling of human resources is essential because people are the most critical risk for the digitalization of the water sector, both in terms of change management and access to skills, there is a need to develop skill sets to deliver value to industry, customers and businesses (Global Water Research Coalition, 2021).

Competence development programs on advanced data management for the water sector is, for example, one of the suggestions to address the digital water skills gap, especially for drinking water utilities (European Commission, 2021a). The digitalization and virtual developments offer "new innovative opportunities for the water sector, including developing working conditions, and data for the governance, processes and practices" (European Commission, 2022). To match these opportunities, the new curricula must include modern approaches in teaching and learning, such as curiosity-driven education, collaborative mentoring and remote co-supervision, and utilize digital tools for group creativity and promoting virtual mobility (Water Europe, 2022a). This virtual mobility is at the core of the Digital Water HEIs Alliance and the distributed water emulative centers Waterline project is setting up. Providing guidance on which skill set to develop based on the mapping of the needs and challenges presented by local stakeholders to HEIs enhance their engagement and of the whole innovation system in moving forward solving of grand societal challenges (European Commission, 2017; Tödtling et al., 2021; Voegtlin et al., 2022), and building their legitimation as a key asset in boosting regional growth and green and digital transitions (Woolford and Boden, 2021).

For the ecosystems mapping, we considered the actual configuration of the smart water innovation ecosystems, whether in the form of smart specialization strategies for sustainability (McCann & Soete, 2020; Miedzinski et al., 2022), smart water clusters or territories (European Commission, 2019) and Water-oriented Living Labs (WOLLS) (Water Europe, 2019; 2022b), all of which are part of and aim to facilitate water innovation ecosystem development. Common to all these structures are the quadruple or quintuple helix approach for the sustainable transformation of regional innovation systems (Grundel and Dahlström, 2016). Quadruple helix stakeholder survey has provided us with data on skills needs and interaction among digital water innovation actors. The interviews have shed light on specific

patterns of collaboration within smart water clusters.

FINDINGS OR EXPECTED OUTCOMES

So far, we have identified local stakeholders in the field of smart water in the eight countries, mapped innovation ecosystems and their needs for skilled personnel in face of the digitalization of water industry both by private and public suppliers and users, the supporting strategies, policies and regulations in the field of water, and digital water in particular and especially the potential for capacity building and research of the local HEIs. Further strengthening of the innovation capacity of the water industry as well as digital transformation of the water industry is expected. HEIs should improve their social engagement through education water professionals in line with the labor market needs.

ORIGINALITY / VALUE

Promoting the adoption of digital water is a means to address water scarcity, water management in all aspects of it (drinking water, wastewater, stormwater, irrigation water) and innovative means to deliver, control and protect the systems. HEIs are at the core of the system that forms skilled people to address the industry needs, develop new knowledge that leads to innovation and create impact in the regional innovation ecosystem where they are placed. Bringing all these topics together in the debate by means of applied research is the main original value of this article.

PRACTICAL / SOCIAL IMPLICATIONS

The main practical implications of this paper are for decision makers in policy, HEIs management and industry leadership as these stakeholders are sourced with knowledge for the establishment of smart water innovation ecosystems and sourcing of skilled personnel to promote the sustainable transformation of water systems. This research contributes to addressing global visions for sustainability, such as the United Nations (UN) Sustainable Development Goal (SDG) 4 and 6, which targets sustainable education and water, respectfully. It has implications also for the European Green Deal's objectives (European Commission, 2021b) to transition to a green and digital economy, as well as the missions healthy oceans and waters and climate-neutral cities of the Horizon Europe Program (2021-2027), the Digital Skills for Recovery and Growth in the context of the European Recovery and Resilience Plan and the newest Green Deal Industrial Plan (European Commission, 2023).

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The limitation of this research refers to its ex-ante nature in the sense that we evaluate local innovation ecosystems and their needs and challenges in terms of the skills set to promote the sustainable transformation by means of digitalization of the water sector. Further research should investigate the impact of modernization or the development new university courses in cooperation with the water industry in connection with the strengthening of smart water innovation ecosystems.

KEYWORDS (3-5)

Smart Specialization Strategies for Sustainability (S4), Smart water, Innovation ecosystems, Capacity building, Waterline.

REFERENCES

- European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a Renewed EU Agenda for Higher Education. Brussels, 30.5.2017, COM(2017) 247 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017DC0247&rid=4>
- European Commission. Water Smart Territories. Joint Research Centre Smart Specialization Platform, 2019. <https://s3platform.jrc.ec.europa.eu/water-smart-territories>. Access: 10.02.2023.
- European Commission. The Need for Digital Water in a Green Europe EU

H2020 projects' contribution to the implementation and strengthening of EU environmental policy. Written by Richard Elelman, Kristina Wencki, Albert S. Chen, Andreas Englund, Gerardo Anzaldúa. Brussels: Executive Agency for Small and Medium-sized Enterprises, 2021a.

European Commission. Digitalisation in the Water Sector: Recommendations for Policy Developments at EU Level. Authors Ulf Stein, Benedict Bueb, Andreas Englund, Richard Elelman, Natacha Amorsi, Francesca Lombardo, Aitor Corchero, Anna Bréchine, Fernando Lopez Aquillar, Michele Ferri. Brussels, European Research Executive Agency (REA), 2022.

European Commission. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic And Social Committee And The Committee Of The Regions A Green Deal Industrial Plan for the Net-Zero Age. Brussels, 1.2.2023 COM(2023) 62 final. Available at: https://commission.europa.eu/system/files/2023-02/COM_2023_62_2_EN_ACT_A%20Green%20Deal%20Industrial%20Plan%20for%20the%20Net-Zero%20Age.pdf. Access: 10.02.2023.

Grundel, I., Dahlström, M., A., Quadruple and Quintuple Helix Approach to Regional Innovation Systems in the Transformation to a Forestry-Based Bioeconomy. *Knowl Econ* (2016) 7:963–983 DOI 10.1007/s13132-016-0411-7

Global Water Research Coalition. The Digital Water Utility of the Future. GWRC, 2021. Available at: http://www.globalwaterresearchcoalition.net/_r5260/media/system/attrib/file/838/Digital%20Water%20Utility%20of%20the%20Future%20Final.pdf. Access: 18.01.2023

Mccann, P. and Soete, L., Place-based innovation for sustainability, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-20392-6, doi:10.2760/250023, JRC121271.

Miedzinski M., Coenen L., Larsen H., Matusiak M., Sarcina A., Enhancing the sustainability dimension in Smart Specialisation strategies: a framework for reflection. Step-by-step reflection framework and lessons from policy practice to align Smart Specialisation with Sustainable Development Goals, Miedzinski M., Matusiak M. (eds.), Publications Office of the European Union, Luxembourg, 2022.

Water Europe. Atlas of the EU Water Oriented Living Labs. 2019. Available at: <https://watereurope.eu/wp-content/uploads/2019/07/Atlas-of-the-EU-Water-Oriented-Living-Labs.pdf>. Access: 10.02.2023.

Water Europe. The Future Needs of Human Capital Development in Support of a Water-Smart Society. 2022a. Available at: https://watereurope.eu/wp-content/uploads/The-future-needs-of-human-capital-development-in-support-of-a-Water_online.pdf. Access: 10.02.2023.

Water Europe. Water-Oriented Living Labs: How to assess and evolve water-oriented living labs – a manual with A Vision. Notebook Series#2. 2022b. Available at: https://www.pnoconsultants.com/innovationservices/wp-content/uploads/sites/9/2022/09/WoLL-Notebook-Series2_2pages.pdf. Access: 10.02.2023.

Woolford, J.L., Boden, M (eds). Higher Education for Smart Specialisation: A handbook. JRC Technical Report, Luxembourg: Publications Office of the European Union, 2021.

Tödting, F., Tripl, M., Desch, V. New directions for RIS studies and policies in the face of grand societal challenges. *European Planning Studies*, 30 (11), 2022, <https://doi.org/10.1080/09654313.2021.1951177>

Voegtlin, C., Scherer, A.G., Stahl, G.K., Hawn, O., Grand societal challenges and responsible innovation. *Journal of management studies* 59(1), 1-28. <https://doi.org/10.1111/joms.12785>.

09

NETWORK INTELLIGENCE TO BOOST INNOVATION
ECOSYSTEMS

9.1 Technology Parks and business incubators as instruments for networking and regional development

Rayane Medina Nogueira¹, Jucelia Maria Lopes Maia Roberto¹, Adriana Ferreira de Faria¹

¹TecnoPARQ - Technological Park of Vicosa, Brazil.

PURPOSE

This article aims to present the importance of the Incubator of Technology-Based Companies (IEBT) and the Technological Park of Viçosa (tecnoPARQ), linked to the Federal University of Viçosa (UFV) in the context of economic and social development of the environment where they are inserted through support for startups and networking among the various actors in the regional innovation ecosystem.

DESIGN / METHODOLOGY / APPROACH

The methodology adopted comprises theoretical and empirical research, in addition to document analysis, through secondary sources and data from the institution itself and from companies linked to it. The approach used is based on qualitative research. In this way, documentary data were collected through access to institutional documents, such as reports. For the construction of the theoretical framework, bibliographical research was used, where scientific articles and reference sites on the subject were consulted, in addition to consulting the annual data of the incubator and tecnoPARQ (ZANELLA, 2013).

FINDINGS OR EXPECTED OUTCOMES

According to Sousa, 2019, Business Incubators are key organizations in the development of startups and aim to shelter and encourage these companies, enabling their initial and temporary development. The Technology Parks aim to promote research and technological innovation, stimulate cooperation between research institutions, universities and companies, in addition to supporting the development of knowledge-intensive business activities (STEINER, CASSIM and ROBAZZI, 2019).

The Technology-Based Business Incubator (IEBT) and the Technology Park of Viçosa (tecnoPARQ) through the Federal University of Viçosa (UFV) promote the creation and consolidation of new businesses through pre-incubation, pre-acceleration, incubation programs, residence and association.

For McCowan, 2020, the university plays an essential role in human development, and in the production of knowledge and innovation, which makes it a relevant actor when we refer to the Triple Helix. The university emerged as a teaching establishment, later became a creator of knowledge, through research that was being developed and more and became more engaged with society in order to meet its requirements in terms of transfer technologies and dissemination of knowledge and extension projects (DE OLIVEIRA COLUS; CARNEIRO, 2021).

This literature is expected to demonstrate the fundamental role of the Business Incubator and tecnoPARQ, as one of the main actors in the local innovation ecosystem, in encouraging the creation and development of new technology-based companies. In addition, we seek to inspire other innovation environments so that they act towards the development of the locality in which they are inserted, as well. Currently, tecnoPARQ has 29 companies physically installed (resident and incubated) and 4 startups that carry out their activities remotely or in a hybrid way. In addition, aiming to create strategic connections with major players in the market, in 2022 tecnoPARQ developed its newest program, the non-resident "Associated Company Program", which aims to expand the scope of action, including companies that can contribute to reaching of the Park's objectives, especially with regard to promoting increased local competitiveness in the development, production and marketing of innovative technology-based products and/or services.

ORIGINALITY / VALUE

Because it is a still young technology park, with only 11 (eleven) years of existence, there are no specific studies of tecnoPARQ in this context. From recent studies focused on the same, we can analyze its relevance and measure its impact on companies and society in general.

PRACTICAL / SOCIAL IMPLICATIONS

According to the IBGE, GDP per capita, which is the gross domestic product divided by the number of inhabitants in the municipality, increased

from R\$ 11,037.52 in 2010 to R\$ 22,472.92 in 2020. Considering that tecnoPARQ was created in 2011, one can see its performance in the economic development of the municipality. Other indicators that make it possible to analyze the importance of the park are the turnover of related companies, which increased by 7.5% from 2010 to 2021 and the number of jobs generated, which increased by 4% in the same period.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The limitation to some current data that reflect the situation of the municipality of Viçosa and of the companies inserted in this innovation ecosystem partially impairs a more precise conclusion of the article.

KEYWORDS (3-5)

Innovation, university, technology park, development, networking.

REFERENCES

- CHANKSELIANI, Maia; MCCOWAN, Tristan. Higher education and the sustainable development goals. *Higher Education*, v. 81, n. 1, p. 1-8, 2021 [access in: 25 jan. 2023]. Available at: <https://link.springer.com/article/10.1007/s10734-020-00652-w>
- DE OLIVEIRA COLUS, F. S.; CARNEIRO, A. M. Abordagens teóricas sobre o engajamento das universidades com a sociedade: contextualização e desenvolvimento. *Revista NUPEM*, v. 13, n. 28, p. 9-27, 2021 [access at: 21 jan. 2023]. Available at: <http://200.201.12.34/index.php/nupem/article/view/5644>
- SOUSA, Marco Aurélio Batista de. A Importância das Incubadoras de Empresas para o Desenvolvimento do Empreendedorismo no Brasil. *Revista Gestão em Foco*, ed. no 11, 2019.
- STEINER, João E.; CASSIM, Marisa Barbar; ROBAZZI, Antonio Carlos. Parques tecnológicos: ambientes de inovação. *Revista IEA*. USP. São Paulo, 2008.
- ZANELLA, Liane Carly Hermes. *Metodologia de Pesquisa*. 2. ed. Santa Catarina: [s. n.], 2013. 134 p. Available at: http://arquivos.eadadm.ufsc.br/EaDADM/UAB_2014_2/Modulo_1/Metodologia/material_didatico/Livro%20texto%20Metodologia%20da%20Pesquisa.pdf. Access on: 5 abr. 2022.

9.2 The impact of the COVID-19 pandemic on research collaboration networks: an analysis for laboratory heads linked to Brazilian public universities

Lorena Nascimento¹, Alexandre Dias¹

¹University of São Paulo, Brazil.

PURPOSE

The Covid-19 pandemic, declared in March 2020, caused a drastic change in work and in the global research agenda. The urgency for solutions to deal with the virus promoted an increase in publications on the subject, about which 4,875 scientific articles and pre-prints, related to coronavirus, were published between January and mid-April 2020 and reached the mark of 87,515 in early October 2022. [1] Furthermore, international collaboration in fields directly related to COVID-19 has received high attention from researchers. [2, 3, 4] An empirical analysis, in the field of biology, noticed an increase in national collaboration accompanied by a decrease in international collaborations during the pandemic. From Latin America, only Brazil appears in the sample, in which 31 Brazilian universities were responsible for 72.2% of preprints in the country. [5] One solution to mitigate barriers caused by the pandemic was the massive use of virtual and telecommunications, mainly for research in basic science that requires use of laboratories and face-to-face activities, making it necessary to model new ways of teaching and work partnerships. [6] It is estimated that remote work, even hybrid and online meetings will continue after the pandemic. [7,8] In this way, observing the different research collaboration behaviors during the COVID-19 pandemic, the present study aims to understand how the scientific and technological collaboration networks of laboratory heads from public universities located in the State of São Paulo, Brazil, changed between the pre- and pandemic periods. Specifically, this work seeks to compare the properties of the networks on these two periods, to analyze how the pandemic impacted these laboratory heads' centrality in their collaboration networks, and to understand whether the laboratories organizational characteristics are associated with gain or loss of importance within the network after the pandemic outbreak.

DESIGN / METHODOLOGY / APPROACH

This work sampled 242 research laboratories located in the State of São Paulo, Brazil. The choice of these institutions was based on the representativeness of their scientific and technological production in the Brazilian scenario. The survey consisted of two parts, on the first part we collected the individual characteristics of each laboratory head, such as research area, gender, time of service, and on the second part, we covered the laboratory's resources, such as the team composition and the cost of equipment.

Subsequently, using the laboratory head name present in our assembled publication bank, we use Scival (Elsevier) to obtain all papers authored by all of the surveyed laboratory heads. The search performed on December 14, 2022, returned 5,661 articles published. Linking each name through co-authorship ties from the articles, we built two scientific collaboration networks (using the software Gephi), one referring to the pre-pandemic period, considering the publications at 2017-2019 triennium, and the other to the 2020- 2022 triennium, such as the pandemic. In the subsequent step (currently in progress), we pretend to repeat the same approach for the construction of the technological collaboration networks through co-invention ties found in patents whose inventors matched any of the previously surveyed laboratory heads, using the Derwent Innovation Index platform.

Next, using Social Network Analysis (SNA), we intend to compare each laboratories heads' centrality measures (betweenness centrality, eigenvector and proximity) and the structure of both networks (co-authorship and co-invention) - size, density, diameters, number of nodes and edges, components and communities -, between the theses periods. Then we will perform a triangulation of the laboratories' data using the centrality measures of the laboratory heads.

FINDINGS OR EXPECTED OUTCOMES

Evidence of changes in laboratory heads scientific networks was found. The results show that during the pandemic there was an increase in scientific production (2,682 - 3,008) . Thus, the network

grew in diameter, number of nodes (12,594 - 16,003) and edges (401,992 - 815,804). Furthermore, the density network increased (0.005 - 0.006) as the number of communities (103- 84). A large contingent of researchers interconnected in the component giant, allows a flow of knowledge between all the interconnected actors, even that indirectly, being beneficial for the production of knowledge. In this case, 86.13% of co-authors can be found at component giant in the pandemic period, in contrast, 59.61% occupied the giant component during the pre-pandemic. With regard to the measures of centrality, there are considerable changes in the importance of researchers, with new laboratory heads emerging as relevant, as well as some losing importance. With regard to technological collaboration networks, it is expected that they will be fragmented and disconnected, following patterns found in other studies that analyze co-inventions.

ORIGINAL VALUE

In developing countries, science and technology are mostly produced at public universities' labs. In our current context the productive scenario of emergent nations has been neglected by the academic field, whereas most works on scientific and technological collaboration mainly portray the reality of more developed countries. Until this date there is no work on how the scientific and technological collaboration networks of laboratory heads working in university laboratories behaves in COVID-19 pandemics. Especially, including the association of the importance of these individuals in their networks with their attributes and the resources they have to work.

PRACTICAL / SOCIAL IMPLICATIONS

Understanding the dynamics of the production of scientific and technological knowledge during a health crisis allows the articulation of actions that can enhance research collaboration networks. These Informations are useful for laboratory heads themselves, for universities and public policy developers.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

In future research, we consider relevant the observation of laboratories linked to other Brazilian public universities, including other states, as well as the observation of research collaboration behavior in other developing countries. There are two relevant limitations to consider in this work. The first is the fact that's covered only scientific papers published in journals indexed on scopus databases. Another one, is the sample, as this work depended on the answers to the questionnaires, we were limited to data from 10% of all laboratories contacted.

KEYWORDS (3-5)

Pandemic, COVID-19, research collaboration networks, laboratory.

REFERENCES

1. Fry, C. v., Cai, X., Zhang, Y., & Wagner, C. S. (2020). Consolidation in a crisis: Patterns of international collaboration in early COVID-19 research. *PLoS ONE*, 15(7 July). <https://doi.org/10.1371/journal.pone.0236307>
2. Aviv-Reuven, S., & Rosenfeld, A. (2021). Publication patterns' changes due to the COVID-19 pandemic: a longitudinal and short-term scientometric analysis. *Scientometrics*, 126(8), 6761–6784. <https://doi.org/10.1007/s11192-021-04059-x>
3. Cai, X., Fry, C. v., & Wagner, C. S. (2021). International collaboration during the COVID-19 crisis: autumn 2020 developments. In *Scientometrics* (Vol. 126, Issue 4, pp. 3683–3692). Springer Science and Business Media B.V. <https://doi.org/10.1007/s11192-021-03873-7>
4. Liu, M., Bu, Y., Chen, C., Xu, J., Li, D., Leng, Y., Freeman, R. B., Meyer, E. T., Yoon, W., Sung, M., Jeong, M., Lee, J., Kang, J., Min, C., Song, M., Zhai, Y., & Ding, Y. (2022). Pandemics are catalysts of scientific novelty: Evidence from COVID-19. *Journal of the Association for Information Science and Technology*, 73(8), 1065–1078. <https://doi.org/10.1002/asi.24612>

5. Abramo, G., D'Angelo, C. A., & di Costa, F. (2022). How the Covid-19 crisis shaped research collaboration behavior. *Scientometrics*, 127(8), 5053–5071. <https://doi.org/10.1007/s11192-022-04450-2>
6. Sohrabi, C., Mathew, G., Franchi, T., Kerwan, A., Griffin, M., Soleil C Del Mundo, J., Ali, S. A., Agha, M., & Agha, R. (2021). Impact of the coronavirus (COVID-19) pandemic on scientific research and implications for clinical academic training – A review. In *International Journal of Surgery* (Vol. 86, pp. 57–63). Elsevier Ltd. <https://doi.org/10.1016/j.ijsu.2020.12.008>
7. Sowe, S. K., Schoenfeld, M., Samimi, C., Steiner, P., & Schürer-Ries, A. (2022). Managing North- South Research Collaboration Projects During the COVID-19 Pandemic. *International Journal of Information Technology Project Management*, 13(1), 1–25. <https://doi.org/10.4018/ijitpm.312255>
8. Rathnayake, N. M., Kumarasinghe, P. J., & Kumara, A. S. (2022). How Do Different Types of University Academics Perceive Work from Home Amidst COVID-19 and Beyond? *Sustainability (Switzerland)*, 14(9). <https://doi.org/10.3390/su14094868>

9.3 Evaluation of Innovation Networks Using a Social Network Based Tool

Nathalia Alves¹, Marina Szapiro², Marco Vargas³

¹ FGV-EAESP-FAPESP, Brazil, ² UFRJ, Brazil, ³ UFF, Brazil.

PURPOSE

Innovation networks supported by public funds are considered critical instruments of public policy and they are very relevant to promote the creation and strengthening of robust innovation system (Benkler 2006, Etzkowitz, 2001, considering both the relevance of these networks, and its heavy public investment, there is a growing need to assess their development to ascertain their potential for innovation and performance (Tero, 2019).

Nowadays, there are a new interest in the definition of innovation metrics (however with few research in network metrics). In general, the metrics are based on traditional measures of inputs and outputs, without considering the detailed information about the network, such as the structure and dynamicity, characteristics very important in innovation networks (Tero, 2019, Walker et al, 1997, Aghion, 2021).

Social networks are very useful for dynamically analyzing elements of a network and the relations among elements as well as its different phases: growth, consolidation, and maturity (Walker et al, 1997). It is intended to evaluate the innovation network at various stages of its life cycle. Unfortunately, the literature on conceptual frameworks for evaluating these networks is scarce and fragmented. In this sense, this paper aims to present a proposal of social networks-based tool for assessing innovation networks.

DESIGN / METHODOLOGY / APPROACH

The research conducted in this study was exploratory and based on cases (Yin, 2009). This research is focused on innovation networks supported by public funds (Kay, Shapira P 2009). In this sense, it was studied three segments of the Brazilian Network for Nanotechnology. These networks were the base for elaborate an evaluation tool. Nanotechnology has been chosen as the application area by its dynamic character, for being an intensive knowledge area and for having high an innovative potential.

Regarding the data, it was used data from the Brazilian register of curricula of researchers (CV-Lattes), which gathers information on publications, research projects, among others, to assess these segments. For Brazil, the CV-Lattes are the official repository to access the scientific productivity of researchers.

A tool was developed for extracting data. The extracted information from the CV-Lattes was used as an input of a social network analysis tool which evaluates the networks through time. For this, a longitudinal analysis was done starting from the beginning of the network until today. It was possible to assess how these networks have evolved and the level of integration and collaboration of the networks' actors. These actors can be researchers from universities, research centers, public or private. This tool allows you to view both the network of actors (researchers) and the network of institutions (aggregated information). The software used to visualize the network was Network X. There was also an extensive theoretical study on innovation networks and evaluation of these networks using secondary data such as books, articles, theses, etc. The developed tool is part of an ongoing project related to the assessment of innovation networks and support tools.

FINDINGS OR EXPECTED OUTCOMES

Among the results obtained in this work, one of the most important is that in nanotechnology in Brazil, networks are not very connected. It is realized that these networks still are in a growth stage, and they are not yet mature or consolidated with a few exceptions.

ORIGINALITY / VALUE

The paper introduced a discussion about the importance of evaluating innovation networks, specifically the public ones, with focus to Nanotechnology.

This work aims to contribute to the study of networks, through a systemic, dynamic, flexible, and transparent approach.

The idea is to evaluate networks and to monitor the evolution and production of the networks in real time.

PRACTICAL / SOCIAL IMPLICATIONS

The current research will be relevant for practitioners as a base for decision making about innovation networks specially in nanotechnology, and for academics as a base of future studies in the issue of innovation networks evaluations with focus in nanotechnology, because research in these topics are scarce in the literature. About social implications, innovation networks are very important for increase innovation and the issue of evaluation is relevant for make investments in these networks and specially in nanotechnology because this emergent technology has the potential of improve the quality of life of society.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This tool is part of an ongoing project related to the construction of a model for evaluating innovation networks with focus in nanotechnology. As future work, the tool will be extended to evaluate aspects such as the influence of the network environment (the relationships between the network and external authors), the generation of well qualified human resources (master and PhD students), and start-ups. Another study that should be done is the introduction of semantic techniques (Mika, 2007) to analyze the production of researchers and suggest, for example, the link between actors working on related issues, this similarity could be implemented using ontologies (Staab, S.; Studer, R 2009). This could encourage the intellectual output of the network participants and resource sharing.

KEYWORDS (3-5)

Nanotechnology, innovation networks, social networks, evaluation.

REFERENCES

- Aghion, Philippe et al (2021) Innovation Networks and Business-Stealing. Available at SSRN: <https://ssrn.com/abstract=3917979> or <http://dx.doi.org/10.2139/ssrn.3917979>
- Alves A D, Yanasse H H, Soma N H (2019) Extração de Informação na Plataforma Lattes para Identificação de Redes Sociais Acadêmicas. <http://www.lac.inpe.br/cap/arquivos/pdf/P04.pdf>. Accessed April 2021.
- Benkler Y (2006) The Wealth of networks. Yale University Press. Available in: http://www.benkler.org/Benkler_Wealth_Of_Networks.pdf Accessed May 2011.
- Etzkowitz Henry (2001) The triple Helix of university- Industry government relations. In International Congress University and R&D in the Knowledge Society. Barcelona.
- Kay L, Shapira P (2009), Developing Nanotechnology in Latin America. In: Journal of Nanoparticle Research, 2009. 11(2):259-278
- Matheus R F, Silva A B O (2021) Fundamentação básica para análise de redes sociais: conceitos, metodologia e modelagem matemática. In: Población D A, Mugnaini R, Ramos L (ed) Redes sociais e colaborativas em informação científica. São Paulo: Editora Angellara, pp 239-287. In Portuguese.
- Rantala Tero, Ukko Juhani (2019) Performance measurement in university-industry innovation networks: implementation practices and challenges of industrial organizations. Journal of Education and Vol. 3, No. 3, 247-2611. <https://doi.org/10.1080/13639080.2018.1460655>
- Walker, Gordon, Kogut, Bruce, and Shan, Weijian (1997.) Social capital, structural holes and the formation of an industry network. Organization science 8.2, pp. 109-125.

10

RESPONSIBLE CONSUMPTION, PRODUCTION AND WORK

10.1 Environmental, Social, and Governance Implementation in Healthcare Organizations: A Case Study of Assuta Medical Centers

Yossi Weiss¹

¹Assuta Medical Center, Israel

PURPOSE

1. Reviewing how to promote ESG in a healthcare organization. Assuta Medical Centers (AMC) as a case study organization that received 2021 Platinum + grade Maala Index, in alignment with the United Nations sustainable development goals (SDG). 2. Sharing the insight from an implementation process in a healthcare organization.

DESIGN / METHODOLOGY / APPROACH

AMC was evaluated by two external entities ("Maala index", "Good vision"). The review categories of the Maala index include A. Ethics and core values, B. Employees, C. Diversity and Inclusion, D. Responsible procurement, E. Community Contribution, F. Employees' Social involvement, G. Environment, H. Corporate governance, I. Social and Environmental management and reporting (6). "Good Vision" reviewed the Global Reporting Initiative (GRI) Index categories of AMC properties: Organization profile, Strategy, Ethics and integrity, Governance, Stakeholder engagement, reporting practice, Management Approach (required for each material aspect), Environmental aspects: Materials, Energy, Emissions, Effluents and Waste, Social aspects: Employment, Labor/Management Relations, Training and Education, Diversity and Equal Opportunity, Customer Health and Safety (7). "Good Vision" (Fahn Kanne & Grant Thornton) has also confirmed the reported details accuracy by reviewing the above-mentioned aspects.

FINDINGS OR EXPECTED OUTCOMES

AMC activities concur with various ESG strategies:

Environmental: Reducing consumption of energy and water while addressing waste. Most of the energy for two medical centers within the AMC organization (Ramat Hachayal and Rishon LeZion) are using electricity from a natural gas power station. In addition, AMC is increasing awareness of renewable energy consumption, reducing disposable dishes use of in the kitchens, and beginning a waste separation project at the Rishon LeZion hospital (8).

Social: AMC has many employees over 60 years old. AMC won the Workforce Diversity prize for 2021 from the Ministry for social equality. In addition, AMC also employs people with disabilities, with the next year's target of expanding to 3% minimum. The company's facilities and properties have been made accessible according to the schedules in the accessibility legislation. Employees are undergoing training in accessibility service as required under service accessibility regulations. AMC has various plans to encourage community volunteering. Staff completed 2840.5 volunteer hours in 2021. AMC has also established a scientifically based online free platform for estimating the degree of personal risk of developing breast cancer ("my pink check").

Procurement: The percent of green procurement is growing each year and includes 12 electric cars. At AMC, many of the holiday gifts given to employees are purchased from companies with social value (social procurement).

Governance: The staff at AMC has written its own code of ethics, a profound process that started in 2015. It included the participation of all stakeholders (e.g., patients, employees, suppliers). The first edition was published in January 2020 and the third one in December 2021 (9). The code communicates visions and values expressed at AMC. All the workers underwent workshops regarding the code of ethics.

School of professionalism: AMC has established a school of professionalism for promoting excellence in medicine. It was launched in 2014 and serves as a model for Israel and the world. The goal of the school is to raise awareness of professional values and integrate those values throughout the organization. Its objectives have been implemented to improve the organizational culture, imparting professional values, and integrating those values within group discourse and discussion that transcend job titles and the organizational hierarchy. Creating clear guidelines and a uniform language of conduct is appropriate for an organization that strives for excellence. The goal of the training is to ensure that the organization and its employees all have extensive experience and knowledge. Classes are held in heterogeneous groups and conducted by professional moderators specially selected from the AMC internal staff. The moderators are

trained in a unique training course.

In Summary: AMC entered an ESG process in November 2019 and earned Platinum and Platinum+ grades from the Maala Index in 2020 and 2021, respectively. AMC won the Workforce Diversity prize for having many employees over 60 years of age.

ORIGINALITY / VALUE

ESG implementation studies in healthcare organizations are scarce, especially in Israel. The areas of activity should reflect the organization's vision and values. In order to receive high ESG grades, the senior management should be committed to the ESG fields, and the organization should do its best to improve the ESG performance, but not at the expense of professional excellence (in AMC case medical excellence).

PRACTICAL / SOCIAL IMPLICATIONS

A big leading health organization can spearhead ESG model in Israel and worldwide.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Adding data regarding other healthcare organizations mainly public hospitals and community medicine.

KEYWORDS (3-5)

Corporate social responsibility (CSR), environmental, social, and governance (ESG), healthcare organization, sustainable development goals (SDG), workforce diversity.

REFERENCES

1. Fatemi A, Glaum M, Kaiser S. ESG performance and firm value: The moderating role of disclosure. *Glob Finance J.* 2018;38(C):45–64.
2. Corporate Social Responsibility: Doing the Most Good for Your Company and Your Cause | Wiley [Internet]. Wiley.com. [cited 2022 Mar 17]. Available from: <https://www.wiley.com/en-us/Corporate+Social+Responsibility%3A+Doing+the+Most+Good+for+Your+Company+and+Your+Cause-p-9780471476115>
3. ESG (Environmental, Social and Governance) - Overview and Framework [Internet]. [cited 2022 Mar 20]. Available from: <https://corporatefinanceinstitute.com/resources/knowledge/other/esg-environmental-social-governance/>
4. PricewaterhouseCoopers. Consumer health behavior and the COVID-19 pandemic [Internet]. PwC. [cited 2022 Mar 30]. Available from: <https://www.pwc.com/us/en/industries/health-industries/library/hri-insight-consumer-health-behavior-and-covid-19-pandemic.html>
5. Hensher M, McGain F. Health Care Sustainability Metrics: Building A Safer, Low-Carbon Health System. *Health Aff Proj Hope.* 2020 Dec;39(12):2080–7.
6. maala-index-questionnaire-2020.pdf [Internet]. [cited 2022 Mar 20]. Available from: <https://www.maala-en.org.il/wp-content/uploads/2020/10/maala-index-questionnaire-2020.pdf>
7. GRI - GRI Standards English Language [Internet]. [cited 2023 Jan 31]. Available from: <https://www.globalreporting.org/how-to-use-the-gri-standards/gri-standards-english-language/>
8. Assuta | Corporate responsibility report 2019 and activity review 2020 [Internet]. [cited 2023 Jan 31]. Available from: <https://assuta.digitaler.co.il/assuta13/>
9. Assuta | the ethical code [

11

TH STRATEGIES IN DEVELOPING COUNTRIES

11.1 Triple Helix and sustainable growth in emerging economies: Stakeholders' tensions in the entrepreneurial ecosystem

Sasha Katalina Soto Rivera ¹

¹La Salle - Ramón Llull, Spain

PURPOSE

Such as the US knowledge creation, entrepreneurship support, and coordination endowments from the 1980s, other latitudes pertain their endowments from their old industrial environments (Tödtling & Trippel, 2018; Trippel et al., 2020). Emergent economies face difficulties to adapt to a sustainability perspective, due to a strong path dependence on their social structures and cultures (Bruton et al., 2008, 2013). The Triple Helix (TH) from an emerging economy does not necessarily align with the institutional, structural, and organisational assumptions that the TH take for granted when striving for new paths of regional development (Bruton et al., 2008), nor they can count on with the US kind of tradition of innovative endowments. The undeveloped legal, institutional, and infrastructural systems in emerging economies give entrepreneurs minimal access to resources, nonetheless, entrepreneurship has had a permanent presence in these contexts (Bruton et al., 2008; Cao & Shi, 2021), although not always represented as productive entrepreneurship (Baumol, 1990).

At the same time, in any kind of structure of TH, either in advanced or emergent economies, the network requires collaborative and collective interactions which are linked to the accumulation of complementary capabilities and skills of organizations

(Neergaard & Ulhøi, 2006). Chaotic behaviour is imminent when more than two helices are involved in the creation of innovation (Leydesdorff, 2010; Leydesdorff & Etzkowitz, 1998). Such interactions produce the critical mass required for knowledge, and capital exchange (Brown & Mason, 2017). Authors coincide that this exchange, either formal or informal, can be related to the origin and success of networks such as industrial districts (Cooke, 2002; Neergaard & Ulhøi, 2006). Relationships that share a common culture and are mediated by the participants' idea of established behaviour; the constant interaction, and recognition of each other's boundaries, build the basic dynamics of the interchange (Neergaard & Ulhøi, 2006). However, new attempts to overcome old dependencies bump into the incumbent stakeholders, as their initiatives face paradoxical situations due to path dependence (Hassink et al., 2019; Smith & Lewis, 2011). The communications, and relationships can be vexed by tensions (Huggins et al., 2018; Provan & Kenis, 2008) or misunderstandings; differences in basic values, beliefs, and the amount of trust that facilitates the interactions of the participants (Casson & della Giusta, 2007). Taking the city of Cali, Colombia as an empirical scenario, this study suggests that a perspective of paradoxical tensions on the stakeholders' relationships helps to understand the difficulties encountered when striving for new path dependencies towards sustainable growth. The paradoxical tensions lens lends a viewpoint on clues to understanding the apparition and posterior management of frictions that could explain how the behaviour of stakeholders would affect a network (Andriopoulos & Lewis, 2009; McGuire & Agranoff, 2011; Provan & Kenis, 2008; Smith & Lewis, 2011; van Bueren et al., 2003), in the search of a new sustainable path (Trippel et al., 2020).

DESIGN / METHODOLOGY / APPROACH

This empirical research focuses on the instrumental case study (Stake, 1995) of the entrepreneurial ecosystem of Cali, Colombia. Using semi-structured interviews (Kallio et al., 2016), coding the informant's data into NVIVO software. Eight different actors from the city were consulted in 11 interviews: the city's development secretary, a private incubator, a non-firm academic actor involved in the support of entrepreneurs, the 1st ranked university in Colombia's incubator, one representative of the private sustainable industry sector, one representative of the traditional industry sector, the local chamber of commerce, and a designated for the regional representative of the nation's agency for entrepreneurship.

FINDINGS OR EXPECTED OUTCOMES

Stakeholders initiatives face paradoxical situations due to path dependence. Such paradoxical tensions appear because there is a constant convergence of competing demands in the dimensions of the vision shared by the actors of the ecosystem. These dependencies

divide in opposite directions that create paradoxes which interfere in drawing new path dependencies for sustainable growth. A paradoxical tension lens can inform on how stakeholders are relating and what attitudes are hindering the progress towards a new sustainable development path.

ORIGINALITY / VALUE

Perspectives that endeavour to explain new path development like the TH only explain that actors collaborate, organize, and work collectively to align themselves around supporting the ecosystem in a region (Brown & Mason, 2017). However, these do not address why collective, collaborative, and synchronized work, although related to successful networks (Hassink et al., 2019), has been detected in some places and not in others (Neergaard & Ulhøi, 2006; Pulka et al., 2021), and furthermore, how, and why regions differ in their capacity to modify assets through agentic processes (Trippel et al., 2020). This work proposes the study of tensions helps to understand the intricacies of collaboration, shedding light on what happens inside the interactions among heterogeneous stakeholders, which are necessary to develop a new sustainable path.

PRACTICAL / SOCIAL IMPLICATIONS

This study bonds research of Entrepreneurial Ecosystems and Triple Helix and the UN's eight sustainable goal. The final commitment is to contribute to the literature and practice in emergent economies, to bring guides that could help tackle this problem at the level of policymakers, universities, entrepreneurs, and incumbents of the region; to detect bottlenecks and target specific barriers for collective work. Theoretical contribution spins at the level of introducing more research in the contexts of emerging economies into the Triple Helix and Entrepreneurial Ecosystems theory. from R\$ 11,037.52 in 2010 to R\$ 22,472.92 in 2020. Considering that tecnoPARQ was created in 2011, one can see its performance in the economic development of the municipality. Other indicators that make it possible to analyze the importance of the park are the turnover of related companies, which increased by 7.5% from 2010 to 2021 and the number of jobs generated, which increased by 4% in the same period.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Further research should look into the nature of the tensions detected and search for theoretical standpoints to study their origins and effects in heterogeneous governance networks from a quantitative approach. A limitation of this work is the specific social reality the context studied describes, which hinders the capacity to generalise findings. Nonetheless, it illustrates what emerging economies and institutional-challenged places could characterize.

KEYWORDS (3-5)

Entrepreneurial ecosystems; Emerging Economies; Stakeholder tensions, Paradox Theory.

REFERENCES

- Baumol, W. J. (1990). Entrepreneurship: Productive, Unproductive, and Destructive. <http://www.journals.uchicago.edu/t-and-c>
- Brown, R., & Mason, C. (2017). Looking inside the spiky bits: a critical review and conceptualisation of entrepreneurial ecosystems. *Small Business Economics*, 49(1), 11–30. <https://doi.org/10.1007/s1187-017-9865-7>
- Bruton, G. D., Ahlstrom, D., & Obloj, K. (2008). Entrepreneurship in Emerging Economies: Where Are We Today and Where Should the Research Go in the Future.
- Bruton, G. D., Filatotchev, I., Si, S., & Wright, M. (2013). Entrepreneurship and strategy in emerging economies. *Strategic Entrepreneurship Journal*, 7(3), 169–180. <https://doi.org/10.1002/sej.1159>
- [br/EaDADM/UAB_2014_2/Modulo_1/Metodologia/material_didatico/Livro%20texto%20Metodologia%20da%20Pesquisa.pdf](https://doi.org/10.1002/sej.1159). Access on: 5 abr. 2022.

- Cao, Z., & Shi, X. (2021). A systematic literature review of entrepreneurial ecosystems in advanced and emerging economies. *Small Business Economics*, 57(1), 75–110. <https://doi.org/10.1007/s11187-020-00326-y>
- Cooke, P. (2002). *Regional Innovation Systems: General Findings and Some New Evidence from Biotechnology Clusters*.
- Galvao, A., Mascarenhas, C., Marques, C., Ferreira, J., & Ratten, V. (2019). Triple helix and its evolution: a systematic literature review. In *Journal of Science and Technology Policy Management* (Vol. 10, Issue 3, pp. 812–833). Emerald Group Holdings Ltd. <https://doi.org/10.1108/JSTPM-10-2018-0103>
- Hassink, R., Isaksen, A., & Trippel, M. (2019). Towards a comprehensive understanding of new regional industrial path development. *Regional Studies*, 53(11), 1636–1645. <https://doi.org/10.1080/00343404.2019.1566704>
- Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, 72(12), 2954–2965. <https://doi.org/10.1111/jan.13031>
- Leydesdorff, L. (2010). The Knowledge-Based Economy and the Triple Helix Model. In *Annual Review of Information Science and Technology* (Vol. 44). <http://europa.eu.int/comm/research/era/pdf/com2000-6-en.pdf>
- Leydesdorff, L., & Etzkowitz, H. (1998). The Triple Helix as a model for innovation studies. In *Science and Public Policy* (Vol. 25, Issue 3). <https://academic.oup.com/spp/article-abstract/25/3/195/1630936>
- Neergaard, H., & Ulhøi, J. P. (2006). *Government Agency and Trust in the Formation and Transformation of Interorganizational Entrepreneurial Networks*.
- Scaringella, L., & Radziwon, A. (2018). Innovation, entrepreneurial, knowledge, and business ecosystems: Old wine in new bottles? *Technological Forecasting and Social Change*, 136, 59–87. <https://doi.org/10.1016/j.techfore.2017.09.023>
- Smith, W. K., & Lewis, M. W. (2011). TOWARD A THEORY OF PARADOX: A DYNAMIC EQUILIBRIUM MODEL OF ORGANIZING. *Academy of Management Review*, 36(2), 381–403. <https://doi.org/10.5465/amr.2011.59330958>
- Stake, R. E. (1995). *The art of case study research*. SAGE Publications.
- Tödting, F., & Trippel, M. (2018). Regional innovation policies for new path development-beyond neo-liberal and traditional systemic views.
- Trippel, M., Baumgartinger-Seiringer, S., Frangenheim, A., Isaksen, A., & Rypestøl, J. O. (2020). Unravelling green regional industrial path development: Regional preconditions, asset modification and agency. *Geoforum*, 111, 189–197. <https://doi.org/10.1016/j.geoforum.2020.02.016>

11.2 An adaptive evolution of policy transfer: the case of Vietnam-Korea Institute of Science and Technology

Aram Cho¹

¹Seoul National University, South Korea.

PURPOSE

Since the release of SDGs, the importance of science and technology has been raised more than ever. Throughout the experiences of developed countries, policy makers in developing nations have realized that science and technology is the key element to achieve their nation's sustainable development. Therefore, there has been a high demand in the Global South to adopt and learn science policies from the Global North. South Korea, once a developing country, experienced both receiving and transferring policies as a recipient and donor.

In 1966, the South Korean and the U.S. government jointly conducted a Korea Institute of Science and Technology (hereafter KIST) establishment project. Contracted with the U.S. Agency of International Development, the Battelle Memorial Institute (hereafter BMI) assisted KIST in its early stage of establishment by providing consultation for institute management, and training services for research & administration. 50 years later, KIST gained its reputation as the leading institute which brought success to the development of the country and a grand scale aid project has been conducted. It was the Vietnam-Korea Institute of Science and Technology (hereafter VKIST) project, to build a new institute in Vietnam modeled after KIST. This time it was KIST that played the role as a transferor of policy and supported VKIST's establishment by providing its know-how in research and administration as well as the overall contents on science and technology policy systems in Korea. In sum, KIST, once a transferee, turned into a transferor after generations.

So far, there have been no reports on policy transfer cases in which once a transferee changes into a transferor. In this paper, by analyzing this unique policy transfer case, similarities and differences of each institute's establishment case are identified. Also, it examines what is and is not inherited throughout the generations and detects the key factors of the (un)success of the inheritance. More importantly, this study aims to provide a better understanding for policymakers in both developed and developing countries that are hoping to conduct systematic and effective projects.

DESIGN / METHODOLOGY / APPROACH

This paper analyzes two policy transfer cases (KIST and VKIST, respectively) with three-step comparative analysis. The first step explores each transferred element in detail – content, involvement, methods, localization, limitations, and outcome. By adopting Evans and Davies (1999) soft and hard transfers classification, the second step describes what was successfully inherited from BMI to VKIST and what transferred elements had to go through evolutionary adaptation. The last analysis shows the overall process of the transfer of KIST and VKIST projects using a converted framework of Dolowitz and Marsh (2000).

FINDINGS OR EXPECTED OUTCOMES

VKIST inherited BMI's operating system, the attitude, and most of the research and administrative capacities. However, some features such as keeping the institute's researcher's independence failed to inherit. Also, the recruitment system and the legislation to project the institute's status were newly introduced by KIST to VKIST. In other words, while soft forms of transfer are readily inherited, some of the hard forms faced inevitable changes by external factors. While three distinctive institutes share the main heredity, it went through natural selection due to localization. Also, in the process of localization, some of the policies had to be evolutionarily adaptive in order to survive in a local context. Thus, policy transfer, especially when it is between three generations, results in evolutionary adaptation of policy.

ORIGINALITY / VALUE

In most empirical studies of policy transfer, it highlights the process between the transferor and the transferee. While these studies conclude by either evaluating the success of the transfer or emphasizing a certain factor as a secret to the success/failure of the transfer, there is no single article analyzing a case in which once a transferee turns into a transferor. In this article, unusual policy transfer cases are analyzed

and it argues that the local context is the most important factor when it comes to policy transfer.

PRACTICAL / SOCIAL IMPLICATIONS

This paper aims to contribute to the few existing empirical studies on science and technology policy transfer and policy transfer between developed and developing countries. Also, this research is significant as it analyzes a case in which once a transferee is now a transferor. By showing three individual science and technology institutes' consecutive policy transfers within 50-years difference, this research reemphasizes the importance of localization in policy transfer.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Unlike the KIST establishment project, the VKIST project is relatively new. Therefore, it may be considered early to evaluate the success of VKIST. Nevertheless, it will be interesting to catch-up with VKIST's performances in the next decade. Also, if new policy transfer cases that are similar to this study's case appear, it will be meaningful to conduct a comparative analysis.

KEYWORDS (3-5)

Science policy, policy transfer, globalization, SDGs.

REFERENCES

- Battelle Memorial Institute. (1971). Report on Battelle's Assistance to The Korea Institute of Science and Technology 1966-1971.
- Clifton, J., & Díaz-Fuentes, D. (2014). The OECD and "the rest": Analyzing the limits of policy transfer. *Journal of Comparative Policy Analysis: Research and Practice*, 16(3), 249-265.
- Dolowitz, D., & Marsh, D. (1996). Who learns what from whom: a review of the policy transfer literature. *Political studies*, 44(2), 343-357.
- Dolowitz, D. P., & Marsh, D. (2000). Learning from abroad: The role of policy transfer in contemporary policy-making. *Governance*, 13(1), 5-23.
- Evans, M., & Davies, J. (1999). Understanding policy transfer: A Multi-level, multi-disciplinary perspective. *Public administration*, 77(2), 361-385.
- Hwang, S., & Song, H. (2019). Policy transfer and role of policy entrepreneur in international aid: exploring international development cases of Korea and Vietnam. *Policy Studies*, 40(1), 1-20.
- Kwon, H. J. (2009). Policy learning and transfer: the experience of the developmental state in East Asia. *Policy & Politics*, 37(3), 409-421.

11.3 Faculty Promotion Evaluation and The Third Missions of Universities: Empirical Evidence from a Developing Country

Zaynab Sabagh¹, Mohammad Moshtari²

¹Sharif University of Technology, Iran, ²Tampere University, Finland

PURPOSE

As part of the promotion of lifelong learning, the fourth of the Sustainable Development Goals emphasizes equal and quality access to tertiary education, including technical, vocational, and higher education. However, the massification of higher education that has been generally followed by inadequate resources has led to a conflict between quality and quantity, especially in developing countries (Acer & Güçlü, 2017; Salajegheh et al., 2022). For newly established institutions in emerging markets and developing countries, an effective and well-designed faculty evaluation system for tenure and promotion is vital for improving the quality of education (Shafian & Salajegheh, 2021) and for the sustainable development of the country (Yirdaw, 2016). However, empirical evidence has revealed that faculty evaluations for promotion and tenure present various challenges and are distant from the original goal of improvement and reflection (McCarthy & Dragouni, 2021).

Given the crucial role of the promotion system in steering faculty members' academic performance and encouraging them to balance research, teaching, and collaborative projects with industry, the present study aims to explore the following three research questions in Iranian higher education.

- 1) What are the unintended consequences of implementing a centralized, quantitative promotion system?
- 2) What are the shortcomings of the current promotion system that lead to unintended consequences?
- 3) What are the moderating factors that strengthen the negative relationship between the promotion system and its unintended consequences?

DESIGN / METHODOLOGY / APPROACH

We used the grounded theory approach and collected and analyzed data from multiple sources. These included data from semi-structured interviews with 35 faculty members of economics and management departments at public universities in Iran and three focus groups on topics related to the promotion assessment system. In addition, we interviewed 10 informants with experience in management at the university level or higher education policy-making at the ministry level. Furthermore, we reviewed secondary data sources, such as policy and regulation documents, related to the current promotion system. In analyzing the data, we utilized an open coding procedure to identify and categorize challenges (Miles & Huberman, 1994). To lessen the chance of bias, two researchers independently examined the data. Findings were compared for similarities and discrepancies until an achievement was reached.

FINDINGS

The qualitative analysis of the data highlighted four unintended consequences caused by the shortcomings of the current promotion system. Shortcomings of the promotion system, in terms of criteria and process, influence faculty performance, behaviors, and experiences. In addition, two moderating variables (faculty's individual profile and institutional experiences and resources) were also identified that could impact the relationship between the promotion system and unintended consequences (See Figures 1-3).

The results clearly showed that the current centralized, quantitative promotion system mainly steers faculty activities towards producing a higher number of publications and disengages them from the Third Mission of the universities to contribute to societal needs. The high emphasis on the number of research outputs encourages faculty to publish in low-quality journals, as it is faster and easier, instead of top-tier leading ones. Additionally, the high pressure on research resulted in a lack of recognition for and the devaluation of other important aspects of academic work such as outreach to industry and transfer of academic knowledge to solve real-world problems, thus disengaging faculty members from identifying and solving the needs and demands of markets and societies.

ORIGINALITY / VALUE

The present study answered the call highlighted by de Rijcke et al. (2015) for an empirical examination of the impacts of faculty evaluation systems. The present study has scrutinized an underexamined context of Iran, a developing country with a centralized higher education system in which little is known about the criteria and processes used in faculty evaluation systems and their consequences. Not only the results are imperative for the Iranian higher education system, but it is insightful for higher education systems with quantitative or centralized evaluation systems.

PRACTICAL / SOCIAL IMPLICATIONS

The results of the present study have implications for university administrators and policymakers to enhance the faculty evaluation system. Besides the number of publications, the Iranian promotion system could include or place more emphasis on other essential academic activities, such as effective dissemination of research, collaborative projects with industry, internationalization, and solving societal challenges. Another way to improve the system is to tailor current regulations to capture institutional missions and disciplinary and individual differences. Finally, the current quantitative-based faculty promotion system could be improved by the addition of some dimensions of a qualitative assessment-based system.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Data was merely collected from management and economics faculty members and insights from faculty employed in other disciplines were not provided in the study. The study is qualitative and used a small sample of participants. Future studies can test this model quantitatively by administering a survey to a larger number of faculty members. Additionally, potential mediating variables such as self-efficacy, coping style, stress appraisal, and work passion can be examined in future qualitative and quantitative research.

KEYWORDS (3-5)

Quantitative faculty evaluation, promotion, developing countries, university-industry relationships, the third mission.

REFERENCES

- Acer, Ebru Karataş, and Nezahat Güçlü. 2017. An analysis of the expansion of higher education in Turkey using the new institutional theory. *Educational Sciences: Theory & Practice* 17 (6).
- de Rijcke, Sarah, Paul F. Wouters, Alex D. Rushforth, Thomas P. Franssen, and Björn Hammarfelt. 2016. Evaluation practices and effects of indicator use—a literature review. *Research Evaluation* 25 (2):161-169.
- Miles, Matthew B, and A Michael Huberman. 1994. *Qualitative data analysis: An expanded sourcebook*: sage.
- McCarthy, Dermot, and Mina Dragouni. 2021. Managerialism in UK business schools: capturing the interactions between academic job characteristics, behaviour and the 'metrics' culture. *Studies in Higher Education* 46 (11):2338-2354.
- Shafian, Sara, and Mahla Salajegheh. 2021. Faculty Members' Promotion: Challenges and Solutions. *Strides in Development of Medical Education* 18 (1).
- Yirdaw, Arega. 2016. *Quality of Education in Private Higher Institutions in Ethiopia: The Role of Governance*. SAGE Open 6 (1)

11.4 A Quadruple Helix that Respects and Nurtures Indigenous Australian Innovation and Development

Benjamin G. Mitchell¹

¹The Australian National University, Australia

PURPOSE

This paper presents the concept of an Indigenous Quadruple Helix (IQH) to better reflect the cultural dynamics and helix interactions of Australia's First Peoples. Addressing the culture, institutions and knowledge-related activities of such a diverse yet ancient people is timely. Reconciling First Peoples with a modern polity to assist innovative development has been extraordinarily challenging. We believe the QH has significant benefits for explaining similarities and differences related to innovation and development in pursuit of a complex harmonization of two historically contrasting societies and that incorporating an Indigenous layer to QH makes an important contribution.

The concept of a Triple Helix (TH) is a western or conventional management construct established to interpret and understand the complex institutional dynamics between the helices of university, industry and government. The Quadruple Helix (QH) is a debated extension which incorporates a fourth helix of community by introducing 'values of democracy' within the innovation process albeit being absent in the inherent nature of the TH model (Kolehmainen, Irvine, Stewart, Karacsonyi, Szabo & Alarinta, 2016). We argue here that the QH, with its strong community embedded construct, is appropriate for better reflecting this indigenous style of society. Both TH and QH are seen as important frameworks for advancing our understanding of how to stimulate innovation and economic development through organisational structures and entities. They are useful also for understanding how such helices and their interactivity change through space and time. Central are the respective actors and respective agents that participate in how knowledge is nurtured, developed and exchanged. As potential collaborative forces, the helices are capable of fostering innovation, economic prosperity and catalyzing regional development (Etzkowitz, 2003; Carayannis & Campbell, 2009).

Nevertheless, Lee & Eversole (2017) posits that the mechanisms of the quadruple helix in fostering interactions within the Indigenous regional communities like Australia's First Peoples is much less understood as they illustrate, many conventions require a 'different world view' (Lee & Eversole, 2017) or a gestalt shift to make sense of such varying cultures. Understanding the people-machinations in a QH and the actors, agents, activities and place, makes such comparisons ever more challenging. This paper draws also importantly upon Kriz, Molloy and Bankins (2018) and its regional innovation management (RIM) approach to understanding QH factors. RIM (Kriz et al. 2018, p. 27) offers "a purposeful approach to systematically analyzing, developing, organizing and implementing processes and practices to improve regional outcomes".

The additional deeper structural components in the QH framework include probing regional readiness, trust, power, time, and sphere changing centrality. These latter concepts appear much more commensurable of a cross-culture analysis where two societies seek to co-exist.

DESIGN / METHODOLOGY / APPROACH

This study has three stages. The first stage, which is reported in this paper, incorporates a detailed literature review and analysis to review the TH from the Indigenous as well as conventional Australian lens in order to validate the suitability of a QH approach for Indigenous innovation. A review of the extant literature seeks to accumulate new knowledge developed from associated theories, interrelationships, and gaps in this domain. This conceptual development will form the foundations for qualitative research to allow the researchers to then more appropriately 'examine the dynamic, context dependent and interactive phenomenon' (Welch et al., 2002 pg. 402) associated with such a societal and place-based innovation and development challenge.

Stage 2 will include elite interviews to review the complexities of Australian Native Title and regionally located Prescribed Body Corporates (PBCs). The creation of the PBCs in Australia has been undertaken to localize economic development and innovation through more Indigenous Australian localized control. The aim will be to

examine potential issues, strengths and weaknesses in relation to PBC QH adoption.

Defining an indigenous-relevant QH that encompasses a First Peoples' world view, and accounts for deeper regionalism, culture and knowledge is appropriate (Lee & Eversole, 2017). Applying a 'foundation expectation of enquiry' (Fergusson, Shallies & Meijer, 2019, pg. 172) will allow for a redefining of each QH sphere of government, industry, university and community viewed through an Indigenous lens. This forms the foundation of the third stage of this project which is to then more deeply examine a number of PBCs using the adjusted QH framing. Our aim will be to investigate differences in how such PBCs are performing, using such an adapted QH, in order to start identifying any anomalies, gaps and opportunities for present and future advancement.

FINDINGS OR EXPECTED OUTCOMES

Research findings to date suggest that QH is already reflected and is immanent in the knowledge of the indigenous elders of the community. In industrialized societies the QH is manifest because knowledge domains have become separate worlds in themselves; QH posits the need to re-integrate them for the purpose of serving our societies effectively. Indigenous Knowledge is less specialized into 'subject areas' as opposed to industrialized societies with separate knowledge domains such as 'art', 'literature', 'history', 'law', 'science', 'commerce', 'medicine', 'governance' etc. It is expected that the communal knowledge of these elders in an indigenous community encapsulates all these subject areas. Applying an Indigenous knowledge perspective extends the QH framework, making it more suitable for the investigation of Indigenous development.

ORIGINALITY / VALUE

Within indigenous communities, knowledge has not branched into separate domains, but exists integral to the society and the ecosystem within which the society functions. The elders are law-makers (=government), owners and users of economic resources (=business), and teachers (=university), all in the one person. So, the helix convention is inherent in the way the elders preserve, disseminate, and pass on that integral, communal, social, ecosystem knowledge. However, it's fragile and dependent upon the community group holding together suggesting that this knowledge can be dissipated and lost if the community fragments, thus context is highly relevant to knowledge so the community's integrity and whole culture is extremely vulnerable. Therefore, given context is highly relevant to knowledge, a contemporary IQH seeks to contribute to help individuals and communities to integrate the two knowledge worlds - the 'traditional' and the 'contemporary' to improve the quality of cross-culture co-existence.

PRACTICAL / SOCIAL IMPLICATIONS

The practical implication of this study is that it reminds policy makers of the need to position Indigenous knowledges at the center of helix development when driving regional innovation. The social implication is that this promotes informed decision making with greater in-depth knowledge and understanding of the complexity of Indigenous regional communities and reminds policy makers of the necessity of applying a culturally appropriate lens towards localized solutions that generate social and economic outcomes.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This research contributes to a rethinking of the QH and its application in regional innovation domains within indigenous communities. Creating an indigenous place-based Quadruple Helix (IQH) posits a fairer application when trying to understand what is transpiring within a region that fosters innovation and regional economic prosperity. Thus, an IQH has generalizable application universally as an exploratory mechanism for indigenous place-based regional innovation.

KEYWORDS (3-5)

Triple Helix, Quadruple Helix, Indigenous, Regional Innovation, Economic Development.

REFERENCES

- Carayannis, E. G., & Campbell, D. F. J. (2009). 'Mode 3' and 'quadruple helix': Toward a 21st century fractal innovation ecosystem: *Journal international de la gestion technologique. International Journal of Technology Management*, 46(3), 201. doi:<http://dx.doi.org/10.1504/IJTM.2009.023374>
- Etzkowitz, H. (2003). Innovation in Innovation: The Triple Helix of University-Industry-Government Relations. *Social Science Information*, 42(3), 293-337. doi:[10.1177/05390184030423002](https://doi.org/10.1177/05390184030423002)
- Fergusson, L., Shallies, B., & Meijer, G. (2019). The scientific nature of work-based learning and research: An introduction to first principles. *Higher Education, Skills and Work-integrated Learning*, 10(1), 171-186. <https://doi.org/10.1108/HESWBL-05-2019-0060>
- Kolehmainen, J., Irvine, J., Stewart, L., Karacsonyi, Z., Szabo, T., & Alarinta, J. (2016). Quadruple helix, innovation and the knowledge-based development: Lessons from remote, rural and less-favoured regions. *Journal of the Knowledge Economy*, 7(1), 23-42. doi:<https://doi.org/10.1007/s13132-015-0289-9>
- Kriz, A., Bankins, S., & Molloy, C. (2018). Readyng a region: Temporally exploring the development of an australian regional quadruple helix. *R & D Management*, 48(1), 25-43. doi:<https://doi.org/10.1111/radm.12294>
- Lee, E., & Eversole, R. (2019). Rethinking the regions: Indigenous peoples and regional development.
- Welch, C., Marschan-Piekkari, R., Penttinen, H., & Tahvanainen, M. (2002). Corporate elites as informants in qualitative international business research. *International Business Review*, 11(5), 611-628. doi:[http://dx.doi.org/10.1016/S0969-5931\(02\)00039-2](http://dx.doi.org/10.1016/S0969-5931(02)00039-2)

11.5 Determining the boosters for innovation in LAC: an econometric analysis

Karen E F Pinto¹, Yohanna Juk¹, Vanessa L Avanci¹

¹InSySPO/Unicamp, Brazil.

PURPOSE

This research aims to investigate which innovation-related variables, i.e., institutions, human capital & research, infrastructure, market sophistication, business sophistication, knowledge and technology outputs, and creative outputs, are the most relevant to allocate countries according to their innovation index, focusing on Latin America and the Caribbean (LAC). Despite the growing attention to the most relevant factors to the development of innovation in emerging markets (see Arikan, Arikan, & Shenkar, 2021; Kim, 2017; Kim, Moon, & Kagawa, 2019; Kumar & Shetty, 2018; Marano, Tashman, & Kostova, 2017), less attention has been paid to Latin America and the Caribbean. This is precisely the theoretical gap this study is trying to fill. Our study may also serve as a basis for policymakers to guide actions toward the most relevant factors for innovation development at the country and regional levels.

DESIGN / METHODOLOGY / APPROACH

In order to achieve such a research objective, we will conduct a linear discriminant analysis and Pearson correlation analysis. We surveyed one hundred twenty-nine countries utilizing secondary data provided by the Global Innovation Index (GII, 2021), the Social Progress Index (2020), and the Environmental Performance Index (EPI, 2020). We adopted a quantitative research approach in which quantifiable results are necessary to achieve the research aim. These countries will be treated in the discriminant analysis as non-metric variables (dependent variable) composed of six groups, according to the regional grouping suggested by the GII and considering their innovation scores. We will use the Statistical Package for the Social Sciences (SPSS, version 26) for data tabulation and statistical analysis.

FINDINGS OR EXPECTED OUTCOMES

This paper provides a few implications of institutional and academic nature. LAC presents an inferior performance in the most relevant indicators to predict innovation variance. In this case, creative outputs and human capital have low scores in this region, which could partially explain the overall innovation score in the group. When analyzing the LAC countries individually, the ones with better innovation scores were Chile (35.1), Mexico and Costa Rica (34.5), Brazil (34.2), and Uruguay (32.2). The discriminant analysis indicates that the environmental and social variables are essential for allocating the countries according to their pre-established group. Countries with good environmental and social performance, solid institutions, and relevant knowledge outputs are those with the most robust innovation scores. In the same way, countries with average performance in these fields also tend to present average innovation scores.

ORIGINALITY / VALUE

This paper brings a few important implications to the theory on innovation from a country-level perspective for approaching LAC with more emphasis, thus filling a gap in the literature, which has been so far more focused on a western mindset and lacks in-depth discussions on this specific region (Viglioni, Brito, & Calegario, 2020). As this study portrays the current situation regarding innovation in LAC, it may serve as a basis to guide public policies towards the areas that affect innovation the most in these countries, such as the number of patents registered, trademark registration, primary and tertiary education, and R&D investments.

PRACTICAL / SOCIAL IMPLICATIONS

Despite not being responsible for predicting innovation in a country, social and environmental indicators are relevant to allocate countries according to their innovation development. For example, more socially and environmentally responsible countries tend to have the highest innovation scores; countries with fewer social and environmental initiatives are also allocated to the group with the lowest innovation scores.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This article presents some limitations. The first refers to one of the

assumptions of the discriminant analysis, that is, to the equivalence of covariance matrices. The significance of the matrices was lower than 0.05, meaning that the groups are not equally distributed. The different group sizes strongly influence this result, and the sample used is represented by six groups with notable differences in their sizes. The second limitation refers to the number of observations utilized herein. The limited number of countries surveyed by the three indexes used in this research prevented the analysis of other variables simultaneously. We suggest future studies to develop qualitative research focused on LAC in which each country could be analyzed individually, thus considering the central issues brought up by the present article, namely institutional environment, knowledge outputs, and environmental and social initiatives.

KEYWORDS (3-5)

Innovation, emerging markets, social variables, and environmental variables.

REFERENCES

- Arikan, I., Arikan, A. M., & Shenkar, O. (2021). Revisiting emerging market multinational enterprise views: The Goldilocks story restated. *Journal of International Business Studies*, 1-22.
- Global Innovation Index. (2021). Dutta, S., Lanvin, B., León, L. R., & Wunsch-Vincent, S. (Eds.). (2021). *Global innovation index 2021: tracking innovation through the covid-19 crisis*. WIPO. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021.pdf
- Environmental Performance Index. (2020). *Environmental Performance Index 2020 Global metrics for the environment: Ranking country performance on sustainability issues*. <https://epi.yale.edu/downloads/epi2020report20210112.pdf>
- Kim, H. (2017). The spatial impact of cultural distances on home bias across Asian emerging markets. *Atlantic Economic Journal*, 45(1), 81-101.
- Kim, E., Moon, S. W., & Kagawa, S. (2019). Spatial economic linkages of economic growth and air pollution: developing an air pollution-multinational CGE model of China, Japan, and Korea. *The Annals of Regional Science*, 63(2), 255-268.
- Kumar, S., & Shetty, S. (2018). Does environmental performance improve market valuation of the firm: evidence from Indian market. *Environmental Economics and Policy Studies*, 20(2), 241-260.
- Marano, V., Tashman, P., & Kostova, T. (2017). Escaping the iron cage: Liabilities of origin and CSR reporting of emerging market multinational enterprises. *Journal of International Business Studies*, 48(3), 386-408.
- Social Progress Index. (2020). Imperative, S. P. (2020). *Social progress index 2020*. <https://legacy.socialprogress.org/assets/downloads/2011-2020-Social-Progress-Index.xlsx>
- Viglioni, M. T. D., Brito, M. J., & Calegario, C. L. L. (2020). Innovation and R&D in Latin America and the Caribbean countries: a systematic literature review. *Scientometrics*, 125, 2131-2167.

11.6 Politicians and money go hand by hand: Local officials and interregional high tech investment flows

Yang Chun¹, HUA Lei², GU Hao³

¹Institute of Science of Science and S&T Management/WISE Lab, Dalian University of Technology, China, ²School of Humanities and Social Sciences, University of Science and Technology of China, China, ³School of Public Administration, Hunan University, Changsha, China.

An increasing attention has been attracted to explore the innovation motivating effects of politicians in emerging markets like China. In the context of China's development, local officials have become a unique lens to understand how local economies commit to high-quality development. Given studies indicate that local officials can devote to boost regional innovation due to the pressures arising from political promotion and government performance assessment. However, understandings are limited on how the local officials attract micro-level high-tech corporate investment outside the region boundary that leads to the macro-level effects of regional innovation. Thus, this paper explores the relationship between local officials and high-tech investment flows, helping establish a more complete picture of understanding regional innovation in China. Local official rotation in China provides an ideal setting for this discussion. When an official start working in a new place, he/she is incentive to introduce investments of high-tech firms from his/her political connected region i.e., previous working city. Such inflowing high-tech investment largely exerts positive influence on developing local innovation. Building on such considerations, this paper collected empirical data including the mobility of local governors and the interregional investment of 70000 high-tech firms at prefectural level from 2008 to 2021. After describing the local official mobility network and the interregional high-tech investment network, we explored the influence of local official mobility on the interregional high-tech investment and examined under what conditions this effect strengthens/weakens. Using MRQAP model, our findings indicate that local official (i.e., major at prefectural level) mobility have positive influence on the interregional high-tech investments. That is, the investment from a major's previous working place is more accessible than those from non-political connected regions. Moreover, the high-tech investment inflowing effect of local official mobility is expected to be increasing when the innovation gap between the current and former serving places is becoming larger. Lastly, the high-tech investment inflowing effect of local official mobility will be declining as the spatial distance between current and former serving places is increasing. These findings enrich our understandings on the innovation motivating effects of politician rotation, help establish theoretical links between the micro-level high-tech firm investment and macro-level regional innovation, and motivate further studies on the determinants of interregional high-tech funds flows and the inequality of regional innovation.

11.7 The synergy of Public and Private Entrepreneurship in the formation of an Emerging Industry—the case of BOE and LED industry in China

Yang Peipei, Xielin LIU

Emerging industries have played a pivotal role in China's rapid development. In recent years, numerous emerging industries have been formed in China. However, limited research has explored their formation mechanism. Through a single case study, we analyze the case of BOE in the LED industry and conclude that the synergy of public entrepreneurship and private entrepreneurship is essential in this process. The regional governments are the main entrepreneurs. Our research contributes to relevant studies by shedding lights on the formation process. The findings also provide policymakers and stakeholders a different mentality when forming strategies and regulations on emerging industries.

12

ENTREPRENEURSHIP EDUCATION IN THE CONTEXT OF TH
APPROACHES

12.1 How to teach soft skills at university. A critical incident analysis of entrepreneurship teachers' reflections in five European countries

Angelo Riviezzo¹, Filomena Pagnozzi¹, Gilda Antonelli¹

¹University of Sannio, Italy.

PURPOSE

The present study aims at evaluating the effectiveness of a new teaching method developed for teaching soft skills at University level, by focusing on the teachers' assessment of their own experience during the classes. Many studies show that soft skills, also defined as life skills or entrepreneurship competence, can be taught, developed and improved. In this vein, the importance of entrepreneurship education clearly emerged. However, still a few studies have been precisely dedicated to assessing the impact of entrepreneurship education and the improvement of its study design to the development of students' entrepreneurship competence.

DESIGN / METHODOLOGY / APPROACH

The study proposes the Critical Incident Technique (CIT) as an empirical tool for the assessment of the teachers' perceptions and perspectives. In particular, the study involved 15 teachers who introduced at the same time, during two semesters in 2022, the new teaching method in 39 courses offered in 5 European Universities. The teachers were asked to describe in detail specific incidents encountered during their teaching experience, without any cognitive filter represented by pre-established items, categories, and elements of assessment. Then, the incidents have been sorted into categories based on similarities in the content and classified as relating to positive and negative outcomes.

FINDINGS OR EXPECTED OUTCOMES

Using the CIT method, teachers' reflections have been analyzed in depth and meaningful conclusions have been drawn about the experimental method and teaching materials developed for teaching soft skills. The analysis of the teachers' feedback highlights the critical and successful elements of the proposed teaching method and thus provides suggestions for improvement.

ORIGINALITY / VALUE

The particularity of the study is that it focuses on teachers' perceptions and perspectives to analyze the effectiveness of the soft skills teaching method proposed to students. Furthermore, the study involved 15 teachers in 5 universities of 5 different European countries (Estonia, Finland, Italy, Poland, and Portugal). The experimentation of the new teaching method and the assessment of the teachers' reflections involved on the whole 39 entrepreneurship courses.

PRACTICAL / SOCIAL IMPLICATIONS

The study showed precise factors that should be taken into proper account when designing new educational programs for teaching soft skills to students. Indeed, from the empirical investigation of the reflections of 15 teachers involved in the experimentation of the didactic guidelines, some fundamental observations emerged, relating to: teaching methodology, teaching environment and cultural background.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The proposed study involved relatively few courses (39) and teachers (15) considering that the analysis was carried out in five different Universities. Moreover, it is limited to entrepreneurship education courses. Future developments of the study will consider non-entrepreneurship education courses, will involve more teachers and a higher number of courses.

KEYWORDS (3-5)

Soft skills, Entrepreneurship competencies, Teaching methods, Entrepreneurship education, Critical Incident Technique.

REFERENCES

Bacigalupo, M., Kampylis, P., Punie, Y., and G. Van den Brande, (2016), "EntreComp: The entrepreneurship competence framework". Luxembourg: Publication Office of the European Union, 10, 593884.
 Berglund, K., Hytti, U., and K. Verduijn, (2020), "Unsettling Entrepreneurship Education". *Entrepreneurship Education and Pedagogy*, 3(3): 208-213. doi: 10.1177/2515127420921480

Butterfield L.D., Borgen W.A., Amundsen N.E. and A.S.T. Maglio, (2005), "Fifty years of the critical incident technique: 1992-2004 and beyond". *Qualitative Research*, 5(4): 475-497
 Chell, E. and L. Pittaway, (1998), "A study of entrepreneurship in the restaurant and café industry: exploratory work using the critical incident technique as a methodology". *Hospitality Management*, 17: 23-32.
 Clamp C., (1980), "Learning through incidents". *Nursing Times*, 76(40)
 Clark B.R., (2004), "Sustaining Change in Universities, Society for Research into Higher Education". Open University Press, London
 Farrel T., (2008), "Critical incident in ELT initial teacher training". *ELT Journal*, 62 (1): 221-229
 Fayolle A. [Ed.], (2007), "Handbook of Research in Entrepreneurship Education", 1, Cheltenham, Edward Elgar
 Hytti, U., and C. O'Gorman, (2004), "What Is "Enterprise Educations"? An Analysis of the Objectives and Methods of Enterprise Education Programmes in Four European Countries". *Education and Training*, 46: 11-23. <http://dx.doi.org/10.1108/00400910410518188>
 Jones C. and J. English, (2004), "A contemporary approach to entrepreneurship education", *Education + Training*, 46(8/9)
 Karimi, S., Biemans, H. J. A., Lans, T., Aazami, M., and M. Mulder, (2014), "Fostering students competence in identifying business opportunities in entrepreneurship education". *Innovations in Education and Teaching International*, 53(2): 215-229
 Kyndt, E., and H. Baert, (2015), "Entrepreneurial competencies: Assessment and predictive value for entrepreneurship". *Journal of Vocational Behavior*, 90: 13-25
 Nealy, C., (2005), "Integrating soft skills through active learning in the management classroom". *Journal of College Teaching & Learning (TLC)*, 2(4)
 Parker D.L., Webb J. and B. D'Souza, (1995), "The value of critical incident analysis as an educational tool and its relationship to experiential learning". *Nurse Education Today*, 15: 111-116
 Riviezzo, A., Testa M., Marino V. and M.R. Napolitano, (2012), "Assessing the Effectiveness of Entrepreneurial Training Programmes: Findings from a Critical Incident Analysis". *International Journal of Operations and quantitative management*, 18 (3): 229-244.
 Venesaar, U., Täks, M., Arro, G., Malleus, E., Loogma, K., Mädamürk, K., Titov, E. and M. Toding, (2018), "Entrepreneurship competence as a basis for the development of entrepreneurship education". *Estonian Journal of education*, 6(2), 118-155 (in Estonian)
 Venesaar, U., Malleus, E., Arro, G., and M. Toding, (2022), "Entrepreneurship competence model for supporting learners development at all educational levels". *Administrative Sciences*, 12(1)
 Viviers, H. A., Fouché, J. P., & G.M. Reitsma, (2016), "Developing soft skills (also known as pervasive skills): Usefulness of an educational game". *Meditari Accountancy Research*, 24(3): 368-389
 Woods P., (1993), "Critical events in education". *British Journal of Sociology of Education*, 14 (4): 355-371

12.2 Academic accelerator program, the value of quality education through university-industry – government support. Case study based on accelerator program for AI start-ups in Brussels

Aleksandra Zaniewska¹

¹The Vrije Universiteit, Belgium.

PURPOSE

The importance of artificial intelligence in society is growing all the time, with rapid changes taking place right in front of our eyes (Raso, et al., 2018). As a result, businesses, public institutions, and governments are looking for new ways to implement AI technologies. Currently, there is a lack of specified guides, workshops, and working frameworks to support the development and design process for newly established businesses or for them to transform their operations to align with goals of Industry 5.0 and UN Sustainable Development Goals (Di Vaio, et al., 2020; Vinuesa, et al, 2020). While exploring an AI-driven enterprise's business model, Weber, et al. (2022), highlight the importance of including governmental and research institutions, their roles, and their impact on business creation and transformation. Furthermore, researchers point out that academic entrepreneurship creates a strong link between the academic world which is knowledge-oriented and the commercial world which is financially driven while focusing on innovation (Barth, 2013). During the process of launching a new business idea, it is vital to engage in knowledge and skills transfer, relationships with external actors and a strong presence in an entrepreneurial ecosystem, all of which are critical for providing start-ups with access to diverse pools of knowledge and exposing them to new business opportunities (Turkina, 2018). The relationships and partnerships do not need to be successful for the new businesses to gain value from the encounter (Hasche & Linton, 2018) The purpose of this study is to explore the impact of the university led accelerator program on the AI start-up ecosystem based on the first cohort of AI start-up founders participating in the accelerator program in the City of Brussels.

DESIGN / METHODOLOGY / APPROACH

This study is based on a practice-based longitudinal qualitative research approach, fueled by in-depth interviews. The interview participants are the AI start-up's founders from Brussels (from 6-10 AI start-ups), recruited for the first cohort of the accelerator program. The data is collected using in-depth interviews and observations during workshop sessions and other interactions with the AI start-ups.

FINDINGS OR EXPECTED OUTCOMES

The study will provide information regarding current knowledge gaps and training needs for business entrepreneurs who use or want to use Artificial Intelligence in their operations and or business model and the importance of cooperation between university-industry in the successful knowledge transfer to support an AI-driven regional economy.

ORIGINALITY / VALUE

Provides the knowledge on how the university-industry partnerships through an accelerator program and learning program can foster the development of AI-based start-ups in response to a regionally evolving start-up ecosystem.

PRACTICAL / SOCIAL IMPLICATIONS

The findings of the study and data collected during the accelerator program, will contribute to a better understanding of AI start-ups needs and their founders for the university-government-industry support and knowledge transfer.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The limitation of this practical case is the sample size, which will be broadened in the future taking into account additional cohorts of the accelerator program increasing the representation of the general population of AI start-ups to develop specific guidelines and quality knowledge sharing practices, mitigating inherent limitations of a smaller group.

KEYWORDS (3-5)

Artificial Intelligence, AI Start-Ups ecosystem, Entrepreneurship, Knowledge Transfer.

REFERENCES

1. Barth, T. D., & Schlegelmilch, W., (2013). Academic entrepreneur, academic entrepreneurship. In Carayannis E.G. (Ed.), *Encyclopedia of creativity, invention, innovation, and entrepreneurship* (pp. 1–8). New York, NY: Springer.
2. Di Vaio, A., Palladino, R., Hassan, R., & Escobar, O., (2020). Artificial intelligence and business models in the sustainable development goals perspective: A systematic literature review. *Journal of Business Research*.
3. Hasche, N., & Linton, G., (2018). The value of failed relationships for the development of a Medtech start-up, *Journal of Small Business & Entrepreneurship*.
4. Raso, F. A., Hilligoss, H., Krishnamurthy, V., Bavitz, C., & Kim, L., (2018). *Artificial intelligence & human rights: Opportunities & risks*. Berkman Klein Center Research Publication.
5. Turkina, E., (2018). The importance of networking to entrepreneurship: Montreal's artificial intelligence cluster and its born-global firm Element AI, *Journal of Small Business & Entrepreneurship*.
6. Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., & Fuso Nerini, F., (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature communications*.
7. Weber, M., Beutter, M., Weking, J., Böhm, M. & Krcmar, H., (2022). *AI Startup Business Models*. *Business & Information Systems Engineering*.

13

OPEN INNOVATION FOR THE ECONOMIC, SOCIAL &
ENVIRONMENTAL DEVELOPMENT

13.1 From Startup Nation to Open Innovation Nation: The Evolution of an Open Innovation Ecosystem in Israel

Gil Avnimelech¹

¹Ono Academic College, Israel.

DESIGN / METHODOLOGY / APPROACH

Conceptual paper based on wide data (we analyzed 3,258 innovation activities in MNCs and startups operating in Israel from our secondary sources, 7,986 innovation related positions of employees from LinkedIn, and conducted 70 structured interviews).

FINDINGS OR EXPECTED OUTCOMES

We identified three primary evolutionary phases in the development of open innovation activities in Israel.

ORIGINALITY / VALUE

We present a wide range of open innovation mechanisms and a model of open innovation activity development in a region cluster. In addition, we present the important connection between open innovation literature and entrepreneurial ecosystem and regional cluster literature.

PRACTICAL / SOCIAL IMPLICATIONS

Better understanding the phase of open innovation activities in a cluster/ ecosystem and the history of it, can assist firm in the cluster developing their open innovation strategy. Moreover, other regions which are in earlier stages of development can learn from this path of development.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

First, we are currently extending our data toward 200 fully structured interviews and based on the data from these interviews we will present more empirical findings. Second, attempt to get deeper understanding of the evolutionary process of development, focusing on trigger to transition between different stages of development. This will enable us to supply better policy implications.

Third, in the future we would like to cooperate with other global research teams and conduct a composition between the patterns of development of open innovation in different countries/regions.

KEYWORDS (3-5)

Open Innovation; Entrepreneurial ecosystems; Evolutionary economics.

REFERENCES

- Avnimelech, G., & Teubal, M. (2006). Creating venture capital industries that co-evolve with high tech: Insights from an extended industry life cycle perspective of the Israeli experience. *Research Policy*, 35(10), 1477-1498.
- Bogers, M., Chesbrough, H., & Moedas, C. (2018). Open innovation: Research, practices, and policies. *California management review*, 60(2), 5-16.
- Chesbrough, H. W. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press, Boston, MA.
- Gort, M., & Klepper, S. (1982). Time paths in the diffusion of product innovations. *The economic journal*, 92(367), 630-653.
- Nelson, R. and S. Winter (1982). *An Evolutionary Theory of Economic Change*. Belknap, Cambridge, MA.
- Randhawa, K., Wilden, R., & Hohberger, J. (2016). A bibliometric review of open innovation: Setting a research agenda. *Journal of Product Innovation Management*, 33(6), 750-772.
- Stam, E., & Van de Ven, A. (2021). Entrepreneurial ecosystem elements. *Small Business Economics*, 56(2), 809-832.

13.2 Markets and Competencies of multiplex biosensors for a sustainable transformation: An exploratory bibliometric analysis

Bernardo Valente¹, Hugo Pinto¹, Tiago Santos Pereira¹, Rita Campos¹

¹Centre for Social Studies of the University of Coimbra, Portugal.

PURPOSE

This research intends to debate the underlying trends characterizing innovation dynamics in emerging biosensors technology. This is developed within the BioAssembler Horizon project, which includes an activity of mapping the significant interdisciplinary dimensions within the biosensors field and tracing the global distribution of technological development hubs.

DESIGN / METHODOLOGY / APPROACH

The research develops a bibliometric analysis of related journal articles, from the Web of Science, and of patent applications based on keywords selected together with biosensor technology developers. The study of this set of documents allows the identification of the scientific and technological knowledge base and its interdisciplinary dimension, through the analysis of journals' citation profile. In addition, the analysis of the institutional origin of the publications characterizes the global distribution of related knowledge competencies and in the different types of quadruple helix actors.

FINDINGS OR EXPECTED OUTCOMES

This research has three main objectives: 1) to provide a mapping of the microelectromechanical sensors (MEMS) technology scientific knowledge base, 2) to characterize the global distribution of technology and innovation in the field and 3) to identify the potential societal impacts of this technology.

ORIGINALITY / VALUE

The production of multiplex biosensors through a MEMS system technology on the surface of silicon wafers, as the one that the BioAssembler project expects to build, may bring a new paradigm to the industry, once it measures several analytes simultaneously, with the promise that it will facilitate accessibility to address clinical and personalized needs. This approach fits with a green chemistry philosophy that aims to simplify chemical production processes that minimize by-products and promote the maximization of sustainable resources (Li & Trost, 2008).

The originality of this communication is grounded on characterizing the knowledge base of a bio-intelligent process in the manufacturing of biosensors and the corresponding potential contribution of the European Union to the sensor manufacturing market, which Asian and North American firms have typically dominated. This will allow an understanding of how the innovation on multiplex biosensing can revitalize the electrochemical economy and markets inside the European Union. Therefore, the original interdisciplinary methodologies used in a dialogic perspective between the engineering and technologies and the social sciences and humanities (SSH) can be prolific in tracking the challenges to the socio-economic structures emerging by launching top-notch global technology.

PRACTICAL / SOCIAL IMPLICATIONS

The interdisciplinary nature of the BioAssembler project will also be further developed through a specific analysis of prior research in the SSH, which addresses biosensor technology, its societal impacts and risks, and how it relates to the broader mapping of the scientific developments in this technology. Aiming for a sustainable transformation of manufacturing systems in Europe, the underlying research project, BioAssembler, engages academic, industrial and societal stakeholders to contribute to developing future paths for this intelligent biosensing technology in the innovation landscape in the EU.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

There is a growing importance of MEMS in developing technological solutions for the health, chemical and food industries, as well as many others that introducing more sustainable biosensors can impact (Tetyana et al., 2021). It would be stimulating for future research to understand how biosensors can potentially spread their influence towards professional healthcare (Mohankumar et al., 2021), food

and agriculture (Curulli, 2021), law enforcement (Nikoleli et al., 2016) or environmental monitoring (Gavrilas et al., 2022). The development of multiplex sensing manufactured through silicon-based label-free biosensors may stimulate the potential applications of this technology, broaden the user spectrum and see growth in the field's scientific state of the art.

The SSH research on the economic and societal impacts and risks of biosensor technologies, to be developed in this project, will constitute an original contribution, providing a guide for future research on the dynamics of biosensors technologies worldwide.

KEYWORDS (3-5)

Biosensors; Innovation; Sustainability; Market Analysis; Bibliometric study.

REFERENCES

- Curulli, A. (2021). Electrochemical biosensors in food safety: challenges and perspectives. *Molecules*, 26(10), 2940
- Gavrilas, S., Ursachi, C. Ş., Perța-Crișan, S., & Munteanu, F. D. (2022). Recent trends in biosensors for environmental quality monitoring. *Sensors*, 22(4), 1513.
- Li, C. J., & Trost, B. M. (2008). Green chemistry for chemical synthesis. *Proceedings of the National Academy of Sciences*, 105(36), 13197-13202.
- Mohankumar, P., Ajayan, J., Mohanraj, T., & Yasodharan, R. (2021). Recent developments in biosensors for healthcare and biomedical applications: A review. *Measurement*, 167, 108293.
- Nikolelis, D. P., & Nikoleli, G. P. (Eds.). (2016). *Biosensors for security and bioterrorism applications* (pp. 413-430). Cham, Switzerland: Springer International Publishing.
- Tetyana, P., Shumbula, P. M., & Njengele-Tetyana, Z. (2021). *Biosensors: design, development and applications*. In *Nanopores*. IntechOpen.

13.3 Open innovation and technological impact: Linking R&D collaboration to patent quality in the aerospace industry

Ma. Dolores León¹

¹University of Cadiz, Spain.

PURPOSE

Recent literature stresses the benefits of acquiring external knowledge and moving away from intramural research and development to open innovation (De Beule and Van Beveren 2019). However, empirical quantitative contributions rarely address the fact that for innovative firms not all sources are of equal value. Thus, the nature of external knowledge sourcing presents a critical but partly explored and poorly understood aspect of open innovation (Brunswick and Vanhaverbeke 2015). The main objective of this work is to carry out an empirical analysis to analyze the role of collaboration between patent assignees on patent quality in the aerospace industry in the framework of open innovation. Specifically, our analysis will attempt to answer the following questions:

Do aerospace companies that collaborate in research with other institutions produce higher quality than those that do not collaborate? Do all research collaborations have the same effect on patent quality or are there significant differences depending on the type of institution with which they collaborate?

DESIGN / METHODOLOGY / APPROACH

Method

The methodology used in our research relies on econometric models. Our dependent variable is the quality of patents, which refers to the impact of the knowledge embodied in patents in terms of stimulating new contributions (for a discussion, see Barberá-Tomás et al. 2011). To measure patent quality, we use the number of forward citations in a five-year window. The main independent variables consider different forms of R&D collaboration between firms, between firms and universities, and between firms, universities and government. To measure R&D collaboration, we will use the institutions that applied for joint patents (joint patents, or co-patents, can be defined as patents which ownership is shared by more than one organization). Our model controls for the characteristics of the patents such as the number of claims, the number of backward citations, the size of the patent family, etc. We also consider other explanatory variables such as the patenting experience of the firm, the fact that one of the collaborators is in a tax haven, along with sector (IPC classes within the aerospace technologies) and year dummies. Given the count nature of the dependent variable, we use negative binomial models and zero-inflated models as robustness.

Data

We rely on an original sample with detailed information on 76.803 aerospace patent families between the years 1991-2014, that were applied for by the top-100 leading companies in the industry. Note that, our unit of measurement is the patent family. One of the main advantages of using patent families is the avoidance of duplications in the information contained in patents that cover the same invention in different countries. PATSTAT and the SIPRI are the main sources of information.

FINDINGS OR EXPECTED OUTCOMES

Our preliminary results show that patents in collaboration have greater quality than patents that were applied for by a single firm. The coefficient of the variable collaboration with other firms/institutions is positive and statistically significant. The incidence ratio shows that, on average, patents in collaboration with other firms or institutions have 19.2% more forward citations than those that were applied for single firms. When we consider different types of collaboration, our results suggest that the greater impacts correspond to different forms of collaboration in which universities are involved (collaboration between firm-university and firm-government-university). However, no significant effect was found when the collaboration is between just firm and government.

We will include in the full paper other models in progress in which analyzed whether the effect of cross-country R&D collaboration on patent quality differs according to the type of institution with which the company collaborates.

ORIGINALITY / VALUE

The idea that firms can benefit from knowledge flows from external sources has been prominent in the literature and in the studies on open innovation (Chesbrough, 2003; De Beule and Van Beveren 2019). However, there is not much research about how different types of R&D collaboration in patents can affect their technological impact. This paper explores this novel issue by examining the aerospace sector.

PRACTICAL / SOCIAL IMPLICATIONS

The analysis of the generation of knowledge in aerospace technologies is relevant because it is a high-tech industry with high added value, and one of the most relevant industries for job creation. In addition, this industry provides a very relevant source of technological knowledge that generates spillovers for the development of other economic sectors and, in general, for economic growth (e.g. Chen & Chang, 2010). Thus, the results of our research can have implications from several perspectives. From the managerial perspective, knowing what kind of collaboration produces greater impact can provide firms with some clues about the choice of their R&D partners. In particular, our preliminary results suggest that a movement to a more proactive way of openness with the university participation would strengthen the technological impact, with benefits for the whole aerospace industry. From the social perspective, the identification of how collaboration affects patent quality can also benefit the whole patent system in accomplishing one of its main objectives, which is to confer a net benefit on society by encouraging follow-on inventions.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Our analysis can be extended by exploring the international/institutional collaboration on patents according to the level of development at the level of countries, or even regions, given the increasing importance of regions in terms of capacity to put innovation policies into practice, particularly in Europe. Furthermore, we have considered the aerospace industry. To check whether our results hold in a more general context, similar analyses could be carried out in other R&D-intensive sectors. Finally, a few caveats must be borne in mind when interpreting our results. First, the analysis of flows of knowledge in patents shows only a partial perspective of the open innovation. Second, we use forward citations as indicator of impact/quality of a patent. More refined indicators can be obtained in the future.

KEYWORDS (3-5)

Patent quality, R&D, collaboration, aerospace industry, negative binomial models.

REFERENCES

- Brunswick, S., & Vanhaverbeke, W. (2015). Open innovation in small and medium-sized enterprises (SMEs): External knowledge sourcing strategies and internal organizational facilitators. *Journal of Small Business Management*, 53(4), 1241–1263.
- Chesbrough H. 2003. *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business School Press: Boston, MA
- de Beule, F., & van Beveren, I. (2019). Sources of open innovation in foreign subsidiaries: An enriched typology. *International Business Review*, 28(1), 135-147.

13.4 Does public R&D funding facilitate regional industrial innovation performance? A case of Chinese pharmaceutical industry

Ruimin PEI¹, Tengyu ZHAO

¹Institutes of Science and Development, Chinese Academy of Science, China.

The government plays significant role in the National Innovation System (NIS) by allocating diversified resources, and public R&D funding is one of the important tools. This study focuses on the relationship of government R&D funding and the regional industrial innovation performance by analyzing the innovation performance of Chinese pharmaceutical industry. The study divides the pharmaceutical industry's innovation process into the lab R&D stage and the new product development (NPD) stage. A two-stage SBM-DEA model is applied to measure the Chinese pharmaceutical industry's innovation efficiency from 2009 to 2020. Whereafter, it investigates the impact of public R&D funding on pharmaceutical industry innovation performance. It is found that the public R&D funding have different effects on the two stages and the overall innovation performance. And the regional characteristics such as environmental regulation, trade openness and ageing degree have impacts on the relationship between public R&D funding and pharmaceutical industry's innovation performance.

13.5 Evolutionary Governance dynamics of powerful customer engagement in industrial innovation: evidence from China's IT infrastructure industry

Jiang YU, Feng CHEN¹, Yuanxin FANG

¹University of Chinese Academy of Sciences, China.

The focus of this paper is on the emerging customer engagement (CE) research in the business-to-business (B2B) settings. Unlike the prevalent and ritualistic CE with manufactures' invitation, in some cases, B2B customers especially those leading-edge ones with strong bargaining power and advanced technology accumulation, adopt more proactive and powerful CE strategies to optimize benefits including cutting costs and achieving highly-customized products. To better understanding the impact of this new open innovation pattern, an evolutionary perspective is adopt to examine the dynamic development and governance of B2B CE process. We employ the Evolutionary Governance Theory (EGT) lens and create a systematic analytical framework that includes three configuration levels (network, dependency, and governance) and seven meta configuration levels (actors, institutional change, power/knowledge, path dependence, path creation, governance objects, and governance models). This framework is applied to a longitudinal single case study of Scorpio Project of China's server industry. We outline three open innovation development phases with leading-edges customers' engagement: horizontal coordination, vertical integration, and ecosystem configuration. Additionally, the co-evolution mechanism of network, dependency, and governance configurations in the governance process of leading customer engagement is fully mapped. Furthermore, we suggest the need for further quantitative research to examine the extent to which deep demand-side participation affects the innovation performance of the demand side. Finally, we propose future research should explore B2B CE or industrial CE from other perspectives, such as alliance, network, and ecosystem, to gain a comprehensive understanding of the phenomenon.

In terms of theoretical contributions, our paper offers three potential contributions. Firstly, it adds to the growing body of research on open innovation in the B2B context, which has received less attention compared to the B2C context. Secondly, it emphasizes the importance of leading customers' deep and powerful involvement in B2B setting, complementing existing literature on the prevalent and ritualistic CE with manufactures' invitation. Lastly, we adopt a dynamic and evolutionary perspective to map the governance process of leading customer engagement in the industrial innovation context, supplementing the application of Evolutionary Governance Theory in the CE field and adding an analytical framework of CE governance.

In terms of practical contributions, our research offers insights for R&D development strategies and policy making, especially in emerging countries. Firstly, our study highlights the successful industrial practice of open innovation driven by leading customers in the Scorpio Project of China, providing a reference for other leading customers facing similar challenges. Secondly, we outline the evolutionary governance of leading customers in different phases, which can help potential customers analyze the evolution direction and formulate their strategies based on their position and the path of evolution. Lastly, we suggest that policy makers should impose limited intervention but necessary legitimacy regulation on the innovation process in bottom-up open innovation driven by leading customers.

13.6 Research on global open science governance framework

Yang WANG¹, Xin WEI, Lihua KONG

¹Computer Network Information Center of Chinese Academy of Sciences, China.

In the face of big scientific challenges, scientists around the world jointly promote scientific research through equality, openness and shared cooperation, and have created a more complete governance system to cope with global scientific and technological challenges. Open science, guided by the principles of "participation, inclusiveness, sharing, collaboration, openness, and transparency," has become an ideal environment advocated by the international scientific community. Against the backdrop of open science on an international level, the governance of technological innovation has become increasingly prominent, and open science governance has received increasing attention. China attaches great importance to the development of open science and is studying and proposing strategic goals for open science in China, as well as more open, inclusive, and mutually beneficial international scientific cooperation strategies, actively integrating into the global innovation network. Looking at the international process of open science, various countries still lack comprehensive and clear policies related to open science, and standards are inconsistent, resulting in an incomplete governance framework for promoting the global open science initiative. China is currently in the stage of exploring open science research, and existing open science policies are mostly built around various open factors, but there are still shortcomings in overall planning of open and inclusive national plans, supporting policies, practical activities, organizational promotion, monitoring and regulatory mechanisms. To better promote China's entry into the global open science community and further promote substantial progress in embracing open science in China, according to academician Yang Wei's "Five Needs" stages for promoting open innovation ecology, namely survival needs, safety needs, social needs, respect needs, and self-driven needs, a set of open science evaluation indicator system and governance framework are constructed from five dimensions: governance goals, governance subjects, governance tools, governance mechanisms, and governance actions. Governance tools include strategic planning, funding tools, evaluation and supervision, norms and regulations, etc.. Governance mechanisms include coordination mechanisms, decision-making consultation mechanisms, participation and dialogue mechanisms, monitoring and evaluation with dynamic adjustment mechanisms, and ethical review and regulatory mechanisms. Governance actions include national open science development strategic governance, scientific research system and scientific research activity governance, priority area governance, breakthrough technology and major challenge governance. This evaluation indicator system can not only serve as an evaluation indicator for China's embrace of open science but also as one of the evaluation indicators for the UNESCO on the open science process in various countries worldwide, providing some reference and guidance for promoting open science globally.

13.7 Digital Finance and Urban Innovation—Evidence from China's Municipal Level

Xiaofei WU¹, Qin Zhou

¹Southeast University, China.

With the help of information technology digital finance affects the development of urban innovation through new financial products. Based on the panel data of 289 cities in China from 2011 to 2018 this article explores the impact of digital finance on urban innovation capabilities and its mechanism. The results show that digital finance has significantly improved the innovation capabilities of cities. By further dimensionality reduction of digital finance it is shown that the coverage of digital finance is more conducive to enhancing the innovation capabilities of cities than the depth of use of digital finance. The mechanism analysis shows that digital finance promotes the development of urban innovation by promoting capital agglomeration and high-quality labor agglomeration. In addition there are obvious regional differences in the impact of digital finance on urban innovation. The research conclusions of this paper provide policy implications for the development of digital finance urban innovation development and inclusive development.

14

GENDER BALANCE AND REDUCTION OF INEQUALITIES

14.1 Academic career and gender inequalities in Brazil: the effect of postdoctoral mobility abroad

Ana Maria Carneiro¹, Ana Maria Nunes Gimenez¹, André Correia Bueno¹, Carolina Mendes B. Ferreira¹, Gabriela Araujo Tetzner¹, Julia Yuki Dias Suzuki¹, Larissa A. Prevato Lopes¹, Luiza M. Capanema Bezerra²

¹University of Campinas, Brazil, ²Agronomic Institute, Brazil.

PURPOSE

Empirical studies have pointed out that academic mobility can increase social capital, contribute to collaborations, and directly influence overall career success (Dueñas-Fernández, Iglesias-Fernández & Llorente-Heras, 2013). However, it is also known that both academic mobility and international scientific collaborations can be negatively impacted by gender inequality. Regarding international mobility, women are underrepresented in all areas of knowledge (Momeni et al., 2022). In science, immobility or low mobility is commonly associated with slower career progression; scarce opportunities to hold coordination and management positions ("glass ceiling"); less insertion in international collaboration networks; and even abandonment of science (Delicado & Alves, 2013; van der Wal, 2021).

The overload of family functions and the partnering effect (Ackers, 2004) are among the obstacles that women may face, which can limit researchers' displacement opportunities (Momeni et al., 2022). This scenario justifies the importance of exploring the international mobility undertaken by Brazilian researchers to analyze, among other aspects, the possible gender imbalances in academic mobility.

The population investigated in this research will be comprised of Brazilians who have done postdoctoral studies abroad. This selection is because they are more advanced in their professional and training trajectories. The phase after the doctorate makes the researcher more independent and responsible for their research agenda, which would leave them better able to conduct high-impact studies (Nerad et al., 2022).

The work aims to design research that evaluates the effect of postdoctoral mobility abroad on employment in the academic career, considering gender inequality and institutional and systemic aspects (such as area of knowledge, academic productivity, and career position) (Aksnes et al., 2019). For this, a consolidated database will be built based on former postdoctoral fellows of the São Paulo Research Foundation (FAPESP) and the triangulation of a set of data sources since there is no consolidated database on mobility and employment ties in the Brazilian case. Next, a comparative study with a descriptive and exploratory design will be carried out between those who had postdoctoral fellowships abroad and those who had postdoctoral fellowships in Brazil without an internship abroad, and which aims, in the future, to enable the carrying out of a quasi-experiment.

DESIGN / METHODOLOGY / APPROACH

The research design is descriptive and exploratory, in which a consolidated database is built with information about employment, academic production and curriculum, as well as the completion of internships abroad. Thus, possible patterns and differentiations between the academic trajectories and the characteristics of the individuals will be investigated. The consolidated database is constructed by exploring, collecting and cross-referencing information from various data sources with quality control of the selected variables. First, we will explore the databases made available by FAPESP regarding former postdoctoral fellows to obtain information about the individuals funded between 2012 and 2017, such as name, institutional affiliation and area of knowledge. Such information is necessary for cross-referencing with other databases. In addition, other information from the researchers' records will be checked regarding the percentage of missing values such as gender, race/color, sexual orientation, and age, among others. The time frame will allow the verification of scientific production and insertion in the labor market in the post-doctorate conclusion years. Subsequently, the FAPESP database will be used for triangulation with three other data sources: (i) formal employment records from the Annual Social Information Report (RAIS) of the Ministry of Labor and Social Security; (ii) the resúmenes available on the Lattes platform of the National Council for Scientific and Technological Development (CNPq); and (iii) the institutional affiliation in the scientific production of a bibliometric study.

FINDINGS OR EXPECTED OUTCOMES

The results found so far show a discrepant distribution of completed

fellowships by knowledge area and a high concentration of destination countries in the Global North. The expected outcomes are the obtaining of different patterns between the effects of mobility of postdoctoral fellows abroad and the effects of the characteristics of individuals (gender) in scientific production and in employment. Thus, enabling the generation and substantiation of hypotheses for future work.

ORIGINALITY / VALUE

The originality of this research is grounded in three factors. Firstly, the increase in knowledge on international mobility, emphasizing the impacts of mobility on the careers of Brazilian scientists and academics and on gender inequality, which is still little explored. Secondly, the increase in the knowledge areas studied and in the number of destination countries. Previous studies usually focused on a few areas, favoring those with low female presence (exact and biological sciences and engineering) and a small group of destination countries (mainly countries of the Global North). Thus, comprehensiveness is one of the innovations of this research, without the prior selection of areas of knowledge or countries of destination. Thirdly, the results will be based on a triangulation of four sets of information, which will complement different types of academic links, validation of research data, and greater reliability.

PRACTICAL / SOCIAL IMPLICATIONS

Gender asymmetries in access to academic mobility highlight the disparities between men and women in career advancement possibilities, considering the relevance of international experiences in the researchers' curriculum. Along with the discussions of Responsible Research Assessment (RRA), global initiatives from groups such as the Research on Research Institute (RoRI) and the Global Research Council (GRC) are bringing the need to consider Equity, Diversity and Inclusion (EDI) in research practices and activities to the debate. Thus, it is essential to expand the understanding of gender inequalities in international mobility and academic careers, especially in the Brazilian context. This will contribute to implement EDI plans and policies and create mechanisms aimed at gender equity in the generation of academic mobility opportunities in funding agencies.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

It is anticipated that there will be two main limitations in the research. The first is the difficulty in obtaining information on the characteristics of individuals. Even with the triangulation of several data sources, the information is often low quality or non-existent. The second limitation stems from the need for more robust methodologies that allow greater inferences about the results, which demands future research advances, where methodologies such as the Generalized Propensity Score (GPS) are implemented.

KEYWORDS (3-5)

Academic mobility; International collaboration; Brazil; Career; Gender.

REFERENCES

- Ackers, L. (2004). Managing relationships in peripatetic careers: Scientific mobility in the European Union. *Women's Studies International Forum*, 27(3), 189-201. <https://doi.org/10.1016/j.wsif.2004.03.001>
- Aksnes, D. W., Piro, F. N., & Rørstad, K. (2019). Gender gaps in international research collaboration: a bibliometric approach. *Scientometrics*, 120(2), 747-774. <https://doi.org/10.1007/S11192-019-03155-3>
- Delicado, A., & Alves, N. A. (2013). "Fugas de Cérebros", "Tetos de Vidro" e "Fugas na Canalização": mulheres, ciência e mobilidade. In Araújo, E.; Fontes, M. & Bento, S. (eds). Para um debate sobre Mobilidade e Fuga de Cérebros. Centro de Estudos de Comunicação e Sociedade, 8-31. Retrieved January 26, 2023, from http://www.lasics.uminho.pt/ojs/index.php/cecs_ebooks/issue/view/120/showToc
- Dueñas-Fernández, D., Iglesias-Fernández, C., & Llorente-Heras, R.. (2013). The Returns obtained from International Mobility by Doctorate Holders. Some evidence from Spain. *International Journal*

of Business and Social Science, 04(12). Retrieved January 26, 2023, from http://ijbssnet.com/journals/Vol_4_No_12_Special_Issue_September_2013/6.pdf

Momeni, F., Karimi, F., Mayr, P., Peters, I., & Dietze, S. (2022). The many facets of academic mobility and its impact on scholars' career. *Journal of Informetrics*, 16(2), 101280. <https://doi.org/10.1016/j.joi.2022.101280>

Nerad, M., Bogle, D., Kohl, U., O'Carroll, C., Peters, C., & Scholz, B. (Orgs.). (2022). *Towards a Global Core Value System in Doctoral Education*. UCL Press. <https://doi.org/10.14324/111.9781800080188>

van der Wal, J. E. M., Thorogood, R., & Horrocks, N. P. C. (2021). Collaboration enhances career progression in academic science, especially for female researchers. *Proceedings of the Royal Society B*, 288(1958). <https://doi.org/10.1098/RSPB.2021.0219>

14.2 Women participation - institutional and structural factors affecting the commercialisation of their research outputs: Findings from Nigeria Universities

Sola Adesola¹

¹Oxford Brookes University, United Kingdom.

PURPOSE

Research output is one of the reasons for gender imbalance in STEM spinouts. Limited number of female academics are leading spinout companies. There has been little or no attention focused on the Nigerian women researchers' progression from research to spinout leadership. This study provides a global south perspective. Science, Technology and Innovation (STI) are central to the Nigerian Government development plan for fostering prosperity and socioeconomic growth. Nigeria is committed to raising awareness of STI and its effect on the Sustainable Development Goals, thus advancing women science, engineering and technological development. This study particularly analyses the institutional capabilities and experiences in STEM university spinouts in Nigeria. Its objectives are:

1. To understand the institutional pathways for women researchers that are specific to academic entrepreneurship and STEM university spinouts.
2. To analyse barriers and enablers in the interactions within the university and institutional environment context of STEM university spinouts.

DESIGN / METHODOLOGY / APPROACH

This study is based on qualitative data from 26 one-to-one in-depth semi-structured interviews undertaken with spinout founders (17 women and 4 men) and 5 interviews with key informants, including people working in technology transfer and intellectual property office. The purpose of these interviews was to understand men and women researchers' experiences of their journey to spinout. The selection of the universities followed a purposive sampling method, based on large number of spinouts and reputation for STEM. Five universities in Nigeria in the southwest were selected for this exploratory study incorporating federal and private institutions. The research leaders have been involved in the founding and governance of STEM university spinouts or intending to start up STEM university spinout. The academic participants in this study included from early career to experienced researchers in STEM research. Questions were developed to understand the participant's journey to spinout and the institutional practice to gender and commercialisation policy. All interviews were conducted on Zoom lasting on average 70 minutes. Data analysis was completed using coded Nvivo.

FINDINGS OR EXPECTED OUTCOMES

The findings from this research have been structured in a way that best represent the current spinout journey in the Nigerian universities. 70% of women founders in our sample originated in chemistry, food processing and medical research. The primary motivation for spinout was the need to identifying and solving society problems. 40% of informants thought there was little or no process to support academic entrepreneurs with starting a STEM university spinout. Lack of resources, funding and infrastructure is a common challenge to all the founders and informants in our project irrespective of gender. Subtle differences emerged from women and men's discussion about perception to risk. Whilst men show nuanced understanding of risk taking due to their nature of role in the society, women's position on the other hand is more risk averse. Women shows greater stereotypes concern for personal attack because of their gender and background. Founders valued establishing good relationships and the need to access mentors and role models.

ORIGINALITY / VALUE

Based on the findings from this research, we offer a set of recommendations to universities as a whole framed within key interventions with the hope that spinout and commercialisation can be developed to foster an engaging and inclusive academic entrepreneurship in the Nigerian universities. The recommendations have implications for the university, industry and government with impact indication.

PRACTICAL / SOCIAL IMPLICATIONS

Our conclusions highlight gaps within the spinout journey but also identify challenges that affect women and men founders alike. Ultimately, this project hopes to promote academic entrepreneurship at the institutional level by encouraging senior leaders and key stakeholders to foster inclusive environment for spinout.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

In the short term, the research plans for wider dissemination and knowledge exchange between the UK and Nigeria through collaboration with stakeholders in Nigeria, in the medium term, there are opportunities to implement some aspects of the research outcomes working with the spinout women founders on capacity building. Long-term goals involve seeking further funding to focus more wider on women spinout and developing impact cases.

KEYWORDS (3-5)

Spinouts, women founders, Nigeria universities, STEM, commercialization.

14.3 Does global innovation consider the elements of equity, diversity, and inclusiveness?

Vanessa L Avanci¹, Karen E F Pinto¹, Yohanna Juk¹

¹InSySPO/Unicamp, Brazil.

PURPOSE

While innovation is one of the most prominent themes concerning entrepreneurial-related aspects at the regional and country level, inclusion is becoming increasingly important in society and academic research (AlShebli, Rahwan, & Woon, 2018; Freeman & Huang, 2015; Sugimoto et al., 2015; Curry et al., 2020; Hatch & Curry, 2020). According to Sugimoto et al. (2015), the field of innovation studies demonstrates the disparities in the exploitation of human capacity for innovation practices, with two particular focuses on the “dearth of academic and female innovators” (p. 1). This article aims to verify the association between countries’ innovation performance and their degree of inclusivity, considering the involvement of marginalized groups. The inclusiveness performance encompasses gender, race, ethnicity, religion, sexual orientation, and disability. In academia, the business environment, and government positions, males - the majority - are predominantly white and of heterosexual orientation (Larivière et al., 2013; Sugimoto et al., 2015). As a change in this direction is beginning, the issue of inclusiveness (precisely gender issues) and innovation has appeared on the agenda over the last few years; this is still an emerging topic with little empirical evidence. This article seeks to advance this discussion to investigate whether new paradigms of inclusion are related to innovation performance at the country level.

DESIGN / METHODOLOGY / APPROACH

We adopted the panel data regression as a statistical technique in this paper and used the software Stata, version 16, for data tabulation and statistical analysis. The years considered in this research were 2021 and 2022. The countries ranked by the Global Innovation Index (GII) and the Inclusiveness Index (II) constitute the research sample. Even though the latest GII covered more than 130 countries, we have only considered the countries represented in both indexes. Therefore, our sample comprises 113 countries and counts on 226 observations.

FINDINGS OR EXPECTED OUTCOMES

The panel data analysis indicates a relationship between innovation, measured through the GII, and inclusiveness. However, this negative association suggests that the most innovative countries tend to present worse performance in terms of inclusiveness. That is, the more innovative a nation, the less inclusive. When considering the variables that make up the inclusiveness index, the only one presenting a positive association with innovation is gender. However, such an association is also negative. For multicollinearity-related reasons, the variable “disability” had to be removed from the statistical analysis. The preliminary results indicate a lack of inclusiveness across countries, especially considering their innovation development level. The lack of association between several inclusiveness pillars and innovation proves this statement. Furthermore, the negative association between gender and innovation indicates that most research and entrepreneurial activities continue to be led by men.

ORIGINALITY / VALUE

This research is relevant because it sheds light on the relationship between inclusiveness and innovation. This topic is gaining attention in recent literature, although it needs to move from narrative to evaluation and actual change. The lack of empirical evidence, i.e., the gap addressed in this study, impacts how policymakers and stakeholders address this. The preliminary outcomes strengthen the lack of diversity in society, especially regarding innovation development across countries.

PRACTICAL / SOCIAL IMPLICATIONS

This relevant discussion allows us to identify, measure and monitor inclusiveness gaps in innovation. It can also help us understand the relationship between the many variables, allowing a more complex interpretation of the relationship between inclusiveness (or the lack of it) and innovation. As highlighted by Sugimoto et al. (2015), institutions are promoting and rewarding innovation activities, so potential disparities in the system must be recognized and addressed.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

The next step of this research is to expand the sample, including data from 2017 to 2022. Even though we considered only the years 2021 and 2022 to avoid problems considering the years before the covid-19 pandemic, we understand that the current sample size is a limitation in this study. In addition, we intend to carry out a linear discriminant analysis to verify which pillars of innovation present the best discriminant power to allocate the countries according to the index categories of inclusiveness (i.e., high, medium-high, medium-low, and low).

We also acknowledge that, although there is a global pattern, this imbalance is also strengthened by local and historical forces contributing to the systemic inequalities hindering marginalized groups’ access to innovation. Identifying each country’s particularities is essential to surpass the obstacles of inclusiveness in innovation.

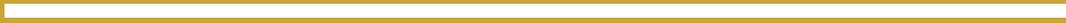
KEYWORDS (3-5)

Gender gap, global innovation, panel data regression, Global Innovation Index, Inclusiveness Index.

REFERENCES

- AlShebli, B. K., Rahwan, T., & Woon, W. L. (2018). The preeminence of ethnic diversity in scientific collaboration. *Nature communications*, 9(1), 5163.
- Curry, S., de Rijcke, S., Hatch, A., Pillay, D., van der Weijden, I., & Wilsdon, J. (2020). The changing role of funders in responsible research assessment: progress, obstacles and the way ahead. (RoRI Working Paper No.3). Research on Research Institute. doi: <https://doi.org/10.6084/m9.figshare.13227914.v1>
- Freeman, R. B., & Huang, W. (2015). Collaborating with people like me: Ethnic coauthorship within the United States. *Journal of Labor Economics*, 33(S1), S289-S318.
- Hatch, A., & Curry, S. (2020) Research Culture: Changing how we evaluate research is difficult, but not impossible. *eLife*, 9(58654). doi: <https://doi.org/10.7554/eLife.58654>
- Larivière, V., Ni, C., Gingras, Y., Cronin, B., & Sugimoto, C. R. (2013). Bibliometrics: Global gender disparities in science. *Nature*, 504, 211–213. doi: <https://doi.org/10.1038/504211a>
- Østergaard, C. R., Timmermans, B., & Kristinsson, K. (2011). Does a different view create something new? The effect of employee diversity on innovation. *Research policy*, 40(3), 500-509.
- Sugimoto, C. R., Ni, C., West, J. D., & Larivière, V. (2015) The Academic Advantage: Gender Disparities in Patenting. *PLOS ONE*, 10(5). doi: <https://doi.org/10.1371/journal.pone.0128000>

15



WELL-BEING SOCIETIES

15.1 Six policy intervention points to foster the protein transition towards sustainability - Addressing repercussions of regime shifts as a prerequisite

Laura Hundscheid¹

¹Institute for Development Research, University of Natural Resources and Life Sciences, Vienna, Austria.

PURPOSE

“Sustainable food systems” have been claimed by the UN in their report “The Future is now” (2019) as one out of six key levers to reach the Sustainable Development Goals (SDGs) and the Paris Agreement (UN, 2019). Essential in this context is the intensive production and overconsumption of meat and animal products, which significantly impact environmental and human health. Industrial meat production largely contributes to global environmental challenges such as biodiversity loss, climate change and nitrogen cycle disruption (e.g., de Boer and Aiking, 2019; Leip et al., 2015). From a health perspective, high meat consumption, mainly red and processed meat, is associated with an increased risk of cardiovascular diseases, type-2 diabetes, obesity and overweight (e.g., IARC, 2015; Wang et al., 2016).

The sustainable protein transition within a broader transition towards sustainable agro-food systems requires holistic policymaking across various policy fields. So far, measures to promote more sustainable protein production and consumption are far from being linked to a single, coherent, sustainable food systems policy since the latter is “lacking from the EU policy portfolio, and the food policy domain is scattered and disintegrated.” (Balázs et al., 2021, p. 3). As noted by Trewern et al. (2022), without a holistic approach to policy making and appropriate policy packaging that targets production and consumption, there is a high risk of remaining business as usual. This highly complex challenge requires innovative frameworks for policy analysis. Through policy mapping across fields and geographical scales, this study aims to provide a comprehensive overview of policies that significantly influence the protein regime in Austria and an overview of measures recommended to achieve a protein transition towards sustainability. Furthermore, we aim to identify gaps in policy activities that potentially hinder the transition by applying the recently introduced transition framework of “six policy intervention points” (Kanger et al., 2020).

DESIGN / METHODOLOGY / APPROACH

We conducted a policy mapping across fields relevant to the protein transition, including (1) food and nutrition, (2) agriculture and environment, (3) climate policies, on supranational (European) and national levels, using the case of Austria as an example. Methods used for the policy mapping exercise include document analysis and semi-structures interviews with experts from each of the policy fields. As a subsequent step of analysis, we applied the recently conceived policy framework for sustainability transitions focusing on six policy intervention points in an innovative way.

FINDINGS OR EXPECTED OUTCOMES

As a result, this work contributes to establishing a cross-sectoral and multi-spatial approach to foster political coherence. Key findings show that the stimulation and acceleration of different niches could be identified within all policy fields, while the implementation of regime destabilizing measures (such as targeting reduced meat consumption, or alternative production systems) is largely lacking. Besides this the so far neglect of dealing with repercussions of regime shifts has been identified as a root cause blocking further implementation of destabilizing measures.

ORIGINALITY / VALUE

Our study provides a so far missing overview of national and supranational policies, that are relevant in the context of the protein transition. Additionally, the study provides contextual knowledge on the protein regime within Austria. The innovative application of the newly conceived transition framework of “six policy intervention points” (Kanger et al., 2020) allowed us to include a so far neglected analytical scope to formulate holistic policy recommendations.

PRACTICAL / SOCIAL IMPLICATIONS

Based on our results, the following policy conclusions can be drawn to accelerate the protein transition:

- Promoting dialogue along the value chain
- Rural-urban food coalitions directly link producers and consumers

- Transdisciplinary creation of a shared vision for agriculture
- Incentives and support for farmers to transition to sustainable, diversified agricultural practices
- Eco-social compensation for tax reform based on true-cost approaches
- Overcoming political silos to foster holistic policymaking

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This study provides an extensive but not yet exhaustive overview of policies relevant for the protein transition. Even though regional policies are perceived as relevant for sustainability transitions in the food sector (e.g. Galli et al., 2020; Sievert et al., 2022), these were not integrated into the study since they expanded the study's scope. Regional-level policies pose an interesting case for further studies since small-scaled transition arenas are more likely to enable niche diffusion and allow destabilizing structures (Galli et al., 2020). As claimed in the latest IPBES-Food publication on the politics of protein (2022) – protein transition needs to be understood in a broader food systems transition. We have attempted to consider this by incorporating various policy fields and merging production and consumption levels. Further studies could focus on addressing the whole value chain, integrating alternative proteins such as fish, insects, or algae, or focus on coherences within policy processes. Furthermore, to concretize policy recommendations and address coherence to a deeper extent, synergies and trade-offs would need to be considered in a systematic manner. A possible, comprehensive approach for this can be offered by methods engaging with SDG-based assessments on target or indicator level (e.g., Horvath et al., 2022; Muscat et al., 2021).

KEYWORDS (3-5)

Policy coherence; policy intervention points; food system; protein transition; food and farming policy.

REFERENCES

- Aiking, H., de Boer, J., 2018. The next protein transition. *Trends Food Sci. Technol.* S0924224418301213. <https://doi.org/10.1016/j.tifs.2018.07.008>
- Balázs, B., Kelemen, E., Centofanti, T., Vasconcelos, M.W., Iannetta, P.P.M., 2021. Policy Interventions Promoting Sustainable Food- and Feed-Systems: A Delphi Study of Legume Production and Consumption. *Sustainability* 13, 7597. <https://doi.org/10.3390/su13147597>
- Candel, J., 2022. EU food-system transition requires innovative policy analysis methods. *Nat. Food* 3, 296–298. <https://doi.org/10.1038/s43016-022-00518-7>
- de Boer, J., Aiking, H., 2019. Strategies towards healthy and sustainable protein consumption: A transition framework at the levels of diets, dishes, and dish ingredients. *Food Qual. Prefer.* 73, 171–181. <https://doi.org/10.1016/j.foodqual.2018.11.012>
- Galli, A., Moreno Pires, S., Iha, K., Alves, A.A., Lin, D., Mancini, M.S., Teles, F., 2020. Sustainable food transition in Portugal: Assessing the Footprint of dietary choices and gaps in national and local food policies. *Sci. Total Environ.* 749, 141307.
- Horvath, S.-M., Muhr, M.M., Kirchner, M., Toth, W., Germann, V., Hundscheid, L., Vacik, H., Scherz, M., Kreiner, H., Fehr, F., Borgwardt, F., Gühnemann, A., Becsi, B., Schneeberger, A., Gratzner, G., 2022. Handling a complex agenda: A review and assessment of methods to analyse SDG entity interactions. *Environ. Sci. Policy* 131, 160–176. <https://doi.org/10.1016/j.envsci.2022.01.021>
- IARC, 2015. IARC Monographs Evaluate Consumption of Red Meat and Processed Meat 2 https://www.iarc.who.int/wp-content/uploads/2018/07/pr240_E.pdf.
- IPCC, 2019. Climate change and land. An IPCC Special Report on Climate Change, desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems
- IPES-Food, 2022. The politics of protein: examining claims about livestock, fish, ‘alternative proteins’ and sustainability.
- Kanger, L., Sovacool, B.K., Noorköiv, M., 2020. Six policy intervention

points for sustainability transitions: A conceptual framework and a systematic literature review. *Res. Policy* 49, 104072. <https://doi.org/10.1016/j.respol.2020.104072>

Leip, A., Billen, G., Garnie, J., Grizzetti, B., Lassaletta, L., Reis, S., Simpson, D., Sutton, M.A., de Vries, W., Weiss, F., Westhoek, H., 2015. Impacts of European livestock production: nitrogen, sulphur, phosphorus and greenhouse gas emissions, land-use, water eutrophication and biodiversity. *Environ. Res. Lett.* 10, 1–13. doi:10.1088/1748-9326/10/11/115004.

Muscat, A., de Olde, E.M., Kovacic, Z., de Boer, I.J.M., Ripoll-Bosch, R., 2021. Food, energy or biomaterials? Policy coherence across agro-food and bioeconomy policy domains in the EU. *Environ. Sci. Policy* 123, 21–30. <https://doi.org/10.1016/j.envsci.2021.05.001>

Trewern, J., Chenoweth, J., Christie, I., 2022. “Does it change the nature of food and capitalism?” Exploring expert perspectives on public policies for a transition to ‘less and better’ meat and dairy. *Environ. Sci. Policy* 128, 110–120. <https://doi.org/10.1016/j.envsci.2021.11.018>

UN, 2019. Global Sustainable Development Report 2019: the Future is Now – Science for Achieving Sustainable Development. United Nations, New York

Wang, X., Lin, X., Ouyang, Y.Y., Liu, J., Zhao, G., Pan, A., Hu, F.B., 2016. Red and processed meat consumption and mortality: dose–response meta-analysis of prospective cohort studies. *Public Health Nutr.* 19, 893–905. doi:10.1017/S1368980015002062.

15.2 The implementation of SDG-3 in Israel

Ruti Berger¹

¹Assuta Medical Centers, Israel.

PURPOSE

1. Review to which extend Israel has achieved Goal 3 compared to worldwide achievements.
2. Recommendations regarding fields for focusing and investing.

DESIGN / METHODOLOGY / APPROACH

Comparison of the available published SDG-3 target achievements (Global, OECD, Europe) to those of Israel.

FINDINGS OR EXPECTED OUTCOMES

SDG3 at international level and as a comparison to Israel. General health COVID-19 continued to pose health and wellbeing challenges globally, adding difficulties in meeting Goal 3 targets. Before the pandemic, progress was evident in many health areas, though progress was marred by huge regional disparities. Global "excess deaths" directly and indirectly attributable to COVID-19 are estimated as 15 million by the end of 2021 (3). The pandemic has severely disrupted essential health services, in all major health areas. Concerted action is needed to overcome this regression in achieving Goal 3 (3). In Israel, a greater excess death was found in the advanced waves, with higher rates in the Arab compared to the Jewish population, 65% and 43%, respectively (5). Life expectancy at birth in Israel is around 83 years, two years higher than the OECD average, 81. In general, satisfaction with life (scale 0 to 10), Israelis gave it a 7.2 grade on average, higher than the 6.7 OECD average (6).

3.4 Mental health

The pandemic has triggered a significant rise in anxiety and depression, particularly among young people. Mental health (MH) services were the most disrupted among essential health services, which widened gaps in MH care (3). In Israel, (8). 3.1, 3.2 Maternal and child health Globally, in 2015–2021, around 84% of births were assisted by skilled health professionals. Coverage in sub-Saharan Africa was 20 percentage points lower than the global average. From 2015 to 2020, the global mortality rate of children under age 5 and neonatal mortality rate fell by 14% and 12%, respectively. Still, 5 million children under age 5 died in 2020 (3). Israel has achieved goals 3.1 and 3.2 (9).

3.8 Universal health coverage (UHC)

The health and economic impacts of COVID-19 have likely worsened uneven progress towards universal health coverage. The UHC service coverage improved to 67% in 2019. There is no available data regarding the impact of COVID-19 on UHC, however, it has likely been dropped (3). In Israel, according to the state health insurance law, the entire population (100%) is insured in UHC of basical medical services (9).

Routine immunization program:

More children are missing out on essential vaccines due to the pandemic.

COVID-19 and associated disruptions have caused more children to miss out on essential vaccines. From 2019 to 2020, coverage of infant immunization slipped from 86% to 83%. COVID-19 responses and vaccinations have diverted health system resources away from other essential services. In Israel, vaccination rates for most routine vaccines are still high in international standards, above 90% - but in the last two years there was decrease of 3% to 5% (10).

Healthcare personnel

The COVID-19 pandemic has taken a heavy toll on health and care workers, who are already stretched thin in most regions.

The density of nursing and midwifery personnel in Northern America is the highest in the world, about 4, 8 and 15 times the global, Southern Asia, and sub-Saharan Africa, respectively. There is a steady increase in medical doctors per 1000 people globally, but the disparities remain high: from around 4 medical doctors per 1000 people in Europe to only 2 in sub-Saharan Africa.

In Israel, the rate of physicians per 1000 population is 3.3, a bit lower

than the OECD average (3.6), but the rate of nurses per 1000 population is 5, nearly half of the OECD average (9.4) (11).

Up to 2020, Israel have been achieved or are close to being achieved 31 indicators out of 72 (43%). Regarding Goal 3: 13 indicators have been achieved or are close to being achieved in Israel (6).

ORIGINALITY / VALUE

The data was existed but not concentrated in one place.

PRACTICAL / SOCIAL IMPLICATIONS

Policies that remove barriers from achieving the SDG should be promoted, especially after the deterioration following two COVID-19 influence. Healthcare personnel should do their best to improve achieving the targets. For example: hospitals can increase their internship quota, especially in needed medical fields. At discharge, physicians can recommend on routine vaccination completion. All health personnel should be proactive in helping patients who are seeking for mental health consultations, especially, young people.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Longitudinal data should be collected continuously and in depth for understanding how SDGs can be more present in healthcare institutes' policies and regulations. Efforts for decreasing health inequities should be increased, hence it would promote health to all as well as improve achieving the additional 16 goals.

KEYWORDS (3-5)

Sustainable Development Goals (SDG), Health and well-being, Healthcare system, Israel.

REFERENCES

1. THE 17 GOALS | Sustainable Development [Internet]. [cited 2022 Apr 4]. Available from: <https://sdgs.un.org/goals>
2. SDG ISRAEL FINAL.pdf [Internet]. [cited 2022 Mar 13]. Available from: <https://www.cbs.gov.il/he/publications/LochutTlushim/2020/SDG%20ISRAEL%20FINAL.pdf>
3. The-Sustainable-Development-Goals-Report-2022.pdf [Internet]. [cited 2022 Aug 3]. Available from: <https://unstats.un.org/sdgs/report/2022/The-Sustainable-Development-Goals-Report-2022.pdf>
4. Goal 3 | Department of Economic and Social Affairs [Internet]. [cited 2022 Aug 2]. Available from: <https://sdgs.un.org/goals/goal3>
5. Haklai Z, Goldberger NF, Gordon ES. Mortality during the first four waves of COVID-19 pandemic in Israel: March 2020–October 2021. *Isr J Health Policy Res.* 2022 May 31;11(1):24.
6. Sustainable Development Report 2022 [Internet]. [cited 2023 Jan 30]. Available from: <https://dashboards.sdgindex.org/>
7. Brafman J, Lubin R, Naor-Ziv R, Rosenberg S, Dwolatzky T. Loneliness, Depression, and Anxiety Experienced by the Israeli Population During the First COVID-19 Lockdown: A Cross-sectional Survey. *Rambam Maimonides Med J.* 2021 Oct 25;12(4):e0030.
8. Kimhi S, Eshel Y, Marciano H, Adini B, Bonanno GA. Trajectories of depression and anxiety during COVID-19 associations with religion, income, and economic difficulties. *J Psychiatr Res.* 2021 Dec;144:389–96.
9. Health and well-being (SDG3) [Internet]. [cited 2022 Aug 3]. Available from: <https://www.cbs.gov.il/he/subjects/Pages/goog-health.aspx>
10. Article in Hebrew regarding essential vaccination [Internet]. 2022 [cited 2023 Jan 26]. Available from: <https://www.zman.co.il/295673/>
11. OECD. Health at a Glance 2021: OECD Indicators [Internet]. OECD; 2021 [cited 2022 Nov 24]. (Health at a Glance). Available from: https://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-2021_ae3016b9-en

15.3 Behavioral Patterns Identification in Active Aging Homes: a Joint Approach by Health Care, Home Assistance and Research

Xavier Baño¹, Rosa Ma Alsina-Pagès¹

¹La Salle - Ramón Llull, Spain.

PURPOSE

The experience focuses on the roadmap used by the La Salle-URL transfer office to develop and support the finance and implementation of a home help project for older individuals living alone. The project was studied from three aspects. First, with regard to the health of the elderly people, the perspective of a medical agent in administration is considered. Second, aid to households services, which includes the social economy sector stand point, and third, research and knowledge transfer from the University.

DESIGN / METHODOLOGY / APPROACH

The methodology followed focuses on the Rapid Tech Transfer model used in knowledge transfer at La Salle-URL [1]. It starts from the valorization of the knowledge that exists in La Salle research groups [2] - in this case, the knowledge around the detection of acoustic events in both indoor and outdoor environments [3] - and it is contrasted with the approach of complex challenges present in the society, in this case, coming from social economy sector to the elderly who live alone most of the time. The approach focuses at the beginning on identifying one of the challenges found in this environment, delimiting it to face it from a technical point of view. Once the proposal for solving the challenge has been generated, all the actors - from the three sides (medical sector and administration, social economy sector, and research at university) - should work together for its detailed design and its progress, transferring the research knowledge that comes from the university to the proposal while the experience from the medical and the assistance parts are also put in common to advance in the challenge solving. The real-life implementation of the proposal, in the same context with the three actors is the final key part of the approach to reach the success in the challenge facing. Once the proof of concept of the technical approach designed is validated, the functional prototype will be developed together with industry, who will also implement the tested version of the service that the proposal gives to families, social assistants and doctors.

FINDINGS OR EXPECTED OUTCOMES

The main outcome of this practical case experience is the modelling of project design and development from La Salle's research and technology transfer, which is profitable for other projects with partners from outside the university - primarily doctors in public hospitals (administration) and social assistants (in social economy sector entities devoted to) -, with common goals to solve.

ORIGINALITY / VALUE

The most relevant value of the practical case presented is the identification of the challenge, the resolution proposal, and the careful design of the project by the university and the other agents, such as medical care by means of the administration and social assistants, as social economy sector entity devoted to elderly attendance. For this purpose, an approach to the challenge with maximum flexibility and agility in project management has been designed, and the involvement of researchers in the acoustic event detection field of knowledge have been involved from very early design process stages of the proposal. The implementation design with an incremental approach, once each part of the design was completed, upgrading to more capabilities if needed, was a crucial part of the process that relied in both social assistants and their experience, and in doctors and their health requirements with respect to the elderly living alone patients. The trustfulness of the relationship among these three agents allowed the evolution of the proposal in two years, into a new approach to behavioral tracking of people living alone with the future goal of detecting relevant changes in their daily routines. The applicability of the research conducted at university, with mainly laboratory algorithms, into a real-life problem with several agents constrains is also part of the value of the experience detailed.

PRACTICAL / SOCIAL IMPLICATIONS

The project has a clear impact on home care for elderly people who

live alone, especially by minimizing intrusion into their lives and by monitoring them to advance medical issues such as analysis behavioral. It is the first step, the validation test that allows us to continue working in this line of knowledge transfer linked to the elderly and social service.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

One of the points that will need to be worked on in the continuation of the project is the scalability of the proposal. So far, there has been methodological work in delimiting the challenge, making a resolution proposal, and developing this proposal to have a validation test in a real environment - a home with a single person - that allows us to move forward. Now we need to develop a proof of concept in several homes, with people with different behaviors, which will allow us to expand our knowledge of the system and make it more flexible and adaptable. It will therefore be necessary to expand the methodology to include more agents, and probably also the people who provide first-hand care to the elderly and even their families. The project, as a social impact and agents involved, becomes wider.

KEYWORDS (3-5)

Co-design, real-life application, active aging, elderly support, home innovation.

REFERENCES

- [1] Baño, X., Alsina-Pagès, R.M., "Rapid Tech Transfer: Agile Approach from University to Companies", ISPIIM Connects Valencia -Reconnect, Rediscover, Reimagine, November 30th - December 2nd 2021. ISBN: 978-952-335-691-7.
- [2] Shepherd, D. A., & Gruber, M. (2021). The lean startup framework: Closing the academic-practitioner divide. *Entrepreneurship Theory and Practice*, 45(5), 967-998.
- [3] Caro-Via, S., Vidaña-Vila, E., Ginovart-Panisello, G. J., Martínez-Suquía, C., Freixes, M., & Alsina-Pagès, R. M. (2022). Edge-Computing Meshed Wireless Acoustic Sensor Network for Indoor Sound Monitoring. *Sensors*, 22(18), 7032.

16



DATA DRIVEN STRATEGIES FOR SDG'S

16.1 Data Science for SDG: the experience of four data science projects into a triple helix model

Elva Lizeth Ramos Monge¹, Álvaro García-Piquer¹

¹La Salle - Ramón Llull, Spain.

PURPOSE

The main goal is to provide a holistic understanding of the connection between industry, academia, and government through four projects into the data science line of the Smart Society research group of La Salle – Universitat Ramon Llull. In this line, two main objectives are pursued, first to describe and analyze how is this interaction and its impact, and second, how this interaction could be improved.

DESIGN / METHODOLOGY / APPROACH

Case of study.

FINDINGS OR EXPECTED OUTCOMES

This work aims to provide a comprehensive analysis of the potential for data science research and applications. It examines the role of data science in addressing industry problems in a socially and environmentally responsible manner, with support from public standards and policies. It aims to identify opportunities to enhance relationships between academia, industry, and government.

ORIGINALITY / VALUE

The originality of this paper lies in the fact that the study and assessments are developed in a practical environment from a research group influenced by the three actors.

PRACTICAL / SOCIAL IMPLICATIONS

This paper addresses the social implications of using data science to solve industry problems. It assesses the responsibility of these solutions towards society and their impact on sustainable development. The objective is to promote a critical reflection on the role of data science in promoting socially responsible outcomes.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Future research should focus on creating new studies and methodologies to foster stronger relationships with other industries. Emphasis should be placed on exploring how data science can support sustainable development goals.

KEYWORDS (3-5)

Data science, Triple helix model of innovation, Case of study, SDG, Industry Innovation.

REFERENCES

- Di Vaio, A., Palladino, R., Hassan, R., & Escobar, O. (2020). Artificial intelligence and business models in the sustainable development goals perspective: A systematic literature review. *Journal of Business Research*, 121, 283-314.
- Etzkowitz, H. (2012) Triple helix clusters: boundary permeability at university – industry – government interfaces as a regional innovation strategy. *Environment & Planning C: Politics and Space*, 30(5):766–779.
- Ferguson, T., & Roofe, C. G. (2020). SDG 4 in higher education: Challenges and opportunities. *International Journal of Sustainability in Higher Education*, 21(5), 959-975.
- Kynčlová, P., Upadhyaya, S., & Nice, T. (2020). Composite index as a measure on achieving Sustainable Development Goal 9 (SDG-9) industry-related targets: The SDG-9 index. *Applied Energy*, 265, 114755.
- Malhotra, C., Anand, R., & Singh, S. (2018). Applying big data analytics in governance to achieve sustainable development goals (SDGs) in India. *Data Science Landscape: Towards Research Standards and Protocols*, 273-291.
- UNESCO/IFAP, UNU-EGOV (2016). *Knowledge societies policy handbook*. Guimarães/Paris, United Nations.
- Yin, R. (1984). *Case study research: Design and methods* (1st ed.). Beverly Hills, CA: Sage
- Vinuesa, R., Azizpour, H., Leite, I. et al. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. *Nat Commun* 11, 233. Publishing.

16.2 Inspiring Citizen Science Innovation on China's Monitoring of Water-related Sustainable Development Goals

Yaqian Wu¹

¹University College London, United Kingdom.

PURPOSE

Help countries, like China to use non-traditional data through citizen science approaches to implement all the targets and indicators of SDG 6.

DESIGN / METHODOLOGY / APPROACH

This study used participant observation and semi-structured interview methods to evaluate the effectiveness of 24 existing water-related CS projects in China, based on a modified CS assessment framework with three dimensions (scientific, participatory, socio-ecological and economic).

FINDINGS OR EXPECTED OUTCOMES

The study provides 4 major outcomes: 1) Water-related CS projects are mainly divided into four types in China, consisting of freshwater monitoring, drinking water monitoring, water-related ecosystem observation, and water education; 2) Since China's policy is inclined towards the construction of ecological civilisation, among these four types of projects, the projects with more government support are the third and fourth types; 3) In order for citizen science to be more widely accepted and promoted in China, it is best to use the term public participation, which can not only dispel the doubts of the government, but also narrow the distance with the public; and 4) Although the current water education project does not contribute data to the SDGs, it can be designed to assist the other three types of projects to complete interactive training, thereby helping to monitor water-related SDGs indicators. This is also one of the main feasible paths for China to expand its water-related CS projects in the future.

ORIGINALITY / VALUE

Make a citizen science data inventory for China's SDG 6 monitoring.

PRACTICAL / SOCIAL IMPLICATIONS

Giving countries a more feasible workstream to collect data for SDG 6 indicators monitoring and further help them adjust their environment policies more corresponding to the UN SDGs and 2030 agenda.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Expand the citizen science applications into other SDGs.

KEYWORDS (3-5)

Water, Sustainable Development Goals, Citizen Science, Innovative design, China.

REFERENCES

Wu, Y. et al. (2022). Citizen science in China's water resources monitoring: current status and future prospects. *International Journal of Sustainable Development and World Ecology*.
Skarlatidou, Dielk, Wu et al. (2022). Extreme citizen science contributions to sustainable development goals: challenges and opportunities of a human-centred design approach. *HCT4SDG – LIFeS*.

16.3 Governance and Data Sourcing in Supervised Learning Development

Qian SUN¹, Cancan WANG

¹University of Chinese Academy of Sciences, China.

Supervised learning development involves data sourcing, which requires the joint participation of multiple organizations in the collection, transmission, sorting, and analysis of multi-source data. While existing studies explore the technical feasibility of multi-source data integration, the institutional foundation of data sourcing – such as governance – is largely neglected. This study explores how the coordination needs of data sourcing in supervised learning development can be accommodated through the deployment of governance mechanisms. We argue that the key is to understand the types and uses of data involved in the development over time. Following a project between an AI company and a hospital in China, our findings advance IS sourcing literature: by providing a needed conceptualization of supervised learning development as a data sourcing process that is both knowledge intensive and subject to potential coordination risks; and by specifying the relevant governance mechanisms and the boundary conditions for such mechanisms to be effective.

16.4 Digital Transformation of Administrative Services and Its Effect on Enterprise Innovation Performance: An Empirical Study of Beijing

Yi ZHENG¹, Jiahui TANG Shenghui ZHAI

¹Institutes of Science and Development, Chinese Academy of Science, China

As the "last mile" in the implementation of various innovation policies, the administrative service system influences enterprise innovation performance by affecting the threshold, conditions, cost, and speed of business operations. In recent years, the Chinese government has promoted government function reforms by undergoing digital transformation in administrative services, which reducing administrative burdens on enterprises significantly, and positively influencing their innovation willingness and performance. Existing studies have explored the relationship between administrative service digitalization and enterprise innovation performance from the perspectives of simplifying administration, improving government efficiency, streamlining administrative approval processes, promoting government informationization, and enhancing government-business relations. However, research using large-scale empirical data at the micro-level is still limited.

In this study, we constructed a panel dataset including administrative service records and innovation performance for 6,590 enterprises in Beijing from 2019 to 2022. Using the number of patent authorizations obtained by the enterprises as the dependent variable and key elements in the administrative service process as independent variables, we conducted a negative binomial regression analysis. The results indicate that the administrative service reform in Beijing's administrative service sector has a significant positive impact on enterprise innovation performance. Among various measures, the positive effects of reducing application materials, improving online processing efficiency, and strengthening government-enterprise interaction are the most significant.

16.5 Build a Balanced and Inclusive AI International Governance System

Sheng Shuyang

This paper sorts out the current artificial intelligence governance models of various countries and international organizations according to the governance system and structure. Based on the theoretical analysis and comparative research, it seems difficult to form a unified and effective international AI governance system because there are too many differences and defects in the current AI governance system among the countries. Therefore, this paper proposes building a balanced and inclusive AI governance system from a unified perspective of Regime Complexes in theory and the characteristics of various current governance models in practice. First, the theory of Regime Complexes provides an analytical framework for discovering the correlation among various AI governance mechanisms, providing the common foundation for the construction of an International AI governance system. Second, the theory of Regime Complexes provides a comprehensive platform that includes all participants to achieve multiple interactions, thereby ensuring the orderly operation of the International AI governance system. With this governance system, a loosely paired norm and mechanism located between integrated and highly fragmented systems, various countries can cooperate on some topics and maintain differences or opposition in others.

17

HYBRID ORGANIZATIONS FOR KNOWLEDGE CO-CREATION,
INNOVATION, ENTREPRENEURSHIP FOR SUSTAINABILITY

17.1 Does Social Identity Matter? How the Interaction of Social Identity and Passion Shape Commercialization Intention in Academia

Malte Stulgies¹

¹RWTH Aachen, Germany.

PURPOSE

The mission of today's universities goes beyond teaching and researching: By enabling e.g., technology transfer and entrepreneurship, the "third mission" of universities centrally pursues a positive impact on society (Siegel & Wright, 2015). To drive this extended mission, entrepreneurial intention (see Hayter et al., 2018) and academic engagement as means of technology transfer (see Perkmann et al., 2013, 2021) have received scholarly attention. In this context, studies identified role-identity-based passion (Wang et al., 2022; Cardon et al., 2013; Stryker & Serpe, 1994) and the passion orchestra of entrepreneurial passion and obsessive scientific passion (Huyghe et al., 2016) as important drivers among other institutional and individual antecedents (Grevén et al., 2020; Johnson et al., 2017; Huyghe & Knockaert, 2015; e.g., Clarysse et al., 2011). However, with studies focusing on role identity, we lack a holistic picture of an individual's identity as influence on intention (Gruber & MacMillan, 2017; Powell & Baker, 2017) and additionally miss a link to universities' claim of having a positive societal impact (Siegel & Wright, 2015; Grimaldi et al., 2011). To close this gap and add to the ongoing, qualitative, discussion regarding the importance of social identity for (social) entrepreneurship (Wry & York, 2019; Pan et al., 2019; Wry & York, 2017), we aim to provide a combined empirical view on the interaction of social and role identity (Wagenschwanz, 2021; Powell & Baker, 2014). We do so by transferring the prevalent founder's social identity (Sieger et al., 2016) to academia and empirically analyzing its interaction with the role-identity-based passion orchestra as antecedent to entrepreneurial intention and academic engagement (Tartari et al., 2014), summarized as commercialization intention. Hence, this study's contribution is twofold: (1) By adding a social identity perspective to academia, we detail the role of identity for academic entrepreneurship and its societal impact. (2) By adding empirical evidence, we contribute to the general discussion of the interaction of social and role identity.

DESIGN / METHODOLOGY / APPROACH

Using a web-based survey, we targeted individuals from three Technical Universities that support entrepreneurship and policymaking, namely Germany's "TU9" universities (TU9 German Institutes of Technology e.V., 2022; Grevén et al., 2020). We identified a diverse academic population of more than 17,000 academic employees and professors across all STEM fields and medicine thus reducing biases and increasing representativeness (Perkmann et al., 2021; Fini et al., 2020; Cohen et al., 2020). After distribution in December 2022, 1,193 academics finalized the survey (8% response rate).

To guarantee validity and reliability, we tested, among others, for potential common method and no response biases. Additionally, we adopted methods to ensure robustness and reduce potential biases, e.g., relying on previously validated survey constructs (see Figure 1 in Appendix) and adding secondary data.

FINDINGS OR EXPECTED OUTCOMES

To theorize our conceptual model and findings, we build on two identity-related theories: (1) Identity theory (Stryker & Serpe, 1994), focusing on role-identity-based passion (Cardon et al., 2009) and social identity theory (Tajfel, 1974), specifically founder's social identity (Fauchart & Gruber, 2011).

Leveraging extant research linking the passion orchestra to commercialization intention (e.g., Huyghe et al., 2016), we theorize based on well-established social identity theory (Hogg & Terry, 2000), that the interaction with social identities fundamentally influences the choice of commercialization, similar to different motivations (e.g., Brändle et al., 2019; Hmieleski & Powell, 2018; D'Este & Perkmann, 2011). For example, we hypothesize a missionary identity increasing the use of commercialization methods that enable reaching large parts of society, e.g., spin-off foundation for high entrepreneurial passion and licensing for high obsessive scientific passion (Lam, 2011). For a full overview of hypotheses, see Table 1 in Appendix. As data analysis is still ongoing, final results including corresponding robustness tests will be available for the Triple Helix 2023 conference.

ORIGINALITY / VALUE

The data was existed but not concentrated in one place.

PRACTICAL / SOCIAL IMPLICATIONS

For practitioners, we offer additional insights: We support universities in strengthening their societal impact by better understanding which identities are prone to specific forms of commercialization and, in extension, enable them to improve support mechanisms. Analyzing which role-identity-based passion – social identity combinations prefer specific commercialization modes helps to identify individuals that should be focused, e.g., by TTOs or support mechanisms, and offers a further step towards achieving higher support efficacy (Goel & Göktepe-Hultén, 2018). Lastly, as we expect some identity combinations to be prevalent in specific scientific fields (Cohen et al., 2020), this helps to define how to best target specific faculties to achieve desired outcomes.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Based on the unique setting in academia and the empirical character, there are some limitations, offering avenues for further research. First, as argued, we focus on role and social identity. Nevertheless, and in line with discussions of Wry and York (2019) and Pan et al. (2019), additional views e.g., on personal identity (Wry & York, 2017) may add towards a holistic picture. Second, we focus on selected German Technical Universities, hence, we recommend replicating this study in non-academic environments. Third, the use of empirical, cross-sectional analyses does not allow detailing the development and reciprocal influence of different identities over time – supplementary longitudinal studies can shed light on this. Lastly, analyses of the interaction with contextual factors, e.g., university mission or reward systems (Huyghe & Knockaert, 2015) or organizational context (Nelson, 2014) appear prudent to connect individual and institutional factors.

KEYWORDS (3-5)

Academic Entrepreneurship; Science Commercialization; Passion Orchestra; Identity Theory; Founder's Social Identity.

REFERENCES

- Brändle, L., Golla, S., & Kuckertz, A. (2019). How entrepreneurial orientation translates social identities into performance. *International Journal of Entrepreneurial Behavior & Research*, 25(7), 1433–1451. <https://doi.org/10.1108/IJEBR-12-2018-0804>
- Cardon, M. S., Gregoire, D. A., Stevens, C. E., & Patel, P. C. (2013). Measuring entrepreneurial passion: Conceptual foundations and scale validation. *Journal of Business Venturing*, 28(3), 373–396. <https://doi.org/10.1016/j.jbusvent.2012.03.003>
- Cardon, M. S., Wincent, J., Singh, J., & Drnovsek, M. (2009). The nature and experience of entrepreneurial passion. *Academy of Management Review*, 34(3), 511–532. <https://doi.org/10.5465/amr.2009.40633190>
- Clarysse, B., Tartari, V., & Salter, A. (2011). The impact of entrepreneurial capacity, experience and organizational support on academic entrepreneurship. *Research Policy*, 40(8), 1084–1093. <https://doi.org/10.1016/j.respol.2011.05.010>
- Cohen, W. M., Sauermann, H., & Stephan, P. (2020). Not in the Job Description: The Commercial Activities of Academic Scientists and Engineers. *Management Science*, 66(9), 4108–4117. <https://doi.org/10.1287/mnsc.2019.3535>
- D'Este, P., & Perkmann, M. (2011). Why do academics engage with industry? The entrepreneurial university and individual motivations. *The Journal of Technology Transfer*, 36(3), 316–339. <https://doi.org/10.1007/s10961-010-9153-z>
- Fauchart, E., & Gruber, M. (2011). Darwinians, Communitarians, and Missionaries: The Role of Founder Identity in Entrepreneurship. *Academy of Management Journal*, 54(5), 935–957. <https://doi.org/10.5465/amj.2009.0211>
- Fini, R., Grimaldi, R., & Meoli, A. (2020). The effectiveness of university regulations to foster science-based entrepreneurship. *Research Policy*, 49(10), 104048. <https://doi.org/10.1016/j.respol.2020.104048>

- Fini, R., Rasmussen, E., Wiklund, J., & Wright, M. (2019). Theories from the Lab: How Research on Science Commercialization can Contribute to Management Studies. *Journal of Management Studies*, 56(5), 865–894. <https://doi.org/10.1111/joms.12424>
- Goel, R. K., & Göktepe-Hultén, D. (2018). What drives academic patentees to bypass TTOs? Evidence from a large public research organisation. *The Journal of Technology Transfer*, 43(1), 240–258. <https://doi.org/10.1007/s10961-017-9595-7>
- Greven, A., Strese, S., & Brettel, M. (2020). Determining scientists' academic engagement: Perceptions of academic chairs' entrepreneurial orientation and network capabilities. *The Journal of Technology Transfer*, 45(5), 1376–1404. <https://doi.org/10.1007/s10961-019-09750-z>
- Grimaldi, R., Kenney, M., Siegel, D. S., & Wright, M. (2011). 30 years after Bayh–Dole: Reassessing academic entrepreneurship. *Research Policy*, 40(8), 1045–1057. <https://doi.org/10.1016/j.respol.2011.04.005>
- Gruber, M., & MacMillan, I. C. (2017). Entrepreneurial Behavior: A Reconceptualization and Extension Based on Identity Theory. *Strategic Entrepreneurship Journal*, 11(3), 271–286. <https://doi.org/10.1002/sej.1262>
- Hayter, C. S., Nelson, A. J., Zayed, S., & O'Connor, A. C. (2018). Conceptualizing academic entrepreneurship ecosystems: A review, analysis and extension of the literature. *The Journal of Technology Transfer*, 43(4), 1039–1082. <https://doi.org/10.1007/s10961-018-9657-5>
- Hmieleski, K. M., & Powell, E. E. (2018). The Psychological Foundations of University Science Commercialization: A Review of the Literature and Directions for Future Research. *Academy of Management Perspectives*, 32(1), 43–77. <https://doi.org/10.5465/amp.2016.0139>
- Hogg, M. A., & Terry, D. J. (2000). Social Identity and Self-Categorization Processes in Organizational Contexts. *Academy of Management Review*, 25(1), 121. <https://doi.org/10.2307/259266>
- Huyghe, A., & Knockaert, M. (2015). The influence of organizational culture and climate on entrepreneurial intentions among research scientists. *The Journal of Technology Transfer*, 40(1), 138–160. <https://doi.org/10.1007/s10961-014-9333-3>
- Huyghe, A., Knockaert, M., & Obschonka, M. (2016). Unraveling the "passion orchestra" in academia. *Journal of Business Venturing*, 31(3), 344–364. <https://doi.org/10.1016/j.jbusvent.2016.03.002>
- Johnson, M., Monsen, E. W., & MacKenzie, N. G. (2017). Follow the Leader or the Pack? Regulatory Focus and Academic Entrepreneurial Intentions. *Journal of Product Innovation Management*, 34(2), 181–200. <https://doi.org/10.1111/jpim.12355>
- Lam, A. (2011). What motivates academic scientists to engage in research commercialization: 'Gold', 'ribbon' or 'puzzle'? *Research Policy*, 40(10), 1354–1368. <https://doi.org/10.1016/j.respol.2011.09.002>
- Meoli, A., Fini, R., Sobrero, M., & Wiklund, J. (2020). How entrepreneurial intentions influence entrepreneurial career choices: The moderating influence of social context. *Journal of Business Venturing*, 35(3), 105982. <https://doi.org/10.1016/j.jbusvent.2019.105982>
- Nelson, A. J. (2014). From the ivory tower to the startup garage: Organizational context and commercialization processes. *Research Policy*, 43(7), 1144–1156. <https://doi.org/10.1016/j.respol.2014.04.011>
- Obschonka, M., Goethner, M., Silbereisen, R. K., & Cantner, U. (2012). Social identity and the transition to entrepreneurship: The role of group identification with workplace peers. *Journal of Vocational Behavior*, 80(1), 137–147. <https://doi.org/10.1016/j.jvb.2011.05.007>
- Pan, N. D., Gruber, M., & Binder, J. (2019). Painting with All the Colors: The Value of Social Identity Theory for Understanding Social Entrepreneurship. *Academy of Management Review*, 44(1), 213–215. <https://doi.org/10.5465/amr.2017.0504>
- Perkmann, M., Salandra, R., Tartari, V., McKelvey, M., & Hughes, A. (2021). Academic engagement: A review of the literature 2011–2019. *Research Policy*, 50(1), 104114. <https://doi.org/10.1016/j.respol.2020.104114>
- 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(2), 423–442. <https://doi.org/10.1016/j.respol.2012.09.007>
- Powell, E. E., & Baker, T. (2014). It's What You Make of It: Founder Identity and Enacting Strategic Responses to Adversity. *Academy of Management Journal*, 57(5), 1406–1433. <https://doi.org/10.5465/amj.2012.0454>
- Powell, E. E., & Baker, T. (2017). In The Beginning: Identity Processes and Organizing in Multi-Founder Nascent Ventures. *Academy of Management Journal*, 60(6), 2381–2414. <https://doi.org/10.5465/amj.2015.0175>
- Siegel, D. S., & Wright, M. (2015). Academic Entrepreneurship: Time for a Rethink? *British Journal of Management*, 26(4), 582–595. <https://doi.org/10.1111/1467-8551.12116>
- Sieger, P., Gruber, M., Fauchart, E., & Zellweger, T. (2016). Measuring the social identity of entrepreneurs: Scale development and international validation. *Journal of Business Venturing*, 31(5), 542–572. <https://doi.org/10.1016/j.jbusvent.2016.07.001>
- Stryker, S., & Serpe, R. (1994). Identity Salience and Psychological Centrality: Equivalent, Overlapping, or Complementary Concepts? *Social Psychology Quarterly*, 57, 16–35.
- Tajfel, H. (1974). Social identity and intergroup behaviour. *Social Science Information*, 13(2), 65–93. <https://doi.org/10.1177/053901847401300204>
- Tartari, V., Perkmann, M., & Salter, A. (2014). In good company: The influence of peers on industry engagement by academic scientists. *Research Policy*, 43(7), 1189–1203. <https://doi.org/10.1016/j.respol.2014.02.003>
- TU9 German Institutes of Technology e.V. (2022). TU9-Positionspapier: Transfer neu denken – Ein Innovationsökosystem auf nationaler und europäischer Ebene. https://www.tu9.de/media/download/tu9-pp_2022-02_innovationsoekosystem_de.pdf
- Wagenschwanz, A. M. (2021). The Identity of Entrepreneurs: Providing Conceptual Clarity and Future Directions. *International Journal of Management Reviews*, 23(1), 64–84. <https://doi.org/10.1111/ijmr.12241>
- Wang, M., Soetanto, D., Cai, J., & Munir, H. (2022). Scientist or Entrepreneur? Identity centrality, university entrepreneurial mission, and academic entrepreneurial intention. *The Journal of Technology Transfer*, 47(1), 119–146. <https://doi.org/10.1007/s10961-021-09845-6>
- Wry, T., & York, J. G. (2017). An Identity-Based Approach to Social Enterprise. *Academy of Management Review*, 42(3), 437–460. <https://doi.org/10.5465/amr.2013.0506>
- Wry, T., & York, J. G. (2019). Blended Colors or Black and White? Avoiding Dichotomous Thinking in Identity and Entrepreneurship. *Academy of Management Review*, 44(1), 215–219. <https://doi.org/10.5465/amr.2018.0111>

17.2 International Soft Landings Program: A Model for Transnational and University Collaboration for the Expansion of SDG missioned Firms Across Borders

Michael Clouser¹

¹Cornell University Ithaca, New York, USA; Universidad EAFIT Medellin, Colombia; The Startup Race Ltd. Edinburgh, Scotland.

PURPOSE

The purpose of this case study is to tell a developing story of an innovative new International Soft Landings program, and to explore the opportunity for entrepreneurial universities and governments to implement new models for hosting and assisting expanding scaleup level firms with the benefits of knowledge transfer, spillover, foreign direct investment and economic development. Such global growth ventures will also deliver on the UN's SDGs under such programs for sustainability.

Arguably the first international soft landings program was delivered by Jim Robbins in San Jose, California, the heart of Silicon Valley, at the turn of the century. Over the last 20 years the sector has expanded rapidly, driven through efforts of promotion, education and certification by the International Business Incubation Association (InBIA) and other economic development organizations. Soft Landings Programs are now imbedded in engaged university incubators such as those based at Georgia Tech, Rutgers, University of Arizona, University of Florida and University of Central Florida. Governments, NGOs and private companies have also launched soft landings programs in recent years including ETC, and the Idea Foundry of Pittsburgh, Pennsylvania USA. The protagonist in the case is The Startup Race Ltd, a virtual international accelerator based in Edinburgh, Scotland, UK, which is a growing and internationalizing company and is currently striking multiple university strategic partnerships. The case will examine the development and strategy of its international soft landings program, a first in class that is transnational with multiple university and government partnerships, reaches emerging markets and developing nations, and focuses on the internationalization of firms that imbed sustainable missions and contribute to one or more of the SDGs.

DESIGN / METHODOLOGY / APPROACH

Empirical research using qualitative and action research methods including field research, semi-structured interviews, textual analysis. As he is imbedded in the international soft landings program of the subject firm itself, the researcher is able gather data from stakeholders, experiment, and involve others on the team to in the exploration. This work builds upon the literature surrounding incubation (Main 2016), entrepreneurial networks and the use of new technologies for the related delivery of virtual services (Papagiannidis 2009). Exploration of existing university-based international soft landings program models will be conducted, along with the needs of internationalizing firms that have sustainability aspirations in their missions. Interviews with the leaders and managers of university programs, economic development agencies, government stakeholders and private sector incubators and accelerators will form the basis of a robust case study and story.

FINDINGS OR EXPECTED OUTCOMES

New model for international soft landings programs for university and governments.

Developed will be an incubation model that is without precedent as it is transnational with multiple university partnerships, including those in emerging economies, and operates virtually in a global context.

The case will uncover university perspectives on the benefits and drawbacks of collaboration with or building international soft landings programs. A set of university incubation programs that are certified by the InBIA will be interviewed, along with other universities in developed and developing countries that are considering soft landings programs. Such nations include Colombia in South America, a new OECD member. Also, perspectives from high-growth businesses with a focus on delivering against one or more SDGs that are planning or embarking on international expansion.

An exhibition of a new model of soft landings through a real, operating, for-profit business that is virtual, collaborative and transnational and includes partners in emerging economies and also has a focus on high-growth sustainable business incubation. Lessons from various models such as the US Market Access Center (USMAC) in Silicon Valley, the Environmental Business Cluster in San Jose, CA, the Michigan Economic Development Corporation, The Scottish Technology

Ecosystem Fund, Scottish Development International, and GrowFL will be incorporated along with the other examples that have leveraged new technologies for services and scaleup business education.

ORIGINALITY / VALUE

Most of the work thus far has been focused on university incubation and acceleration of new technology and sustainable startups and spinouts. However, little has been accomplished in the area of international soft landings. Coverage in the literature has included franchise locations (Yo-Sho) and expanding, "Israeli Model" incubators in Silicon Valley (Mencin 2009). But in general, the publishing of scholarly work has been light in this sector of incubation. The soft landings program saw its official recognition and launch with the International Business Incubation Association in 2011 (InBIA 2011). The organization has since expanded its services and has a dedicated website for its Soft Landings members which aligns with its certification of such programs. This case study will include a series of open-ended questions for students of business, higher education, sociology and other disciplines, thus lending itself well to the case study method of teaching. Included will be strategic ponderings such as "What should the Startup Race do with its soft landings model? What universities should be partnered with and why? How should the company enter emerging markets and partner with universities and governments in emerging economies? How can sustainability and SDGs be built into the business models and missions of globally expanding firms? What are the benefits of soft landings programs to universities and their stakeholders? How can soft landings programs benefit the local community, sustainability, and foreign direct investment and economic development in a region? What needs of expanding international firms should the program managers focus on, and how might they deliver on satisfying those needs? What education might the scaling company executives need, and how might The Startup Race deliver this knowledge using eLearning? What are the possible business models that The Startup Race Ltd. might design for the international soft landings program, and what are the benefits and drawbacks of them?"

An interactive case website (Wordpress) will be built as part of this project. It will enable public interaction and discussion board in answering the above questions or more. This feedback will be utilized by the Startup Race through its modeling and execution of the international soft landings program.

The plan for the future of this case involves further development including a video-based case to be filmed this summer in Scotland and Estonia, along with the leveraging of audio to create a podcast of one hour in length. The written case study will be distributed through such channels as HBS and the Case Centre. The video and audio products through various channels including YouTube, Twitter, TikTok, LinkedIn, Soundcloud, and blog posts.

PRACTICAL / SOCIAL IMPLICATIONS

Model for internationalizing and expanding sustainable business models that address the SDGs. University collaboration, knowledge transfer, foreign direct investment and economic development will result from implementations by universities, governments and hybrid organizations.

KEYWORDS (3-5)

Internationalization, acceleration, incubation, soft landings, sustainability.

REFERENCES

Case Centre <https://www.thecasecentre.org/>
 GrowFL <https://growfl.com/>
 Idea Foundry in Pittsburgh, Pennsylvania USA <https://www.ideafoundry.org/>
 International Business Innovation Association (InBIA), International Soft Landings <https://inbia.org/global-programs/soft-landings/>
 Environmental Business Cluster <https://www.azocleantech.com/>

[suppliers.aspx?SupplierID=211](https://grow.gatech.edu/softlandings/suppliers.aspx?SupplierID=211) Georgia Tech Soft Landings <https://grow.gatech.edu/softlandings/>
 James Robbins <https://www.linkedin.com/in/james-robbins-7a050219/details/experience/> HBS Case studies <https://hbsp.harvard.edu/cases/>
 Mencin, O and Erickson, C (2009) "Silicon Valley's US Market Access Center: The Incubator as a Soft Landing Zone", The International Journal of Entrepreneurship and Innovation, Vol 10, issue 3
 Mian, S, Lamine W, Fayolie A "Technology Business Incubation: An Overview of the state of knowledge", Technovation, Vols 50-51, pp 1-12
 Michigan Economic Development Corporation <https://www.michiganbusiness.org/> OECD – Colombia <https://www.oecd.org/colombia/>
 Papagiannidis, Li, Etkowitz and Clouser (2009) "Entrepreneurial Networks : A Triple Helix Approach to Brokering Human and Social Capital", Journal of International Entrepreneurship, Vol 7, pp 215-235
 Scottish Development International <https://www.sdi.co.uk/>
 Scottish Technology Ecosystem Fund <https://www.gov.scot/publications/scottish-technology-ecosystem-review-ecosystem-fund/>
 The Startup Race Ltd. <https://thestartuprace.com/>
 University of Arizona – Soft Landing <https://techparks.arizona.edu/university-arizona-center-innovation-earns-soft-landing-designation-serve-international-companies>
 University of Central Florida – Soft Landing <https://incubator.ucf.edu/soft-landing/>
 University of South Dakota, Soft Landings <https://blogs.und.edu/uletter/2010/06/center-for-innovation-designated-as-soft-landings-international-incubator-2/>
 Wordpress <https://wordpress.com/>
 Yo, Sho, Watson, Azevedo (2014), E-Strategy and Soft Landings for Franchising in Emerging Markets, Trends in E-Services, E-Businesses and E-Commerce, IGI Global

17.3 Technological Parks in Brazil: a study of official papers and legislation

Helano Diógenes Pinheiro¹, Felipe Moura Oliveira², Laércio de Matos Ferreira³, Marina Bezerra da Silva⁴

¹Piauí State University Brazil, ² Federal University of Ceará, Brazil, ³ Aveiro University, Portugal, ⁴ Federal Institute of Piauí, Brazil

PURPOSE

The paper analyzes the recent diffusion of the Technology Parks model in Brazil based on documents referring to the Programa Nacional de Inovação (PNI) legislation and the evaluation report of the Brazilian experience produced between 2002 and 2022. Policy, whose normative instruments succeed each other from MCT Ordinance No. 715/2002, which institutes the Programa Nacional de Apoio às Incubadoras de Empresas - PNI, until the recent publication report in 2022. The PNI remains an active program for throughout the period, encompassing 05 governments of different ideologies, with changes in the design and composition of its management structure to contemplate different entities and visions regarding the parks. In the case of the reports, taken together, they make it possible to question the existence of a linear policy. The MCTI document; CDT/UNB (2014) registers adherence of 20 initiatives in the period from 2007 to 2013, but with parks considered in operation not being listed in the 2013 survey. Of the 94 initiatives present in 2013, 67 were included in the report ABDI/ANPROTEC (2008), with 07 non-compliant initiatives in the period of 05 years. The same occurs in other surveys, such as that of 103 enterprises in 2017 (CDT/UNB & MCTIC, 2019), which was encouraged for 93 technology parks identified in 2021. The inconsistencies between the different survey results are reported by the report themselves. presented, being attributed, in general, to the metrics adopted or even to the taxonomy referring to the technology parks. Because it is a heterogeneous experience that depends on a learning curve, there would be an increasing complexity of innovation policy that requires capturing elements related to regional practice (Arrona & Zabala-Iturriagagoitia, 2019). Due to its contextual role, a possible discrepancy for the number of initiatives in each region of Brazil reported in the reports may mean a difficulty in replicating general models.

DESIGN / METHODOLOGY / APPROACH

It works as an exploratory study, using documentary research based on information from a secondary source (Michel, 2009), verifying in-depth qualitative analysis (Olsen, 2015). Hansson (2007) draws attention to the limitations of macro studies, focused on survey research, however, in this study, the Brazilian experience in the period 2002-2022 evolution is analyzed by the increasing of legislation referring to technology parks and by reports produced by different institutions, demands by the Ministério da Ciência e Tecnologia (MCT) of Brazil, accessed at the National Association of Entities Promoting Innovative Enterprises (ANPROTEC) electronic address, which keeps records of the different studies produced in the period.

FINDINGS OR EXPECTED OUTCOMES

The reports reveal the public policy implementation that doesn't always materialize in practice. The documents indicate the technology parks in Brazil implementation has a local dynamic that is difficult to be fully understood. Such evidence is given by the quantitative differences between the 2008, 2014, 2019 and 2021 reports, which involve not only growth, but setbacks in park indicators, with parks considered operational, at one point, not necessarily appearing in the following survey, signaling inconsistencies. Macro surveys don't allow a full performance of technology parks understanding, however they indicate discrepancies that may be associated with the local context and the lack of a standardized taxonomy for parks. It is necessary to evaluate the construction of regional policies considering local aspects, through more immersive research.

ORIGINALITY / VALUE

This paper revisits the need of the recent trajectory of incentive programs for technology parks, in order to identify methodological gaps that can guide future researches that effectively contribute to guide the development of parks connected with the scientific and entrepreneurial base of the region.

PRACTICAL / SOCIAL IMPLICATIONS

Contemplating a period of 20 years, the research allows identifying successful experiences and inferring about possible failures in park initiatives, due to framing problems or disregard of the local context. This overview makes it possible to identify the possibility of outlining or revising intervention strategies that are more connected with the socio-economic specificities and territory development objectives.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

As a limitation of this study, is possible to note that it is an essentially exploratory approach, which allows important reflections on the panorama of the policy for the implementation of parks in Brazil, but which does not generate new data for the analysis of these environments in the country. For future research, it is intended to develop qualitative studies, with greater depth of specific sensations, for which the inferences of this study will contribute to a more immersive procedure in the park, exploring their experiences and moments and capturing the learning process of each experience, to then make associations to models and policies.

KEYWORDS (3-5)

Technological Parks, Programa Nacional de Inovação, Innovation.

REFERENCES

- ANPROTEC. (2008). Portfólio de Parques Tecnológicos no Brasil. Brasília, DF/BR. Available on: https://anprotec.org.br/site/wp-content/uploads/2020/06/portfolio_versao_resumida_pdf_53.pdf. Accessed in jan/2023.
- Arrona, A.; Zabala-Iturriagagoitia, J. M. (2019) On the study and practice of regional innovation policy: the potential of interpretive policy analysis, *Innovation: The European Journal of Social Science Research*, 32:1, 148-163, DOI:10.1080/13511610.2018.1528141.
- BRASIL. Ministério da Ciência, Tecnologia, Inovações e Comunicações. (2019) Estudo de Projetos de Alta Complexidade: Indicadores de Parques Tecnológicos. Brasília: Centro de Apoio ao Desenvolvimento Tecnológico (UnB). Available on: <https://anprotec.org.br/site/wp-content/uploads/2021/08/MCTIC-UnB-ParquesTecnologicos-Portugues-final.pdf>. Accessed in Jan/2023.
- MCTI; CDT/UNB (2014) Estudo de Projetos de Alta Complexidade: indicadores de parques tecnológicos / Centro de Apoio ao Desenvolvimento Tecnológico. Ministério da Ciência, Tecnologia e Inovação – Brasília: CDT/UnB, 2014.
- HANSSON, F. (2007). Science parks as knowledge Organizations – the “ba” in action? *EJIM - European Journal of Innovation Management* Vol. 10 No. 3. pp. 348-366.
- Michel, M. H. (2009) Metodologia e pesquisa científica em ciências sociais: um guia prático para acompanhamento da disciplina e elaboração de trabalhos monográficos. 2a ed. São Paulo: Atlas.
- Olsen, W. (2015). Coleta de dados: debates e métodos fundamentais em pesquisa social. Porto Alegre: Penso.

17.4 Integration of knowledge silos in an emerging economy leveraging digital clusters – Creating a Case for Nigeria

Taofeeq Ashiru¹, Gladys Ehindola², Lowell Ufot³

¹CypherCrescent, Nigeria, ² Obafemi Awolowo University, Nigeria.

PURPOSE

The use of digital platforms to create and share value has been a growing trend in many advanced economies, though yet to be fully tapped in emerging economies such as Nigeria. With its abundance of natural resources and knowledgeable people working on various initiatives, Nigeria has the potential to make great strides in improving its economy through the use of digital platforms.

The purpose of the paper is to showcase how CypherCrescent, an indigenous digital technology company, is planning to utilize the digital platform business model to bring together the different knowledge clusters in the country by connecting individuals, academic institutions, and government agencies with varying areas of expertise. Thereby fostering collaboration and creating a knowledge-sharing network that will help drive innovation and economic growth.

DESIGN / METHODOLOGY / APPROACH

The organization is applying the theory of network business models, which according to Currier (2019), aims to leverage the internet and related digital spaces to bring together different players on digital platforms to form relationships between multiple participants to collaborate and optimize the flow of data/information that will lead to value creation for all parties thereby leading to network-effects.

FINDINGS OR EXPECTED OUTCOMES

The platform has the potential to address the 17 United Nations' sustainable development goals by allowing seamless collaboration between stakeholders to address local and national challenges using global/local (GLOCAL) perspectives and knowledge.

ORIGINALITY / VALUE

Nigeria has one of the best network coverage and infrastructure for mobile connectivity in Africa, with 38.73% internet user penetration in 2022 and projected to increase to 48.11% in 2027 (Statista, February, 2023). With a population estimated to be around 216.7 million as of 2022, the knowledge platform will help create a conducive environment for innovation (Statista, March 10, 2022).

As of 2023, the Nigerian federal ministry of education listed 170 universities in Nigeria. 79 private, 43 federal universities, and 48 state universities. According to Fatherprada, the student counselor group, about 69 research institutes in Nigeria cover various areas of human endeavour.

The Nigerian federal ministry of civil service commission listed 1,316 government ministries and agencies in the country. There are various private organizations in Nigeria, with silos of activities in combination with government institutions and academia, which is apparent in the number of 5,380 patents, 103,462 trademarks, and 9,621 industrial design applications filed between 2012 to 2021 (WIPO, 2022).

Indeed, harnessing all the listed knowledge silos and beyond can solve some of the country's pain points and create values such as speed to market, collaborations, succession planning, knowledge transfer, gaining new perspectives, cost reduction, and mentorship opportunities.

PRACTICAL / SOCIAL IMPLICATIONS

The platform has the potential to de-cluster the knowledge silos in the country by encouraging Public, Private, Partnerships, and usage of the triple helix model of innovation. Such interaction will foster effective policymaking that will create an enabling environment for co-creation with implications for multiple benefits to the national and international communities.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

This paper presents an urgent need for more trust- building, value creation, and sharing within the digital space to build a collaborative community. Getting policymakers on board can address problems associated with knowledge silos, thereby developing shared communities leading to network effects. The snowball effects of the

collaborative efforts can be replicated across Africa.

KEYWORDS (3-5)

Knowledge clusters, Digital platforms, Network-effects.

REFERENCES

- Currier, J. (2019). The Network Effects Bible. Retrieved February 11, 2023, from, <https://www.nfx.com/post/network-effects-bible>
- Digital & Trends (February 2023). Internet Usage in Nigeria as of 2023. In Statista. Retrieved February 14, 2023, from <https://www-statista-com.eu1.proxy.openathens.net/study/82964/internet-usage-in-nigeria/?locale=en>
- Fatherprada, Student Counselor, List of all the Research Institute in Nigeria. Retrieved February 14, 2023, from <https://fatherprada.com/info/69-list-of-research-institutions-in-nigeria/>
- Federal Ministry of Education. (February 6, 2023). Number of universities in Nigeria as of 2023, by ownership [Graph]. In Statista. Retrieved February 14, 2023, from <https://www.statista.com/statistics/1130701/number-of-universities-in-nigeria/?locale=en>
- Nigerian federal ministry of civil service commission. Retrieved February 14, 2023, from <https://www.fedcivilservice.gov.ng/mdas?d=1&page=14#>
- World Population Review. (March 10, 2022). Population of Nigeria in selected years between 1950 and 2022 [Graph]. In Statista. Retrieved February 14, 2023, from <https://www.statista.com/statistics/1122838/population-of-nigeria/?locale=en>
- World Intellectual Property Organization, WIPO, 2022 Statistical Country Profiles. Department for Economics and Data Analytics. Retrieved February 14, 2023, from https://www.wipo.int/ipstats/en/statistics/country_profile/profile.jsp?code=NG

17.5 Technology parks in Brazil: an analysis of the performance evaluation

Adriana Ferreira de Faria¹, Jeruza Alves Haber¹, Andressa Caroline De Battisti¹, Marcelo Gonçalves do Amaral², Andréa Aparecida da Costa Mineiro³
¹Federal University of Viçosa, Brazil, ² Federal University of Niteroi, Brazil, ³ Federal University of Itajubá, Brazil.

PURPOSE

Technology parks represent a worldwide phenomenon for promoting innovation and technological development. The inconclusive results on the parks' contribution lead to the need to obtain detailed information about when, how and why the parks provide value-added contributions, considering their heterogeneous nature. This work aimed to develop a systemic framework, suitable to understand the nature and dynamics of technology parks in Brazil, through qualitative and quantitative combined methods, which allowed the analysis of the determinants of performance evaluation in the settlement process.

DESIGN / METHODOLOGY / APPROACH

This study is characterized as a qualitative and quantitative combination of research methods, defined as combined exploratory, carried out in two phases. The qualitative approach is carried out first, with the aim of exploring the research topic in order to provide subsidies for the quantitative phase. Thus, a survey was carried out with technology parks in Brazil, at different stages of development (operation, implementation and planning). The general information questions of the survey about the parks, since the creation of the park until 2021, were answered by 7 parks under planning, 19 parks under implementation and 57 technology parks in operation, and specific questions of the survey about innovation, economic and finance indicators, from 2017 to 2021, were answered for 40 technology parks in operation.

The survey collection instruments were developed considering the success factors in the literature for technology parks and were validated through multi-case analysis, with 19 technology parks. Then, a descriptive data analysis was developed to build a framework about technology parks in Brazil. For the present study, with regard to technology parks, the critical success factors were listed as prerequisites, parameters or determinants for the viability of these environments in fulfilling their mission as a promoter of technological and economic development.

FINDINGS OR EXPECTED OUTCOMES

The first technology park in Brazil was created in 1983. Until December 2021, 102 technology park initiatives in Brazil were identified by the researchers, with 61 technology parks in operation, 23 parks in the process of being implemented and 18 parks in the initial planning stage. According to the data presented in this study, in 2021, Brazil had 57 technology parks in operation that generated more than 40 thousand jobs by their tenant companies. By the year 2000, there were about 379 tenant companies, and in January 2023 the statistics show 2.321 companies within Brazilian parks.

In terms of the land ownership, about 42% of technology parks in operation were located on the university land, 22% of the parks have their own land, 20% of the parks are based on the City Hall land, 7% are established on the Federal Government land, another 4% on the State Government land and the land of 5% of technology parks belongs to Associations. In any of the legal models presented by the parks in Brazil, it is necessary to have councils or other bodies for collegiate decision making, with representatives from different sectors, reflecting the nature of the parks as intermediate organizations, strongly influencing the university-business-government relationship and balancing the interests and objectives of the different stakeholders, as a Triple Helix Model. In 2021, universities made up the boards of 100% of the technology parks in operation, followed by the Municipal Government (83%), Business associations (66%) and State government (54%). This governance process, which is a parks' critical success factors, established by collegiate decision making, permits the stakeholders alignment and the focus in decision making process.

The results showed that technology parks in Brazil are young (age of the park) and small (number of tenant companies), with a financing deficit, which had as a major challenge the attraction of companies for their environment, in particular anchor companies. The south and southeast regions comprise 79% of the technology park initiatives in Brazil. This spatial pattern seems to reflect the economic conditions of

the region. The number of tenant companies is an important variable in the park's performance, and is usually the main metric for stakeholders, as in addition to contributing to the park's primary mission, social and economic development also impacts the parks' financial sustainability. The results showed that the dissemination of technology parks in Brazil has encountered relevant challenges, in particular the scarcity of resources for expansion and improvement of infrastructure and difficulty in attracting companies.

ORIGINALITY / VALUE

The results presented here represents a systemic framework about the evolution, dissemination, dynamic and results of technology parks in Brazil, throughout its history, which can instruct park managers and public agents to make factual decision, from quantitative and qualitative information, which allows the understanding of the main challenges and bottlenecks for the development and success of technology parks in the country. Another element worth mentioning is that a competitive intelligence platform was developed by the researchers with the aim to collect, integrate and monitor technological parks in Brazil, their tenant companies and other resident organizations, over time. This platform, called MCTI-InovaData-BR, and this study were established with the financial support from the Ministry of Science, Technology and Innovations (MCTI) of the Brazilian government. It is expected that the platform will help the government and decision makers formulate strategies, design public policies and identify actions that will stimulate innovation and induce economic development. Free access to MCTI-InovaData-BR is available at: <https://www.inovadata-br.ufv.br/>.

PRACTICAL / SOCIAL IMPLICATIONS

The results demonstrate the importance of technology parks in Brazil and the need to maintain public policies in the long term, in order to increase the size of parks, in terms of concentration of new technology-based companies, and attraction of anchor companies, generating jobs and income qualified. It is estimated that technology parks in Brazil made investments of the order of 5,63 billion reais until 2021, and they need more 5 billion reais. So, it is expected that the correct understanding of the context of technology parks, as developed in this study, allows the proposition of actions, management and governance models, as well as public policies, which can contribute not only to the success of these ventures, but can also help with the leverage of technological innovation, country's competitiveness and consequently improvement of the Innovation Index of Brazil.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

There is a clear need for more systemic approaches, supported by analytical and statistical references, which can be applied in a practical way by various stakeholders of the technology parks. The continuity of studies and research, initiated in this work, with the support of MCTI-InovaData-BR, as a strategic tool, with the due provision of data by the technology parks, will allow a proposition of increasingly assertive strategic actions in the long run.

KEYWORDS (3-5)

Technology park; Innovation policy; Economic development; Triple Helix.

REFERENCES

- Albahari, A., Barge-Gil, A., Pérez-Canto, S., & Modrego, A. (2018). The influence of science and technology park characteristics on firms' innovation results. *Papers in Regional Science*, 97(2), pp. 253-279. doi:10.1111/pirs.12253
- Albahari, A., Pérez-Canto, S., Barge-Gil, A., & Modrego, A. (2017). Technology parks versus science parks: does the university make the difference. *Technological Forecasting and Social Change*, 116 (C), 13-28. doi:10.1016/j.techfore
- Bellgardt, F., Gohlke, J., Haase, H., Parzonka, R., & Schicketanz, J. (2014). Triple helix and residential development in a science and technology park: the role of intermediaries. *Triple Helix*, 1(10), 1-14.

- Cadorin, E., Klofsten, M., Albahari, A., & Etzkowitz, H. (2020). Science parks and the attraction of talents: activities and challenges. *Triple Helix*, 6(1). doi:10.1163/21971927-00601002
- Cai, Y., & Etzkowitz, H. (2020). Theorizing the Triple Helix model: past, present, and future. *Triple Helix*, 7(2). doi:doi.org/10.1163/21971927-bja10003
- Dabrowska, J., & Faria, A. F. (2020). Performance measures to assess the success of contemporary science parks. *Triple Helix*, pp. 1-43. doi:10.1163/21971927-bja10006
- Etzkowitz, H. (2003a). Innovation in innovation: the Triple Helix of university-industry-government relations. *Social Science Information*, 42(3), 293-337.
- Etzkowitz, H. (2003a). Innovation in innovation: the Triple Helix of university-industry-government relations. *Social Science Information*, 42(3), 293-337. doi:10.1177%2F05390184030423002
- Etzkowitz, H. (2003b). Research groups as 'quasi-firms': the invention of the entrepreneurial university. *Research Policy*, 32, 109-121. doi:10.1016/S0048-7333(02)00009-4
- 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. doi:10.1016/S0048-7333(99)00055-4
- Etzkowitz, H., & Zhou, C. (2018). Innovation incommensurability and the science park. *R&D Management*, 48(1), pp. 73-87. doi:10.1111/radm.12266
- Faria, A. F., Haber, J. A., Battisti, A. C., Dabrowska, J., & Sedyama, J. A. (2022). Technology parks in brazil: an analysis of the determinants of performance evaluation. *Internacional Journal of Innovation*, 10(1), 30-67. doi:10.5585/iji.v10i1.19456
- Faria, A. F., Ribeiro, J. d., Amaral, M. G., & Sedyama, J. A. (2019). Success factors and boundary conditions for technology parks in the light of the triple helix model. *Journal of Business and Economics*, 10(1), 50-67. doi:10.15341/jbe(2155-7950)/01.10.2019/005
- 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. doi:10.1016/j.technovation.2004.03.003
- Johnson, W. H. (2008). Roles, resources and benefits of intermediate organizations supporting triple helix collaborative R&D: The case of Precarn. *Technovation*, 28, 495-505.
- Leydesdorff, L. (2000). The triple helix: an evolutionary model of innovations. *Research Policy*, 29, 243-255. doi:10.1016/S0048-7333(99)00063-3
- Löfsten, H. (2016). Business and innovation resources: Determinants for the survival of new technology-based firms. *Management Decision*, 54(1), 88-106.
- Metcalfe, A. S. (2010). Examining the trilateral networks of the Triple Helix: intermediating organizations and academy-industry-government relations. *Critical Sociology*, 36(4), 503-519.
- Ministério de Ciência, Tecnologia e Inovação (MCTI) & Centro de Apoio ao Desenvolvimento Tecnológico (CDT/UNB). (2014). Estudo de Projetos de Alta Complexidade: Indicadores de Parques Tecnológicos. Brasília: Brasil. Acesso em 30 de March de 2020, disponível em http://www.anprotec.org.br/Relata/PNI_FINAL_web.pdf
- Ministério de Ciência, Tecnologia e Inovação (MCTI). (2015b). Parques tecnológicos e incubadoras para o desenvolvimento do Brasil: propostas de políticas públicas para parques tecnológicos e incubadoras de empresas. Brasília: Brasil. Acesso em 30 de March de 2020, disponível em <http://ppi.certi.org.br/4-PropostasPoliticasPublicasParquesIncubadoras.pdf>
- Ministério de Ciência, Tecnologia, Inovações e Comunicações (MCTIC) & Centro de Apoio ao Desenvolvimento Tecnológico (CDT/UNB). (2019). Indicadores de Parques Tecnológicos: Estudo de Projetos de Alta Complexidade - Fase 2. Brasília: Brasil. Acesso em 30 de March de 2020, disponível em <http://www.mctic.gov.br/mctic/export/sites/institucional/arquivos/MCTIC-UnB-ParquesTecnologicos-Portugues-final.pdf>
- Ribeiro, J. d., Faria, A. F., Freitas, K. A., & Ladeira, M. B. (2019). A balanced scorecard model for science parks. 18(4), pp. 118-135. doi:10.21714/1984-6975FACES2019V18N4ART7232
- Ribeiro, J., Higuchi, A., Bronzo, M., Veiga, R., & Faria, A. F. (2016). A Framework for the Strategic Management of Science & Technology Parks. *Journal of Technology Management & Innovation*, 11(4), 80-90. doi:10.4067/S0718-27242016000400011
- Zhang, Y., Chen, K., & Fu, X. (2019). Scientific effects of Triple Helix interactions among research institutes, industries and universities. *Technovation*, 86, 33-47. doi:10.1016/j.technovation.2019.05.003

17.6 APTENISA Acceleration Program: Government and Spain Science Parks Initiative

Carmen Adán¹

¹La Salle Technova, Spain.

PURPOSE

Identify key metrics and aspects related startups' growth.

DESIGN / METHODOLOGY / APPROACH

Case Study

FINDINGS OR EXPECTED OUTCOMES

Metrics such as the number of jobs created, start-ups formed, and investments realized were identified.

ORIGINALITY / VALUE

Application of Triple Helix Theory.

PRACTICAL / SOCIAL IMPLICATIONS

Regional economic growth.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Some limitations of the data collected; since 32 startups were analyzed, a larger sample is recommended for future research.

ABSTRACT

APTENISA is the Startup ideation and Acceleration Program, a national initiative coordinated by the Association of Science and Technology Parks of Spain (APTE) and ENISA. This program includes a set of programs designed to promote the creation and growth of new technology-based companies and where entrepreneurs are helped from the initial idea to the acceleration phase, validation of the business model and incorporation. Based on the methodologies such as Lean LaunchPad, Business Model Validation and Customer Discovery. Those methodologies were implemented by La Salle Technova Barcelona and the Madrid Science Park; furthermore, both Science Parks were designated as the driving force for the coordination, implementation, and monitoring of the program together with APTE and ENISA. The program was offered to entrepreneurs, students, founders, academics, and the Startup team individual and team support and coaching to build a successful business. APTENISA is co-financed by Enisa, the National Innovation Company, a public capital entity under the Ministry of Industry, Trade and Tourism of the Government of Spain for innovative entrepreneurship. Ten Science and Technology Parks were detected, and more than 100 technology-based business ideas and 32 future Startups will be accelerated. APTENISA program promoted the connection between ten participating parks and the interaction and shared experiences and knowledge. The program was conducted during six months. Each week theoretical concepts were introduced, and practical sessions were held, either in inverted sessions (where participants present in front of the rest of the participants in the program) or in workshops to apply concepts. Additionally, learning based on experiences, such as creative thinking, problem solving and interaction with people, clients and consumers were incorporated. The Lean LaunchPad (LLP) methodology was used to test and develop business models. The (LLP) is based on the scientific method and combines experiential learning with the three components of a successful lean startup: Alexander Osterwalder's "Business Model Canvas", Steve Blank's "Customer Development Model", and Agile Engineering. Lean LaunchPad can be explained by the combination of three elements: Flipped Sessions (Flipped Classrooms): unlike master classes, these sessions are characterized by interaction between the students and the teaching team. Students, in private and before class, prepared the sessions by watching lectures and presentations, and doing readings. They used the "in-class" time to present what they are learning and the results of their weekly client interviews. Each startup team was required to get out of the building and test the assumptions of their business model by meeting with customer contacts each week. Experiential Learning: Far from passive, rote-based learning, this learning is based on creative thinking, problem solving and active interaction with people. Team-based learning, in which students present their findings as a team. They prepared presentations that

become the basis for discussion, brainstorming and proposals for improvement from teachers and mentors, as well as fellow program participants. The beneficiaries of the program learned to structure business models and brainstorm ideas about the various functional areas of the company. They also analysed and searched for customer typologies, contrasting evaluations of the product or service with "the outside".

The Aptenisa accelerator program is a good example of application of Triple Helix Model since it required collaboration between government, industry, and academia. Thirty-two startups were analyzed and metrics such as the number of jobs created, startups created, and investments made were identified. The findings indicate that the Aptenisa program play a crucial role in the success of early-stage companies and can be feasible facilitator of startups growth.

KEYWORDS (3-5)

Acceleration, incubators, startups, public funds.

REFERENCES

1. Albahari, A., Barge-Gil, A., Pérez-Canto, S., and Modrego, A. (2018). The Influence of Science and Technology Park Characteristics on Firms' Innovation Results. *Papers in Regional Science*, 97 (2), pp. 253–279.
2. Bardin, L. (1991). *Análisis de contenido* (Vol. 89). Ediciones Akal.
3. Barnes, T., Pashby, I., and Gibbons, A. (2002). Effective University-Industry Interaction: A Multi-case Evaluation of Collaborative R&D Projects. *European Management Journal*, 20 (3), pp. 272–285.
4. Bercovitz, J., and Feldman, M. (2006). *Entrepreneurial Universities and Technology Transfer: A Conceptual Framework for Understanding Knowledge-based Economic Development*. *The Journal of Technology Transfer*, 31(1), pp. 175–188.
5. Bodas Freitas, I. M., Argou Marques, R., and Mirra de Paula e Silva, E. (2008). *University industry Collaboration and the Development of High- technology Sectors in Brazil*. Georgia Institute of Technology.
6. Bruneel, J., D'Este, P., and Salter, A. (2010). Investigating the factors that diminish the barriers to university–industry collaboration. *Research Policy*, 39 (7), pp. 858– 868.
7. Caldera, A., and Debande, O. (2010). Performance of Spanish Universities in Technology Transfer: An Empirical Analysis. *Research Policy*, 39 (9), pp. 1160–1173.
8. Charmaz, K. (2007). *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. London: SAGE.
9. Chiesa, V., Frattini, F., Lazzarotti, V., and Manzini, R. (2009). Performance Measurement in R&D: Exploring the Interplay between Measurement Objectives, Dimensions of Performance and Contextual Factors. *R&D Management*, 39 (5), pp. 487–519.
10. Colombo, M. G., and Delmastro, M. (2002). How Effective are Technology Incubators? Evidence from Italy. *Research Policy*, 31 (7), pp. 1103–1122.
11. Conti, A., and Gaule, P. (2011). Is the US Outperforming Europe in University Technology Licensing? A New Perspective on the European Paradox. *Research Policy*, 40 (1), pp. 123–135.
12. D'Este, P., and Patel, P. (2007). University-Industry Linkages in the UK: What are the Factors Underlying the Variety of Interactions with Industry? *Research Policy*, 36 (9), pp. 1295–1313.
13. Davey, T., Baaken, T., Galán-Muros, V., and Meerman, A. (2011). *The State of European University-Business Cooperation*. Part of the DG Education and Culture Study on the Cooperation between Higher Education Institutions and Public and Private Organisations in Europe.
14. Davey, T., Meerman, A., Galán-Muros, V., Orazbayeva, B., and Baaken, T. (2018). *The State of University-Business Cooperation in Europe*. Final Report. Luxembourg: Publications Office of the European Union.
15. Ferguson, R., and Olofsson, C. (2004). *Science Parks and the Development of NTBFs—Location, Survival and Growth*. *The Journal of Technology*

Transfer, 29 (1), pp. 5–17.

16. Etzkowitz, H., and Leydesdorff, L. (1998). The Endless Transition: A "Triple Helix" of University-Industry-Government Relations. *Minerva*, 36 (3), pp. 203–208.

17. Hitt, M. A., Ireland, R. D., and Lee, H. U. (2000). Technological Learning, Knowledge Management, Firm Growth and Performance: An Introductory Essay. *Journal of Engineering and Technology Management*, 17 (3/4), pp. 231–246.

18. Perkmann, M., Neely, A., and Walsh, K. (2011). How Should Firms Evaluate Success in University-Industry Alliances? *A Performance Management*, 41 (2), pp. 202–216.

19. Yang, C. H., Motohashi, K., and Chen, J. R. (2009). Are New Technology-based Firms Located on Science Parks really more Innovative? Evidence from Taiwan. *Research Policy*, 38 (1), pp. 77–85.
Measurement System. R&D

17.7 Waste battery recycling patent/article trend analysis: From a knowledge spillover perspective

Junhee Bae¹

¹Korea institute of Geoscience and mineral resources, Republic of Korea.

PURPOSE

Analysis of patents/papers in the field of battery recycling, which is rapidly emerging, and drawing implications in terms of knowledge spillover.

DESIGN / METHODOLOGY / APPROACH

Patent/article trend analysis and data envelopment analysis

FINDINGS OR EXPECTED OUTCOMES

Implications from the perspective of patent/article trends and implications from the perspective of knowledge spillover.

ORIGINALITY / VALUE

As the electric vehicle market continues to grow, the industry related to waste batteries at the end of their life cycle is growing rapidly, and this study presents these R&D trends and future R&D strategic directions.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

There is a lack of data on R&D investment in the waste battery industry. In case of identifying such R&D investment scale, it is necessary to find out the impact of investment on R&D performance (patents, articles) and the actual impact of these outcomes on actual R&D diffusion and application.

KEYWORDS (3-5)

Waste battery recycling technology, Sustainable R&D, Technology trend analysis, Climate change

REFERENCES

- Bae J, Chung Y, Lee J, Seo H (2020) Knowledge spillover efficiency of carbon capture, utilization, and storage technology: A comparison among countries. *J Clean Prod* 246:119003. <https://doi.org/10.1016/j.jclepro.2019.119003>
- Nelson AJ (2009) Measuring knowledge spillovers: What patents, licenses and publications reveal about innovation diffusion. *Res Policy* 38:994–1005. <https://doi.org/10.1016/j.respol.2009.01.023>
- Wang EC, Huang W (2007) Relative efficiency of R&D activities: A cross-country study accounting for environmental factors in the DEA approach. *Res Policy* 36:260–273. <https://doi.org/10.1016/j.respol.2006.11.004>

18

THEORETICAL FOUNDATIONS AND METHODOLOGICAL
APPROACHES FOR TH RESEARCH

18.1 Evolution of Triple Helix, Derived Models, and Other Abstractions

Marcelo Gonçalves do Amaral¹, Andrea Aparecida da Costa Mineiro², Adriana Ferreira de Faria³, Iasmim Ribeiro de Abreu e Costa¹

¹Triple Helix Research Group Brazil / Fluminense Federal University, Brazil, ²Federal University of Itajubá, Brazil, ³Federal University of Viçosa, Brazil

PURPOSE

The research aims to analyze the evolution of Triple Helix as a theory and a movement from 2003 onwards. In addition, it transits between recent metaphors to explain the innovation system that ended up being gathered under the same umbrella.

DESIGN / METHODOLOGY / APPROACH

This research study is essentially an essay based on literature review. The review was not systematic but organized with previous publications about TH model (AMARAL; MINEIRO; FARIA, 2022; MINEIRO et al., 2021; MINEIRO, 2019). The content was also influenced by a TH revisionist moment started in 2019 (CAI; ETZKOWITZ, 2020; LEYDESDORFF; SMITH, 2022). Several authors have been re-discussing the model, its influences, and its gaps, and proposing new arrangements aiming to update the metaphor that best represents the current complexity of the relationships between the economic actors of the second decade of the 21st century (Amaral and Cai, 2021).

FINDINGS OR EXPECTED OUTCOMES

Since it began to be widespread, there have been attempts to include new actors and helices in the original model. Etzkowitz and Leyderdorff were initially quite reluctant to accept such interventions, but later they understood that the model can receive interventions and enhancements. Since then, they have been dialoguing with these new versions, also understanding that science, as an open process, is built interactively and iteratively. Therefore, the research shows variations of the model with three, four, five, and six helices, particularly the Quadruple Helix, Quintuple Helix, and Triple Helix Twins (CARAYANNIS; CAMPBELL; GRIGORODIS, 2021; ETZKOWITZ; ZHOU, 2006; HARDIANTO et al., 2019; AMARAL; CAI, 2022), in addition to theoretical discussions about an infinite number of helices and new syntheses such as EUTOHA and the neo-Triple Helix Model (CARAYANNIS; CAMPBELL, 2022; CAI, 2022), constituting a broad overview of the metaphors of the helix as a way of explaining the behavior of social actors. It also shows practical applications of the model to support users in their development.

ORIGINALITY / VALUE

This work is original in its scope including helices model variations published between 2002 and 2022.

PRACTICAL / SOCIAL IMPLICATIONS

This study is essential for anyone who wants to understand the evolution of the TH model over the last twenty years from a theoretical and practical viewpoint.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

In some respects, the TH model lost the enchantment it had ten or twenty years ago, and many theorists and practitioners moved to more-helix models (AMARAL; MINEIRO; FARIA, 2022; CAI; LATTU, 2022). This movement is related to the search for more adequate explanations for the relationships that take place in the economy and society, but it also has a certain aspect of fad, which science must analyze, but avoid. The emergence of EUTOHA's discussion or neo-Triple Helix Model open new stream for research.

KEYWORDS (3-5)

Triple Helix; Quadruple Helix; Quintuple Helix; Triple Helix Twins, EUTOHA; neo-Triple Helix Model.

REFERENCES

AMARAL, M.; CAI, Y. The Tribology of the Helices: Relations between Triple, Quadruple and Quintuple Helix Models. *Triple Helix*, 9(1):1-5, 2022. <https://doi.org/10.1163/21971927-12340006>
 AMARAL, M.; CAI, Y. The Triple Helix Model and the Future of Innovation: A Reflection on the Triple Helix Research Agenda. *Triple Helix*, 8(2):217-229, 2021. <https://doi.org/10.1163/21971927-12340004>

AMARAL, M.; MINEIRO, A.; FARIA, A. As Hélices da Inovação: Interação Universidade- empresa-Governo-Sociedade no Brasil. Editora CRV, 2022.

CAI, Y. Neo-Triple Helix Model of Innovation Ecosystems: Integrating Triple, Quadruple and Quintuple Helix Models. *Triple Helix*, 9(1):76-106, 2022. <https://doi.org/10.1163/21971927-bja10029>

CAI, Y.; ETZKOWITZ, H. Theorizing the Triple Helix model: Past, present, and future. *Triple Helix*, (7):189-226, 2020. <https://doi.org/10.1163/21971927-bja10003>

CAI, Y.; LATTU, A. Triple Helix or Quadruple Helix: Which Model of Innovation to Choose for Empirical Studies? *Minerva*, 60:257-280, 2022. <http://doi:10.1007/s11024-021-09453-6>

CARAYANNIS, E.; CAMPBELL, D. Towards an Emerging Unified Theory of Helix Architectures (EUTOHA) Focus on the Quintuple Innovation Helix Framework as the Integrative Device. *Triple Helix*, 9(1):65-75, 2022. <http://doi.org/10.1163/21971927-bja10028>

CARAYANNIS, E.; CAMPBELL, D.; GRIGORODIS, E. Helix Trilogy: the Triple, Quadruple, and Quintuple Innovation Helices from a Theory, Policy, and Practice Set of Perspectives. *Journal of the Knowledge Economy*, 2021. <http://doi.org/10.1007/s13132-021-00813-x>

CARAYANNIS, E.; CAMPBELL, D. 'Mode 3' and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46(3-4):201-234, 2009.

CARAYANNIS, E.; CAMPBELL, D. Open Innovation Diplomacy and a 21st Century Fractal Research, Education and Innovation (FREIE) Ecosystem: Building on the Quadruple and Quintuple Helix Innovation Concepts and the "Mode 3" Knowledge Production System. *Journal of Knowledge Economy*, 2:327-372, 2011.

ETZKOWITZ, H.; LEYDESDORFF, L. The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy*, 29(2):109-123, 2000.

ETZKOWITZ, H.; ZHOU, C. Triple Helix twins: innovation and sustainability. *Science and Public Policy*, 33(1):77-83, 2006.

FARINHA, L.; FERREIRA, J. Triangulation of the Triple Helix: A conceptual framework. *Triple Helix Association*, 2013.

HARDIANTO, W.; SUMARTONO; MULUK, M.R. K.; WIJAYA, F. PentaHelix Synergy on Tourism Development in Batu, East Java. *International Journal of Innovation, Creativity and Change*, 10(6):137-149, 2019.

LEYDESDORFF, L. The Triple Helix, Quadruple Helix, ..., and an N-tuple of Helices: Explanatory Models for Analyzing the Knowledge-based Economy? *Journal of Knowledge Economics*, 3(1):25-35, 2012. <https://doi.org/10.1007/s13132-011-0049-4>

LEYDESDORFF, L.; ETZKOWITZ, H. The Triple Helix as a Model of Innovation Studies. *Science & Public Policy*, 25(3): 195-203, 1998.

LEYDESDORFF, L.; SMITH, H. L. Triple, Quadruple, and Higher-Order Helices: Historical Phenomena and (Neo-)Evolutionary Models. *Triple Helix*, 9(1), 2022. <https://doi.org/10.1163/21971927-bja10022>

MINEIRO, A. A Hélice Quádrupla e Quintupla e seus Relacionamentos em Parques Científicos e Tecnológicos Consolidados no Brasil. Doctoral thesis (Business Management), Federal University of Lavras, 2019.

MINEIRO, A.; ARANTES, R.; VIEIRA, K.; CASTRO, C.; CARVALHO, E.; AMARAL, M. Business practices for strengthening the quadruple and quintuple helix: a study using structural equation modeling, *International Journal of Innovation Science*, 2021. <https://doi.org/10.1108/IJIS-02-2021-0049>

MULYANINGSIH, H. Enhancing innovation in quadruple helix perspective: The case of the business incubators in Indonesia. *International Business Management*, 9(4):367-371, 2015. <http://doi.org/10.36478/ibm.2015.367.371>

VIALE, R.; CAMPODALL'ORTO, S. An evolutionary Triple Helix to strengthen academy- industry relations: suggestions from European regions. *Science and Public Policy*, 29(3):154-168, 2002. <http://doi.org/10.3152/147154302781781029>

18.2 Revisiting, Rediscovering, and Rethinking Triple Helix

Marcelo Amaral¹, Marília Schocair²

¹Triple Helix Research Group Brazil / Fluminense Federal University, Brazil, ²São Paulo University, Brazil.

PURPOSE

This research revisits the literature of Henry Etzkowitz and Loet Leydesdorff, mainly published between 1995 and 2003, which presents the central concepts of the Triple Helix. The study aims to present the model, seeking to go beyond the superficial but didactic view of the three superimposed spheres. The model has complexities and subtleties; and, therefore, a more in-depth look at the work of the main authors, their use, and the understanding of the criticisms will help the researchers to have a better comprehension of the theory and how to use it.

DESIGN / METHODOLOGY / APPROACH

This effort is part of a project carried out since 2009 to map production on the topic of university-industry-government linkages and build a database. The TH database is a spreadsheet in MS Excel and has approximately 4,000 items published in all Triple Helix Conferences, Triple Helix Journal, and other sources. This database allows the use of bibliometric analysis techniques and serves to study the evolution of the academic movement. The members of the Triple Helix Research Group Brazil reviewed a considerable part of the existing literature produced on the topic and selected 258 scientific communications, published between 1983 and 2021. Additionally, other documents were accessed, many of them unfinished or original versions of later published papers, collected by the Triple Helix Association. From the analysis of this material, in many cases articles already read and cited and, in other cases, using the floating reading technique, it was possible to select 73 most relevant works. This material has been treated by this research group since mid-2021. Eighteen of these articles were discussed in depth in a master's course and 54 were summarized.

FINDINGS OR EXPECTED OUTCOMES

This paper presents the Triple Helix model, from its antecedents, its central concepts, and the discussions that it influences. Triple helix is based in previous approaches (like university-business collaboration and national innovation system), and it is supported by several theories (like Simmel's social geometry of triads interaction, Gaudens' intermediaries' properties, and Occam's Razors). The model has a neo institutional and neo-Schumpeterian approaches working together to improve the comprehension of innovation phenomena. Thus, it is possible to identify a research agenda based on the most relevant ideas, unfinished ideas, and gaps found. It seems two ways to do that. One in theoretical studies and a second one in comparative case studies across countries. The role of the university in the society and the transformation process to reach an entrepreneurial university; how to measure linkages across actors and spheres; how transform this metaphor in practical tool to be implement in companies and public policies; are questions mapped and open to future research.

ORIGINALITY / VALUE

There are revisionist works by Triple Helix, but essentially done by the main authors themselves. This is the first revisionist work conducted in large scale. It discusses gaps in the model and proposes a research agenda.

PRACTICAL / SOCIAL IMPLICATIONS

It is expected that this study will dialogue with active researchers in the field and attract new brains to advance in theoretical solutions that later allow advances in the real world in search of the prosperity of society. For scholars working on the topic, the paper discusses new horizons for research. Also, it is a good introduction for those who want to know more about the topic. There's no practical or social implication in terms of policy or use of Triple Helix.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

There is a clear lack of practical and useful tools to apply Triple Helix in the public policy and in the companies. In terms of research, there are several peripheral ideas, not developed, such as the movement of

people across the helices as a dynamic element (DZISAH; ETZKOWITZ, 2008) and the transformation of spheres into spaces (ETZKOWITZ; RANGA, 2010). There were efforts to try to position Triple Helix as a recipe for exiting economic crises (RANGA; ETZKOWITZ, 2012), but the lack of more normative and predictive content limited and continues to limit such use. More recently, efforts have been observed to approach topics such as open innovation (LEYDESORFF; IVANONA, 2016) and sustainability (CAI; ETZKOWITZ, 2020). These efforts bring us to the discussion about the inclusion of new helices. Another idea, the financial sector as a helix, appears in the literature due to the relevance of venture capital and state funding in the innovation process. This is a subject that can be further discussed.

KEYWORDS (3-5)

Triple Helix; university-industry-government; entrepreneurial university.

REFERENCES

- AMARAL, M.; MINEIRO, A.; FARIA, A. F. As Hélices da Inovação: Interação Universidade- empresa-Governo-Sociedade no Brasil. Editora CRV, 2022.
- CAI, Y. Neo-Triple Helix Model of Innovation Ecosystems: Integrating Triple, Quadruple and Quintuple Helix Models. *Triple Helix*, 9(1):1-31, 2022. <http://dx.doi.org/10.1163/21971927-bja10029>.
- CAI, Y.; ETZKOWITZ, H. Theorizing the Triple Helix model: Past, present, and future. *Triple Helix*, 7(2-3):189-226, 2020. <https://doi.org/10.1163/21971927-bja10003>.
- DZISAH, J.; ETZKOWITZ, H. Triple Helix Circulation: The Heart of Innovation and Development. *International Journal of Technology Management & Sustainable Development*, 7(2):101-115, 2008. https://doi.org/10.1386/ijtm.7.2.101_1
- ETZKOWITZ, H. MIT and the Rise of Entrepreneurial Science. London: Routledge, 2002.
- ETZKOWITZ, H.; DZISAH, J. Professors of Practice and the Entrepreneurial University. *International Higher Education*, 10-11, 2007. <https://doi.org/10.6017/ihe.2007.49.7989>
- ETZKOWITZ, H.; LEYDESORFF, L. The Endless Transition: A "Triple Helix" of University-Industry-Government Relations. *Minerva*, 36(3):203-208, 1998. <https://doi.org/10.1023/A:1017159001649>
- ETZKOWITZ, H.; LEYDESORFF, L. The Dynamics of Innovation: From National Systems and "Mode 2" to a Triple Helix of University-Industry-Government Relations. *Research Policy*, 29(2):109- 123, 2000. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)
- FARINHA, L.; FERREIRA, J. Triangulation of the Triple Helix: A conceptual framework. *Triple Helix Association*, 2013.
- LEYDESORFF, L. The Triple Helix, Quadruple Helix, ..., and an N-Tuple of Helices: Explanatory Models for Analyzing the Knowledge-Based Economy? *Journal of the Knowledge Economy*, 3(1):25-35, 2012. <https://doi.org/10.1007/s13132-011-0049-4>
- LEYDESORFF, L.; ETZKOWITZ, H. The Future Location of Research: A Triple Helix of University-Industry-Government. *EASST Review*, 15(4):20-25, 1996a.
- LEYDESORFF, L.; ETZKOWITZ, H. Emergence of a Triple Helix of University-Industry-Government Relations. *Science and Public Policy*, 23(5):279-286, 1996b. <https://doi.org/10.1093/spp/23.5.279>

18.3 Econometric Models of Triple and Quadruple Spirals for Solving Applied Problems of Innovative Economy

Nikolay Egorov¹

¹North-Eastern Federal University, Republic of Sakha (Yakutia), Russia.

PURPOSE

Methodology and tools of econometric analysis and assessment of innovative development of economic entities within the framework of the concept of the Triple Helix theory.

DESIGN / METHODOLOGY / APPROACH

The paper presents the methodology and tools of econometric analysis and assessment of innovative development of economic entities within the framework of the concept of the Triple Helix theory. Econometric calculations using this methodology allow for an operational assessment of the level of innovative development of the region and the effectiveness of the contribution of the scientific and educational complex, business and government authorities to the consolidated integral index of innovative development of the region.

FINDINGS OR EXPECTED OUTCOMES

On the basis of correlation and regression analysis within the framework of the Quadruple Helix model, the possibility of predictive assessment of the standard of living of the population of the territory depending on the level of innovative development of the region is shown. The process of performing a quantitative assessment is carried out on the basis of a system of indicators in the innovation and social spheres, which can be adjusted depending on the goals and objectives of the study being solved.

ORIGINALITY / VALUE

Within the framework of the Quad Helix model, the presence of a certain close relationship between the key indicators of innovation activity and civil society has been established, which will allow using the standard regression formula of dependence of the type $y=ax+b$ to model predictive estimates of the impact of innovative development on improving the level and quality of life of the population (on the example of the Republic of Sakha (Yakutia)).

PRACTICAL / SOCIAL IMPLICATIONS

The presented research methodology will improve the level and quality of strategic planning and management of the development of the innovative economy and civil society of countries and macro-regions. The results of the work can be useful to authorities, business structures and scientific and educational organizations for the analysis, prediction of the formation and development of the socio-economic system of territories.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Further research on this topic will be aimed at studying the impact of the results of innovative activities on improving the quality of life of the population in the conditions of digital transformation of socio-economic processes based on the "Quadruple Spiral" model.

KEYWORDS (3-5)

Econometric model, Triple and Quadruple Helix, innovation potential, standard of living of the population.

REFERENCES

- Egorov, N., Babkin, A., Babkin, I., Yarygina, A. (2021). Innovative Development in Northern Russia Assessed by Triple Helix Model. *International Journal of Technology*. Vol. 12(7), pp. 1387-1396. <https://doi.org/10.14716/ijtech.v12i7.5355>.
- Egorov, N.; Pospelova, T.; Yarygina, A.; Klochkova, E. (2019). The Assessment of Innovation Development in the Arctic Regions of Russia Based on the Triple Helix Model. *Resources*. No. 8(2). P. 72. <http://doi.org/10.3390/resources8020072>.
- Egorov, N. (2015). Method of assessment of level of contribution of triple helix participants in innovative development of economy subject. *Helice*. Vol. 4. Issue 2. P. 27-31. http://doi.org/10.17686/sced_rusnauka_2015-1323.

18.4 Visualizing Triple Helix in the Brazilian Context

Eron Passos Andrade¹, Helano Diógenes Pinheiro², Angela Machado Rocha³, Marcio Luis Ferreira Nascimento³

¹Federal University of Recôncavo da Bahia, Brazil, ²Federal University of Piauí, Brazil, ³ Federal University of Bahia, Brazil.

PURPOSE

This work proposes to visualize the Triple Helix through mathematical and statistical techniques considering Brazilian University database.

DESIGN / METHODOLOGY / APPROACH

Initially, the Discursive Textual Analysis (DTA) was adopted to analyze textual data from the abstracts of 48 texts, including articles published in journals, event proceedings and book chapters indexed in the Scopus and Web of Science databases. This was done to qualitatively portray the Triple Helix in the Brazilian context. Then, used exploratory multivariate analyses known as principal component analysis (PCA), in a data set with 12 variables using available data from public universities. In this work is presented a new procedure that takes into account mathematical and statistical tools that could map Triple Helix in a quantitative and integrative way.

FINDINGS OR EXPECTED OUTCOMES

This quali-quantitative approach allowed viewing Triple Helix in terms of its helices, considering the application of different frequency statistical techniques, in addition to multivariate exploratory analyses. The results revealed that interactions between industry and universities are sporadic and limited, and the Brazilian government acted as an intermediary between these two actors, mainly in the elaboration of laws and public policies to promote and finance the technological innovation. As another result, the flow of knowledge and technology has not been sufficient to reach maturity in Triple Helix. Thus, the contributions of Brazilian universities to technological innovation still fall short of the possibilities promoted by the Triple Helix model.

ORIGINALITY / VALUE

This is among the first study to use this approach for technological innovation. In other words, in DTA, based on the frequency of words, it was possible to visualize Triple Helix in the Brazilian context. Likewise, in PCA the helices from Triple Helix theory are visible and grouped. Considering such statistical tools that taking into account industry, academia and government interrelations.

PRACTICAL / SOCIAL IMPLICATIONS

A complex system like the Triple Helix model could be illustrated by figures, presenting industry, academia and government interrelations in Brazil. The present mathematical approach also shed light on traditional and classical analysis on technological innovation studies, offering new possibilities, as minimizing some subjectivities in innovation classification.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Future research could consider larger databases to investigate other institutions and compare with other countries.

KEYWORDS (3-5)

Technological Innovation. Triple Helix. Discursive Textual Analysis. Principal Component Analysis. Brazil.

REFERENCES

Andrade, E. P.; Pereira, J. S.; Rocha, A. M.; Nascimento, M. L. F. (2022). An Exploratory Analysis of Brazilian Universities in the Technological Innovation Process. *Technological Forecasting & Social Change*, 182.
 Andrade, E. P.; Rocha, A. M.; Nascimento, M. L. F. (2023). Triple Helix in the Brazilian Context: The Contribution of Universities to Technological Innovation [Hélice Triplíce no contexto brasileiro: a contribuição das universidades na inovação tecnológica]. *Revista Tecnologia e Sociedade*, 19 (55).
 Camargo, B. V.; Justo, A. M. (2013). IRAMUTEQ: um software gratuito para análise de dados textuais. *Temas em Psicologia*, 21 (2), 513-518.
 Etzkowitz, H., 2008. *The triple helix: University–industry–government innovation in action*, Routledge, London and New York, NY.
 Etzkowitz, H. and Leydesdorff, L., 1997. *Universities in the global*

knowledge economy: A triple helix of academic–industry–government relations. Cassell, London.

Etzkowitz, H. and Zhou, C., 2017. *The triple helix: Innovation and entrepreneurship university–industry–government*. *Advanced Studies* 31 (90), 23-48.

Fávero, L. P. Belfiore P., 2019. *Data Science for Business and Decision Making*. Academic Press, Cambridge.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., 2019. *Multivariate Data Analysis*. Cengage, London.

UFBA - Federal University of Bahia, 2019. Reports, available at: <https://proplan.ufba.br/documentacao-legislacao/relatorios-gestao> (accessed 9 June 2019).

UFPE - Federal University of Pernambuco, 2019. Reports, available at: <https://www.ufpe.br/proplan/relatorios-de-gestao> (accessed 9 June 2019).

UFPR - Federal University of Paraná, 2019. Reports, available at: <http://www.proplan.ufpr.br/portal/relatorio-de-gestao/> (accessed 9 June 2019).

UFRGS - Federal University of Rio Grande do Sul, 2019. Reports, available at: <http://www.ufrgs.br/ufrgs/a-ufrgs/relatorios> (accessed 9 June 2019).

UFSCar - Federal University of São Carlos, 2019. Reports, available at: http://www.spdi.ufscar.br/documentos/relatorio_contas/ (accessed 9 June 2019).

UFV - Federal University of Viçosa, 2019. Reports, available at: <https://www.dti.ufv.br/relatorioufv/> (accessed 9 June 2019).

Unesp - São Paulo State University "Júlio de Mesquita Filho", 2019. *Statistical Yearbooks*, available at: <https://ape.unesp.br/anuario/> (accessed 9 June 2019).

Unicamp - State University of Campinas, 2018. *Statistical Yearbooks*, available at: <https://www.aeplan.unicamp.br/anuario/2018/anuario2018.pdf> (accessed 9 June 2019).

18.5 Arts for future: how arts-based initiatives (ABIs) can contribute to competences for advancing sustainability transformations in scientific working processes

Sophia-Marie Horvath¹, Georg Gratzner¹

¹University of Natural Resources and Life Sciences Vienna, Austria.

PURPOSE

Solutions to global sustainability challenges, such as climate change, conflicts, poverty, biodiversity loss and social inequality frequently lack integration across epistemologies and disciplines. This leads to fragmentation of proposed measures. Complex real-world problems, however, call for creative and broad approaches that require strong sustainability competences. While creativity is acknowledged to be important for finding innovative solutions, it is either not reflected in competence frameworks or subsumed under other competences. Here, we argue that integrating arts and artistic strategies into sustainability research, can facilitate the development and use of certain competences for advancing sustainability transformations in research for sustainable development. Arts have positive impacts on learning (Gullatt 2008), social inclusion and social equity (Durrer 2008) community solidarity and crime reduction (Belfiore and Bennett 2007) as well as the creation of economic benefits. Arts based approaches were found to have positive effects in terms of value creation for sustainable development in each of the three pillars of sustainability, i.e., ecologic, social and economic.

DESIGN / METHODOLOGY / APPROACH

In this contribution, we merged scientific work with arts-based initiatives (ABIs) in so called Sustainability Jam Sessions (SJSs) (Carlsson et al. 2015), where the goal was to promote fresh thoughts and out of the box thinking concerning solution strategies for SDG 15 in Austria. In group discussions at the end of each SJS, the influence of the ABIs on the scientific working process was reflected. Later, the reflections were analyzed following the framework of competences for advancing sustainability transformations with the aim to examine the following research questions: a) Do researchers and practitioners observe an influence of ABIs on their competences for advancing sustainability transformations in scientific working processes? b) Which competences are perceived to be influenced and how?

FINDINGS OR EXPECTED OUTCOMES

In the SJSs, an influence of the ABIs on creativity and critical thinking was observed by the participants in a direct as well as an indirect way (e.g., brokered by emotions, change of perspective, and broadening of horizons). Moreover, including ABIs into the SJSs had positive side effects on the group feeling.

ORIGINALITY / VALUE

In general, our findings support the idea of art creating a more holistic problem understanding through involving emotions and broadening a person's horizon. This can lead to more holistic solutions, especially for complex real-world problems, and can improve their implementation.

PRACTICAL / SOCIAL IMPLICATIONS

The inclusion of arts into scientific processes bears the potential of a more holistic problem understanding, and, by fostering creativity and critical thinking, to more holistic and innovative solutions to these problems. Therefore, it can, as one strategy, help to overcome the science-policy implementation gap.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

For further projects, an inclusion of ABIs more frequently and systematically as well as a more thorough involvement of the arts into transdisciplinary research projects in general (e.g., in the form of artistic research or arts-based methods) could bear a high potential. This, however, remains to be investigated.

KEYWORDS (3-5)

Arts-based initiatives, competences for advancing sustainability transformations, creativity, complex real-world problems, wicked problems.

REFERENCES

- Belfiore, Eleonora; Bennett, Oliver (2007): Rethinking the social impacts of the arts. In *International Journal of Cultural Policy* 13 (2), pp. 135–151. DOI: 10.1080/10286630701342741.
- Carlsson, Anders; Hjelm, Olof; Baas, Leo; Eklund, Mats; Krook, Joakim; Lindahl, Mattias; Sakao, Tomohiko (2015): Sustainability Jam Sessions for vision creation and problem solving. In *Journal of Cleaner Production* 98, pp. 29–35. DOI: 10.1016/j.jclepro.2014.10.041.
- Durrer, Victoria (2008): A Case Study in Policy Delivery: Examining Social Inclusion through Interpretation and Practice. In *Cultural Policy, Criticism and Management Research* (3), pp. 1–31.
- Gullatt, David E. (2008): Enhancing Student Learning Through Arts Integration: Implications for the Profession. In *The High School Journal* 91 (4), pp. 12–25. DOI: 10.1353/hsj.0.0001.

18.6 Understanding the Complexities of University–Industry Collaboration in Iran’s Public Sector

Mohammad Moshtari¹

¹Tampere University, Finland.

PURPOSE

Given that the internal resources of public organizations are not always sufficient to effectively handle their policy and operational challenges, they need external expertise and knowledge and thus often outsource research needs to higher education institutions. The outsourced research projects can have different aims, from identifying and providing suggestions for resolving specific organizational problems to formulating policies and implementation plans with society-wide impact. Such initiatives can improve the awareness of policymakers and citizens, and in addition, may trigger changes in industries by revising the policies or practices of public organizations. However, there is anecdotal evidence of the low impact of collaborative research initiatives: duplicate, scattered, and ineffective projects geared mostly to quick results with high visibility but low impact on socioeconomic problems. Considering research projects as professional services, public organizations and universities face challenges and tensions in different phases of the relationship process such as needs identification, contract design, and quality assessment.

DESIGN / METHODOLOGY / APPROACH

In the present study, we first identify the challenges and then explore the practices of public organizations to mitigate the tensions and unintended consequences of those practices. We conclude by offering several policy suggestions to improve the university–public organization collaboration to increase the quality and impact of research projects and by describing several avenues for future studies on this important topic. In this paper we address the following research questions:

- What challenges are associated with university–public organization collaboration?
- What practices are applied by universities and public organizations to manage those challenges, and what are their unintended consequences?

FINDINGS OR EXPECTED OUTCOMES

The findings suggest three categories of challenges: the contextual characteristics of the public sector in developing countries, public organizations lacking competence in research project administration, and the passive role played by universities. The first set of challenges is related to the lack of acknowledgment in public organizations that there is a genuine need for such services. Productivity is not a central concern of public organizations, and dedicating resources to research collaborations with universities might be justified to garner political support and obtain legitimacy from society. In addition, the practice of allocating research budgets of public organizations in small chunks to large numbers of researchers can be explained with this approach. Overall political instability leads to survival concerns among political groups and managers, leading to management turnover, shifting regulations, and ultimately a short-term perspective on making decisions and allocating resources.

The second set of challenges relates to a lack of competence in public organizations regarding research service procurement and administration. They do not have skills in needs identification, supplier selection, and supplier assessment or the ability to coordinate large projects that involve consortium creation. Operating within highly bureaucratic processes, managers are highly risk-averse and allocate projects to professors with political connections and financial interests. The third set of challenges relates to the lack of an active role for universities. Their governance processes were not crafted to work with partners in civil society; thus, potential partners establish their own research departments and invite professors to collaborate with them there. Universities encourage obtaining external projects and give points for the promotion of faculty members, but they also take 15% overhead, with the rest of the budget under the direction of the professor; universities do not audit how those funds are spent. This lack of transparency allows faculty members to use funds for their personal use and pay low salaries to their research teams, which are often made

up of master’s or doctoral students. Unhealthy competition and poor collaboration among faculty members and universities discourage them from proposing joint research projects or consortiums. This is partly related to professors’ lack of interdisciplinary and social skills. Robust collaboration among professors is also not a criterion for faculty member promotion.

ORIGINALITY / VALUE

University–industry collaboration has been extensively explored in the literature, but less attention has been paid to such collaborations involving the public sector. Although there are challenges common to university collaborations with both the private and public sectors, the public sector requires both transparency of process and high-quality services. In addition, public organizations entail extra complexity rooted in highly regulated contexts and operate in an uncertain environment with significant political influences, especially in developing countries. Understanding these challenges to collaboration is particularly crucial for countries like Iran, where the public sector wields immense power and has taken on duties that are intended to serve wide swaths of society.

PRACTICAL / SOCIAL IMPLICATIONS

The suggestions to improve the quality of university–public organization collaboration includes increasing awareness and inducing long-term views on political decisions, meaningful stakeholder involvement, having third-party agencies to facilitate the collaboration, centralizing procurement processes, and improving the competencies and resources of the decentralized organizations. The suitability of any of the above suggestions requires additional research that includes engagement with public organizations, policymakers, and university administrators. A combination of capacity building in public organizations and universities and formalizing or even centralizing research project administration will facilitate effective collaboration. In addition, developing codes of conduct and improving and digitalizing processes, increasing transparency, and consolidating the funds currently scattered across public organizations would all improve collaboration and its outputs. These improvements can enhance the quality and impact of research projects and academic and practitioner networks, open data to wider use, share information, and increase mutual trust which eventually strengthens inter-organizational collaboration in the public sector.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Our research setting is limited to public organizations that contract for research and consulting services from faculty members affiliated with management and economics departments, in Iran, and therefore the generalizability of findings requires further research.

KEYWORDS (3-5)

Public sector, developing countries, university–industry relationships, the third mission.

18.7 Helix Innovation Models: a Systematic Literature Review with data analysis script by R software

Andréa Aparecida Costa Mineiro¹, Victor Eduardo de Mello Valério¹, Isabel Cristina da Silva Arantes¹, Sandra Miranda Neves¹, Eliana de Fátima Salomon Souza¹

¹Federal University of Itajubá, Brazil.

PURPOSE

Systematic literature review studies have grown as a strategy for understanding certain epistemological fields, considering that these follow specific analysis protocols in order to compile approaches for various documental corpus. This article focuses specifically with a systematic review whose target is to know the state of the art of studies on the Helix (Triple, Quadruple, Quintuple) and to compile theoretical and methodological perspectives for data analysis. In specific terms, the target was: (i) to systematize the findings of the research on helix innovation models to verify the trends in this investigation field; (ii) suggest a methodological framework for systematic reviews; and (iii) propose a data analysis script using the R software. The theoretical-methodological scope involved compiling the studies and providing a real contribution to the scientific field.

DESIGN / METHODOLOGY / APPROACH

This present study is classified as a systematic literature review, of a quantitative nature, with meta-analysis, following the Siddaway, Wood and Hedges (2019) classification. The analytical corpus consisted of available articles on the international databases Web of Science (WOS) and Scopus. The descriptors used for studies selection were: Quintuple_Heli* or Quadruple_Heli* or Triple_Heli* or Forth_Heli* or Fifth_heli* in the "Topic" field, which considers the search in the title, abstract and keywords. As a result, 21,180 documents distributed in the 2 databases were found. The following criteria were adopted: (i) exclusion of articles from the year 2023, because it has not ended (105 exclusions); (ii) exclusion of studies outside the article format (3,455 exclusions); (iii) delimitation by knowledge area - only the areas of Management, Business, Economics, Social Sciences, Environmental Studies and Public Administration were selected (15,378 exclusions), and (iv) exclusion of duplicate articles (697 exclusions), resulting 1,545 papers, which were analyzed by the R software, through pre-programmed operations in the Bibliometrix, which allowed multiple evaluations from different perspectives.

FINDINGS OR EXPECTED OUTCOMES

The results found were presented in seven categories: (i) general theme information; (ii) authors; (iii) articles; (iv) periodicals; (v) countries; (vi) references, and (vii) treated topics. It was found that the articles in the database have an expired date of 6.79 years, with 4,049 keywords, 3,287 authors, an average of 2.93 co-authors per paper and 19.16% of articles have international co-authorship. The authors Leydesdorff, Etzkowitz and Carayannis are the most cited and their works have publication periodicity along the time, however in the last 10 years, there has been the emergence of new authors such as Ferreira, Wang, Grigorouds, Marques and Cai. The outstanding papers are those of Henry Etzkowitz (2000) and Carayannis (2009). The most cited countries are the United States, Belgium and the Netherlands and the driving themes of the sample are Triple Helix, Innovation, Entrepreneurial University, Technology Transfer.

ORIGINALITY / VALUE

In theoretical and methodological terms, the study provides practical orientation for readers regarding how the main data of a systematic review can be found in the R software, helping researchers in their literature analysis. Regarding descriptive information, R adds in relation to the documents time average over time, references consolidation and collaboration among authors. The R contributions in relation to authors and articles stand out in the analysis of local citations and the authors fractional contribution. For journals, the contribution is due to citations impact and historical contributions to the research field. With regard to themes, it is possible to frame them, considering their centrality and density, in addition to the combination of variables such as: (i) journals, authors and keywords; (ii) references, authors and keywords; and (iii) evolution of keywords over the analyzed period.

PRACTICAL / SOCIAL IMPLICATIONS

The paper presents a framework for systematic reviews based on 7 basic steps: (i) definition of problem research and theme demarcation under study; (ii) survey in the literature about the production around the defined theme; (iii) material systematization - selection of articles that reflect the objectives of the study and articles exclusion that deviate from the proposal; (iv) categorization of research findings; (v) data synthesis (meta-analysis); (vi) construction/elaboration of scientific evidence; and (vii) writing and publication of results.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Among the limitations, the use of two bases is highlighted, and the addition of other terms such as N-Tuple Helix is suggested. **KEYWORDS:** Triple Helix; Quadruple Helix; Quintuple Helix; Systematic Review.

KEYWORDS (3-5)

Triple Helix; university-industry-government; entrepreneurial university.

REFERENCES

- Aria, M.; Cuccurullo, C. (2017) bibliometrix: An R-tool for comprehensive science mapping analysis, *Journal of Informetrics*, 11(4), 959-975, Elsevier.
- Carayannis, E. G.; Campbell, D.F.J. (2009). 'Mode 3' and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46, 201-234.
- Carayannis, E. G.; Campbell, D.F.J. (2011). Open Innovation Diplomacy and a 21st Century Fractal Research, Education and Innovation (FREIE) Ecosystem: Building on the Quadruple and Quintuple Helix Innovation Concepts and the "Mode 3" Knowledge Production System. *Journal of Knowledge Economy*, 2, 327-372.
- Etzkowitz, H.; Leydesdorff, L. (1995). The Triple Helix—University-Industry-Government relations: A laboratory for knowledge based economic development. *EASST Review*, 14, 14-19.
- 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 (2), 109-123.
- Leydesdorff, L. (2000). The triple helix: an evolutionary model of innovations. *Research Policy*, 29 (2), 243-255.
- Siddaway, A. P.; Wood, A. M.; Hedges, L. V. (2019). How to do a systematic review: a best practice guide for conducting and reporting narrative reviews, meta-analyses, and meta-syntheses. *Annual Review of Psychology*, 70 (1), 747–770.

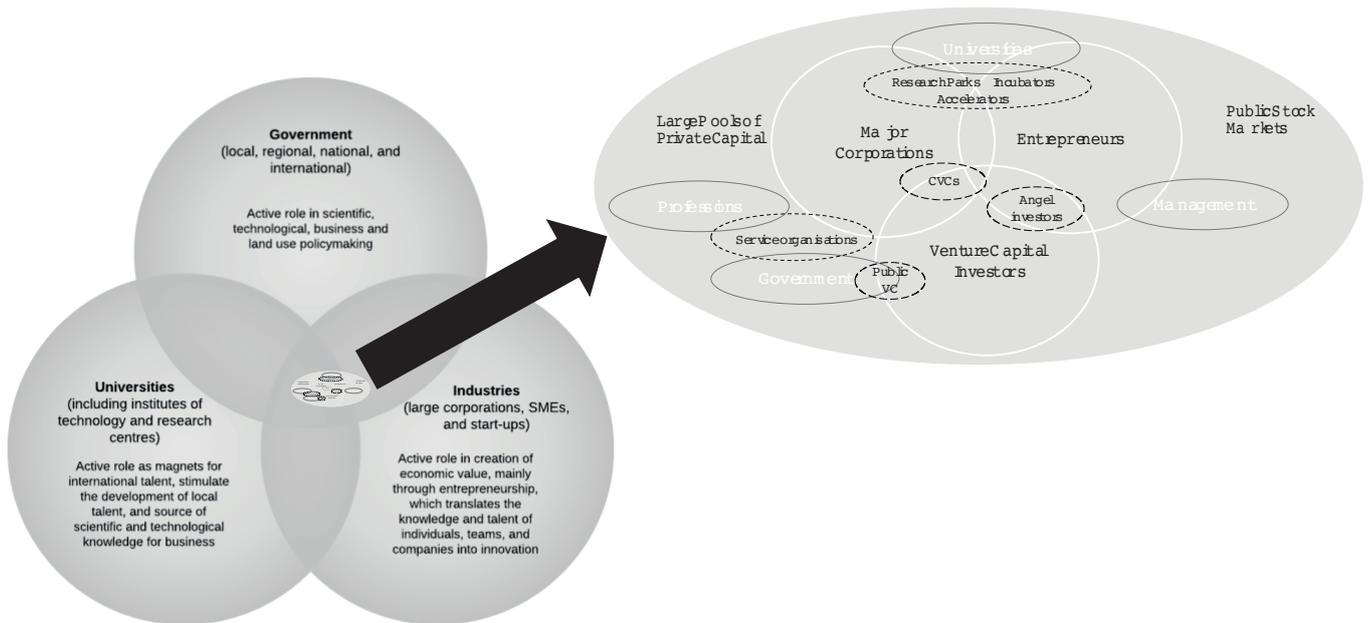
18.8 Triple Helix and Cluster of Innovation approaches combined: exploring a new perspective on industrial value creation

Jerome Engel¹, Jose Miguel Pique², Aline Figlioli³

¹University of California/ Berkeley, USA, ²La Salle - Ramón Llull, Spain ³Ignite Exponential / Plextek, United Kingdom.

PURPOSE

This paper aims at demonstrating how the employment of the Triple Helix (TH) and the Cluster of Innovation (COI) frameworks, when combined, expand the explanatory power of both approaches, providing an accurate and detailed understanding of industrial value creation, in terms of its ecosystem components, culture and behaviors. Its articulation is demonstrated in figure 1.



The Triple Helix (TH) explains economic ecosystems in a generic way, introducing the role of the university as a partner in the industrial process. Its significant contribution is to show the entire relationship between industry, government, and academia (Cai & Etzkowitz, 2020; Leydesdorff & Etzkowitz, 1998).

The Cluster of Innovation (COI) framework looks at such ecosystems through the lens of the contribution of the entrepreneurial process. Specifically, commercialization through new business creation. It is not as broad or all-inclusive approach as the Triple Helix. It is particular in that it identifies the dynamic nature of the entrepreneurial ecosystem- within explicit definition of the culture and behaviors of the entrepreneurial process, where individuals and small teams accrue resources to test new commercial ideas and approaches (Engel et al, 2022).

DESIGN / METHODOLOGY / APPROACH

The paper is based on the analysis of multiple cases (Yin, 2009; Stake, 1995) using the combined framework of Triple Helix and Cluster of Innovation approaches. The two cases selected disclose how the interaction of the components, mainly through their hyper behaviors, assume particular characteristics when new venture creation and scaling are assumed as the basis for industrial value creation.

FINDINGS OR EXPECTED OUTCOMES

Although recent studies stretch the TH model including new dimensions of analysis, as in the Quadruple and Quintuple Helix models (Carayannis & Campbell, 2010), we argue that such dimensions are present in the layers of analysis of the TH approach (Cai, & Etzkowitz, 2020), but the triadic interactions of the main actors, university – government – industry, are the most revealing in terms of understanding the dynamics of the innovation process in ecosystems.

We drill into the layers of TH interactions, employing the COI framework, focusing on new venture creation and scaling. We look at the resources required – such as talent, technology, finance – but go beyond that addressing what we call the hyper behaviours.

ORIGINAL VALUE

It provides a unique zoom in one of the layers of interaction of the TH approach: new venture creation and scaling.

PRACTICAL / SOCIAL IMPLICATIONS

The new combined approach allows the identification of gaps in terms of interactions and behaviors that enable the industrial value creation in the TH ecosystem. This knowledge is relevant for policy makers, in particular those engaged in regional economic development, and theoretical analysis as well.

DIRECTIONS FOR FUTURE RESEARCH / LIMITATIONS

It focuses on one of the layers of interaction of the TH approach: new venture creation and scaling. Other dimensions, such as institutional development and governance, are suggested for future research.

KEYWORDS (3-5)

Triple Helix, Cluster of Innovation, industrial value creation, ecosystem components, behaviors.

REFERENCES

- Cai, Y., & Etzkowitz, H. (2020). Theorizing the Triple Helix model: Past, present, and future. *Triple Helix*, 7(2-3), 189-226
- Carayannis, E. G., & Campbell, D. F. (2010). Triple Helix, Quadruple Helix and Quintuple Helix and how do knowledge, innovation and the environment relate to each other?: a proposed framework for a trans-disciplinary analysis of sustainable development and social ecology. *International Journal of Social Ecology and Sustainable Development (IJSESD)*, 1(1), 41-69.
- Engel, J. (ed) (2022), *Global Clusters of innovation in the age of disruption*, Edward Elgar.
- Leydesdorff, L., & Etzkowitz, H. (1998). The triple helix as a model for innovation studies. *Science and public policy*, 25(3), 195-203.
- Stake, R. E. (1995). *The art of case study research*. Sage.
- Yin, R. K. (2009). *Case study research: Design and methods (Vol. 5)*. sage.

19

EVALUATING THE IMPACT OF TH INITIATIVES

19.1 Efficiency index of Triple Helix relations – network DEA model

Milica Jovanović¹, Gordana Savić¹, Maja Levi-Jakšić¹, Milan Martić¹

¹University of Belgrade – Faculty of Organizational Sciences, Serbia.

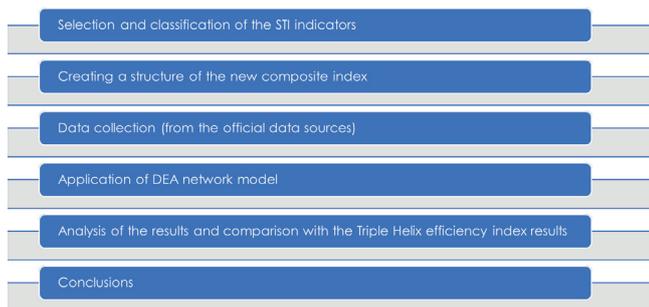
PURPOSE

The purpose of the research is to explore a new model for evaluating performance of Triple Helix actors. The authors will propose another approach to measuring performance of national innovation systems based on the efficiency approach. The aim is to explore if the network model of Data Envelopment Analysis (DEA) approach can assess the strength of the synergy among the Triple Helix actors and rank the observed countries accordingly. The paper will compare the obtained results with the Triple Helix efficiency index results published in Jovanović et al. (2022) and explore another perspective that could be used for creating effective public policies (Park & Stek, 2022).

DESIGN / METHODOLOGY / APPROACH

The approach will continue the research published in Jovanović et al. (2020; 2022). The model will be based on a set of publicly available science, technology, and innovation (STI) indicators to assess performance of 34 OECD countries (OECD, 2020). Indicators will be classified into pillars according to the Triple Helix actors and will be further aggregated by applying network DEA model. DEA approach assesses how successfully entity transforms provided inputs into outputs (Charnes et al., 1978). The latest research used two-phase DEA approach (Jovanović et al., 2022) and this research adapts the methodology by applying network model which, based on the previous application, has more potential in measuring the synergy between the actors (Ouyang & Jang, 2020; Yang et al., 2018; Michali et al., 2021). Tone and Tsutsui (2009) stress out that traditional DEA models neglect linking activities within observed units and propose network DEA model for evaluation of the overall efficiency of the evaluated elements (countries in this case). This support multiple actors' perspective and evaluation of synergetic performance previously evaluated by Leydesdorff (2003) and mutual information approach (Leydesdorff & Strand, 2012; Leydesdorff & Park, 2014, etc).

The design of the research is shown in Figure 1:



FINDINGS OR EXPECTED OUTCOMES

The applied model ranks the observed countries according to the collaboration in STI activities. The results will give the exact measure of the national innovation systems' overall efficiency based on the Triple Helix model and provide quantification of their relationships. Application of DEA network model gives quantitative feedback on the improvements that could improve the national efficiency.

ORIGINALITY / VALUE

This research is another approach to quantification of the Triple Helix relations. Previous application of DEA models (eg. Tarnawska & Mavroeidis, 2015; Jovanović et al. 2022) shown the potential of this methodological approach and gave impetus for its improvement. The approach presented in this paper will be another effort to finding the most suitable approach to measuring performance of the Triple Helix actors.

PRACTICAL / SOCIAL IMPLICATIONS

The model should highlight the gaps within the observed systems

and provide directions to policymakers. Jovanović et al. (2022) shown these models could provide insights into the innovation paradox and identify weak links within the countries. These results could become a valuable tool for policymakers, inputs for smart specialization policy, and provide improvements of decision-making process.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Although this model is scalable at any level (national, regional, or local), due to limitation on data collection, it should be adapted. Further research will try to design the most suitable set of indicators at other levels to provide more insights for lower level of policymakers and examine the specificities of this process at other levels of the economy.

KEYWORDS (3-5)

Triple Helix performance, Data Envelopment Analysis, Composite index, Efficiency.

REFERENCES

- Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2(6), 429-444. doi:10.1016/0377-2217(78)90138-8
- Jovanović, M., Rakićević, J., Jeremić, V., & Levi-Jakšić, M. (2020a). How to Measure Triple Helix Performance? A Fresh Approach. In A. L.-H. Abid Abu-Tair, *Proceedings of the II International Triple Helix Summit. THS 2018. Lecture Notes in Civil Engineering (Vol. 43, pp. 245-262)*. Switzerland: Springer, Cham. doi:https://doi.org/10.1007/978-3-030-23898-8_18
- Jovanović, M., Savić, G., Cai, Y., & Levi-Jakšić, M. (2022). Towards a Triple Helix-Based Efficiency Index of Innovation Systems. *Scientometrics*, 127, 2577-2609. doi:10.1007/s11192-022-04304-x
- Leydesdorff, L. (2003). The mutual information of university-industry-government relations: an indicator of the Triple Helix dynamics. *Scientometrics*, 58, 445-467. doi:10.1023/A:1026253130577
- Leydesdorff, L., & Park, H. W. (2014). Can synergy in Triple Helix relations be quantified? A review of the development of the Triple Helix indicator. *Triple Helix*, 1, 4. doi:10.1186/s40604-014-0004-z
- Michali, M., Emrouznejad, A., Dehnokhalaji, A., & Clegg, B. (2021). Noise-pollution efficiency analysis of European railways: A network DEA model. *Transportation Research Part D: Transport and Environment*, 98(1), 102980. doi:10.1016/j.trd.2021.102980
- OECD. (2020). *Main Science and Technology Indicators*. Retrieved august 15., 2020, from OECD: <http://www.oecd.org/sti/msti.htm>
- Ouyang, W., & Yang, J.-b. (2020). The network energy and environment efficiency analysis of 27 OECD countries: A multiplicative network DEA model. *Energy*, 197, 117161. doi:10.1016/j.energy.2020.117161
- Park, H. W., & Stek, P. (2022). Measuring Helix Interactions in the Context of Economic Development and Public Policies: From Triple to Quadruple and N-Tuple Helix vs. N-Tuple and Quadruple Helix to Triads. *Triple Helix*, 9(1), 43-53. doi:10.1163/21971927-bja10026
- Tarnawska, K., & 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
- Tone, K., & Tsutsui, M. (2009). Network DEA: A slacks-based measure approach. *European Journal of Operational Research*, 197(1), 243-252. doi:10.1016/j.ejor.2008.05.027
- Yang, G.-l., Fukuyama, H., & Song, Y.-y. (2018). Measuring the inefficiency of Chinese research universities based on a two-stage network DEA model. *Journal of Informetrics*, 12(1), 10-30. doi:10.1016/j.joi.2017.11.002

19.2 The challenges and opportunities of work-based learning in an online environment

Thais Fagundes¹, Andre Perusso², Habtamu Garomssa³

¹Fondazionebrodolini, Italy, ² University of Groningen, Netherlands, ³ FH Münster, Germany.

PURPOSE

Research has shown that Work-based learning (WBL) is a powerful pedagogy to foster graduate work readiness (Jackson, 2016; WEXHE, 2019; Perusso & Wagenaar, 2021). While the impact of WBL within the context of an authentic physical work environment is largely explored, our knowledge of its implementation in an online environment (eWBL) remains limited.

The main purpose of this study is therefore to explore the challenges and opportunities of implementing WBL in an online environment.

METHODOLOGY

The research followed a qualitative multicase study approach (Stake, 2013) and tried to analyze 27 cases of online and hybrid WBL offerings across 5 European countries i.e., Germany, Netherlands, Italy, Ireland, and Slovenia. Each case was based on semi-structured interviews conducted with students or alumni participating in an online or hybrid format, a company supervisor and higher education representatives supporting the WBL program. The interviews were recorded and transcribed for analysis. In total, we interviewed 86 participants: 27 representatives of HEIs, 27 internship supervisors at the companies, and 32 students or alumni.

The data analysis adheres to Miles et al. (2014) following an explanatory stance using analytic progression. From the respondents' raw data, we extracted the most relevant concepts. We then grouped these concepts according to their contribution to the dimensions we wanted to investigate: (i) How WBL was provided before COVID-19, (ii) the challenges encountered in shifting to eWBL, including the implications of WBL on learning outcomes (soft skills, practical experience, networking, and workplace culture), and (iii) the alternatives/solutions found.

PRELIMINARY FINDINGS

The study showed that the lower distraction and the high flexibility (e.g. less commuting time, flexible working hours) of eWBL generally resulted in higher intern productivity. Moreover, company representatives highlighted that eWBL expands the possibility of talent acquisition, which translates into greater competitiveness for companies.

Furthermore, eWBLs contributed to the development of several soft skills. Particularly, autonomy, problem-solving, resilience, critical thinking, self-efficacy and digital skills such as online communication and IT literacy. These skills were reported to increase interns' employability.

The study also showed the negative impacts of eWBL. Particularly, it can hinder collaborative skills such as teamwork and creativity. It also has a generally negative impact on networking capabilities. Several recommendations were offered. Closer interaction between mentor and intern, recurring feedback, open multiple lines of communication, onboarding activities and many others that will be described in greater detail in the next phases of the project.

Complementing the work of Hora et al. (2021), our results also show that the issue of equity and accessibility might be both minimized and enhanced by eWBL. Moreover, it risks excluding students with some physical or intellectual disability, first-generation academics, or weaker social and economic backgrounds population.

In summary, the research indicated that eWBL is not a homogeneous solution, and it does not apply to all types of activities, industries, and student behavioral profiles, requiring a thorough evaluation by program supervisors and facilitators. A successful eWBL implementation will require the assessment of trainees' profiles best suited to this program and a clear definition of the objectives to be achieved at the end of the process.

ORIGINALITY / VALUE

The topic of eWBL is a newly emerging topic with a limited understanding of its process and impact. Moreover, since the study presents a comprehensive geographical scope, composed of five countries from different WBL traditions, its result has implications for a wide range of higher education providers.

IMPLICATIONS

We expect this research to contribute to upskilling educators in higher education (lecturers, trainers, and administrative staff) on how to design and deliver high-quality eWBL. The findings will also help boost graduates' work readiness and employability as the work environment is increasingly shifting to online and hybrid formats, and ways of making work-based learning effective in this new environment have become an urgent need of educators across the EU. Finally, the findings also point to ways in which companies can enhance their online internship offerings.

FURTHER RESEARCH

Future research could evaluate how eWBL offerings could be tailored to the learning needs of different demographic groups.

KEYWORDS (3-5)

Work-based learning; online internships; employability.

REFERENCES

- Hora, M.T., Lee, C., Chen, Z. and Hernandez, A., 2021. Exploring Online Internships amidst the COVID-19 Pandemic in 2020-2021: Results from a Multi-Site Case Study. WCER Working Paper No. 2021-5. Wisconsin Center for Education Research.
- Jackson, D. (2015). Employability skill development in work-integrated learning: Barriers and best practice. *Studies in Higher Education*, 40(2), 350–367.
- Miles, H., & Huberman, A. M. (2018). *Saldana. (2014). Qualitative data analysis: A methods sourcebook*, 3.
- Stake, R. E. (2013). *Multiple case study analysis*. Guilford press.
- Perusso, A., & Wagenaar, R. (2021). The state of work-based learning development in EU higher education: learnings from the WEXHE project. *Studies in Higher Education*, 47(7), p. 1-17.
- WEXHE. (2019). *Integrating Entrepreneurship and Work Experience in Higher Education*. European Commission Erasmus+ Programme. P.6.

19.3 Validation of a framework for evaluating knowledge mobilization strategies: Delphi survey of experts

Saliha Ziam¹

¹TÉLUQ University, Canada.

PURPOSE

A growing number of knowledge-oriented organizations, such as granting agencies, governments, public organizations, universities, and health authorities, are investing considerable resources to increase the use of research knowledge to improve professional practice, decision making, and public policy. The proliferation of research on knowledge mobilization (Kmb) over the past two decades has deepened our understanding of the dynamics of this process and of the factors that can impede its deployment, such as knowledge users' capabilities (their beliefs, capacity to absorb knowledge, etc.), contextual conditions (resources, leadership, facilitating factors, etc.), and the availability of effective mobilization strategies (frequency, implementation, fit with context). However, as yet, few good-quality studies have evaluated the impacts of Kmb, such that we still know too little about the effectiveness of the different strategies and the contextual conditions in which they may be effective. This is problematic, in that their development cannot be fully grounded in empirical evidence. In fact, their evaluation is complicated by the virtual absence of evaluation tools and validated indicators that would allow organizations to assess the impacts of their Kmb strategies. Moreover, the difficulty that these organizations experience in relation to evaluation (due to lack of expertise and resources) is a concern that has been raised many times. This study will address this expressed need to improve organizations' capacity to conduct Kmb evaluation studies. Using a collaborative co-construction approach with key actors in Kmb, our aim has been to design and validate an integrative and operational framework for the evaluation of Kmb strategies in the social domain. As a first step in this project, we conducted a scoping review of frameworks and theories commonly used to evaluate Kmb strategies. In that review we identified four potentially relevant dimensions for planning and evaluation: the context, implementation process, effects, and impacts of these strategies. The preliminary framework was validated by international experts in Kmb. This article will present the results of this consultation process involving experts who provided feedback on the relevance and coherence of the dimensions of the proposed framework.

DESIGN / METHODOLOGY / APPROACH

Using the Delphi method, a consultation has been undertaken to enrich and validate the framework developed after a scoping review. This consultation method is designed to collect, in successive waves, the informed opinions of experts, who are consulted remotely using a questionnaire containing both closed and open questions. Besides preserving anonymity, this method offers the advantage of providing feedback after each stage of the consultation to show areas of consensus and divergent opinions, and, in that process, to give participants the opportunity to revise their opinions. Participants in the Delphi process were selected based on their expertise in Kmb and evaluation, as well as on their willingness to be involved in the various steps required for this method. We initially selected 132 experts. The majority were academics (66%); a smaller proportion were professionals (20%) or managers (9%). Of the selected experts, the majority (71%) had expertise in knowledge mobilization, 24% had combined expertise in evaluation and knowledge mobilization, and 5% had expertise in evaluation only. In terms of geographical provenance, the majority came from Canada (53%), while others, in smaller proportions, came from Australia (15%), the United Kingdom (13%), and the United States (10%). A marginal number came from France, Mexico, Brazil, Chile, Switzerland, Belgium, the Netherlands, Burkina-Faso, and South Africa (1% for each of these countries). In the first round, participants are invited to consult the framework developed and to comment (using a Likert-type scale) on the relevance and clarity of each component and the proposed definitions. After assessing each component of the framework, they have the opportunity to suggest improvements or additions to the basic structure in the box provided for open-ended questions. In subsequent rounds, the proposed changes are included. Once consensus, set at 80%, is reached, the new enriched

version of the framework will be produced by the research team.

FINDINGS OR EXPECTED OUTCOMES

This Delphi consultation is currently in progress. This assessment exercise is expected to result in a validation of the framework components and of the potential indicators to be taken into account when evaluating Kmb strategies. The framework thus developed will have a solid methodological foundation, as it will be based on the advice of international experts working in the field of knowledge mobilization.

ORIGINALITY / VALUE

- The evaluation of Kmb strategies is still a relatively emerging and fragmented field in need of significant research attention.
- The development of an evaluation framework validated by experts will make it possible to better document the effectiveness of Kmb strategies and the conditions necessary for their successful implementation.
- By developing an integrative evaluation framework, this work helps strengthen the capacity of organizations to evaluate their Kmb initiatives.

PRACTICAL / SOCIAL IMPLICATIONS

This project will contribute greatly to the field of Kmb research and practice. It will make it possible to use a common methodology based on an evaluation framework validated by a rigorous scientific approach. Our project is in line with initiatives aimed at better evaluating the benefits of research in terms of the health and well-being of individuals and of society in general. Thus, our framework will focus on the intermediate (short- and medium-term) effects that are produced during the implementation of Kmb and that help explain the long-term impacts. The added value of this framework is, unquestionably, the validation process proposed. Moreover, the framework will be tested in a real-world context, with two organizations dedicated to Kmb. This will ensure the acceptability and applicability of the proposed dimensions and indicators of the framework. It will be useful for all knowledge-oriented organizations that need or want to demonstrate the difference they make through the knowledge they produce or use. In the long term, the use of the framework in different settings will better document the effectiveness of Kmb strategies as well as the mechanisms for facilitating research use. Ultimately, this will provide Kmb strategies with more empirically sound foundations.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

In future research, it would be advisable to test the framework for evaluating Kmb strategies in different settings and to refine the measurement tools, an element that has been neglected by Kmb researchers to date.

KEYWORDS (3-5)

Knowledge mobilization; knowledge translation; theories, models, and frameworks; evaluation; Delphi method.

REFERENCES (SELECTED)

- Glasgow RE, Harden SM, Gaglio B, Rabin B, Smith ML, Porter GC, et al. RE-AIM Planning and Evaluation Framework: Adapting to New Science and Practice With a 20-Year Review. *Frontiers in Public Health* [Internet]. 2019 [cited 2022 May 28];7. Available from: <https://www.frontiersin.org/article/10.3389/fpubh.2019.00064>
- Alkin M, Taut S. Unbundling Evaluation Use. *Studies in Educational Evaluation*. 2003;29(1):1–12.
- Kuchenmüller, T., Chapman, E., Takahashi, R., Lester, L., Reinap, M., Ellen, M., & Haby, M. M. (2022). A comprehensive monitoring and evaluation framework for evidence to policy networks. *Evaluation and Program Planning*, 91. <https://doi.org/10.1016/j.evalprogplan.2022.102053>
- Varallyay NI, Langlois EV, Tran N, Elias V, Reveiz L. Health system decision-makers at the helm of implementation research: development

- of a framework to evaluate the processes and effectiveness of embedded approaches. *Health Research Policy and Systems*. 2020 Jun 10;18(1):64.
- McCabe KE, Wallace A, Crosland A. A Model for Collaborative Working to Facilitate Knowledge Mobilisation in Public Health. *Evidence & Policy: A Journal of Research, Debate and Practice*. 2015 Nov;11(4):559–76.
- Edgar L, Herbert R, Lambert S, MacDonald JA, Dubois S, Latimer M. The Joint Venture Model of Knowledge Utilization: A Guide for Change in Nursing. *Nursing leadership*. 2006;9(2):41–55.
- Stetler CB, Damschroder LJ, Helfrich CD, Hagedorn HJ. A Guide for applying a revised version of the PARIHS framework for implementation. *Implement Sci*. 2011;6(101258411):99.
- Brennan SE, Cumpston M, Misso ML, McDonald S, Murphy MJ, Green SE. Design and Formative Evaluation of the Policy Liaison Initiative: A Long-Term Knowledge Translation Strategy to Encourage and Support the Use of Cochrane Systematic Reviews for Informing. *Evidence & Policy: A Journal of Research, Debate and Practice*. 2016;12(1):25–52.
- Brangan J, Quinn S, Spirtos M. Impact of an evidence-based practice course on occupational therapist's confidence levels and goals. *Occupational Therapy In Health Care*. 2015;29(1):27–38.
- Bonetti D, Johnston M, Pitts NB, Deery C, Ricketts I, Tilley C, et al. Knowledge may not be the best target for strategies to influence evidence-based practice: Using psychological models to understand RCT effects. *International Journal of Behavioral Medicine*. 2009;16(3):287–93.
- Buckley LL, Goering P, Parikh SV, Butterill D, Foo EKH. Applying a "stages of change" model to enhance a traditional evaluation of a research transfer course. *J Eval Clin Pract*. 2003;9(4):385–90.
- Boyko JA, Lavis JN, Dobbins M, Souza NM. Reliability of a tool for measuring theory of planned behaviour constructs for use in evaluating research use in policymaking. *Health Res Policy Syst*. 2011 Jun 24;9:29.
- Imani-Nasab MH, Yazdizadeh B, Salehi M, Seyedin H, Majdzadeh R. Validity and reliability of the Evidence Utilisation in Policymaking Measurement Tool (EUPMT). *Health Res Policy Syst*. 2017;15(1):66.
- Dwan KM, McInnes P, Mazumdar S. Measuring the Success of Facilitated Engagement between Knowledge Producers and Users: A Validated Scale. *Evidence & Policy: A Journal of Research, Debate and Practice*. 2015;11(2):239–52.
- Diamond, I. R., Grant, R. C., Feldman, B. M., Pencharz, P. B., Ling, S. C., Moore, A. M., & Wales, P. W. (2014). Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies. *Journal of clinical epidemiology*, 67(4), 401-409.
- Niederberger M and Spranger J (2020) Delphi Technique in Health Sciences: A Map. *Front. Public Health* 8:457. doi: 10.3389/fpubh.2020.00457
- Haynes A, Rowbotham S, Grunseit A, Bohn-Goldbaum E, Slaytor E, Wilson A, et al. Knowledge mobilisation in practice: an evaluation of the Australian Prevention Partnership Centre. *Health Res Policy Syst*. 2020 Jan 31;18(1):13.
- Haines M, Brown B, Craig J, D'Este C, Elliott E, Klineberg E, et al. Determinants of successful clinical networks: the conceptual framework and study protocol. Castaldi P, KD McElduff P, Needham K, Pollock C, Sanson Fisher R, Scott A, Watt H, editor. *Implement Sci*. 2012;7(101258411):16.
- Leeman J, Sommers J, Vu M, Jernigan J, Payne G, Thompson D, et al. An evaluation framework for obesity prevention policy interventions. *Prev Chronic Dis*. 2012;9(101205018):E120.
- Pettman TL, Armstrong R, Waters E, Allender S, Love P, Gill T, et al. Evaluation of a Knowledge Translation and Exchange Platform to Advance Non-Communicable Disease Prevention. *Evidence & Policy: A Journal of Research, Debate and Practice*. 2016 Jan;12(1):109–26.
- Yearwood AC. Applying a logical theory of change for strengthening research uptake in policy: a case study of the Evidence Informed Decision Making Network of the Caribbean. *Rev Panam Salud Publica*. 2018;42(csl, 9705400):e91.
- Thomson D, Brooks S, Nuspl M, Hartling L. Programme theory development and formative evaluation of a provincial knowledge translation unit. *Health Res Policy Syst*. 2019;17(1):40.
- Garad R, Kozica-Olenski S, Teede HJ. Evaluation of a Center of Research Excellence in Polycystic Ovary Syndrome as a Large-Scale Collaborative Research Translation Initiative, Including Evaluating Translation of Guideline Impact. *Semin Reprod Med*. 2018;36(1):42–9.
- Reddy S, Wakerman J, Westhorp G, Herring S. Evaluating impact of clinical guidelines using a realist evaluation framework. *J Eval Clin Pract*. 2015;21(6):1114–20.
- Guo R, Bain BA, Willer J. Application of a logic model to an evidence-based practice training program for speech-language pathologists and audiologists. *J Allied Health*. 2011;40(1):e23-8.
- McDonald S, Turner T, Chamberlain C, Lumbiganon P, Thinkhamrop J, Festin MR, et al. Building capacity for evidence generation, synthesis and implementation to improve the care of mothers and babies in South East Asia: methods and design of the SEA-ORCHID Project using a logical framework approach. *BMC Med Res Methodol*. 2010;10(100968545):61.
- Tabak RG, Khoong EC, Chambers DA, Brownson RC. Bridging research and practice: models for dissemination and implementation research. *Am J Prev Med*. 2012;43(3):337–50.
- Wensing M, GroR. Knowledge translation in health: how implementation science could contribute more. *BMC Med*. 2019 Dec;17(1):88.
- Kreindler SA. Advancing the evaluation of integrated knowledge translation. *Health Res Policy Syst*. 2018 Nov 6;16(1):104.
- Best A, Holmes B. Systems thinking, knowledge and action: towards better models and methods. *Evidence & Policy*. 2010 May;6(2):145–59.
- van Mil HGJ, Foegeding EA, Windhab EJ, Perrot N, van der Linden E. A complex system approach to address world challenges in food and agriculture. *Trends in Food Science & Technology*. 2014 Nov;40(1):20–32.
- Wehrens R. Beyond two communities – from research utilization and knowledge translation to co- production? *Public Health*. 2014 Jun;128(6):545–51.
- Ridde V, Pérez D, Robert E. Using implementation science theories and frameworks in global health. *BMJ Global Health*. 2020 Apr 1;5(4):e002269.
- Salter KL, Kothari A. Using realist evaluation to open the black box of knowledge translation: a state-of-the-art review. *Implementation Science*. 2014 Sep 5;9(1):115.
- Van Eerd D, Cole D, Keown K, Irvin E, Kramer D, Gibson B, et al. Report on knowledge transfer and exchange practices: A systematic review of the quality and types of instruments used to assess KTE implementation and impact. [Internet]. Toronto: Institute for Work & Health; 2011 p. 130.
- Dobbins M, Robeson P, Ciliska D, Hanna S, Cameron R, O'Mara L, et al. A description of a knowledge broker role implemented as part of a randomized controlled trial evaluating three knowledge translation strategies. *Implementation Sci*. 2009 Dec;4(1):23.
- Rychetnik L, Bauman A, Laws R, King L, Rissel C, Nutbeam D, et al. Translating research for evidence-based public health: key concepts and future directions. *J Epidemiol Community Health*. 2012 Dec;66(12):1187–92.
- Weiner BJ, Lewis CC, Stanick C, Powell BJ, Dorsey CN, Clary AS, et al. Psychometric assessment of three newly developed implementation outcome measures. *Implementation Sci*. 2017 Dec;12(1):108.
- Bhawra J, Skinner K. Examination of tools associated with the evaluation of knowledge uptake and utilization: A scoping review. *Evaluation and Program Planning*. 2020 Dec;83:101875.
- Proctor EK, Powell BJ, McMillen JC. Implementation strategies: recommendations for specifying and reporting. *Implementation Sci*. 2013 Dec;8(1):139.
- Albrecht L, Archibald M, Arseneau D, Scott SD. Development of a checklist to assess the quality of reporting of knowledge translation interventions using the Workgroup for Intervention Development and Evaluation Research (WIDER) recommendations. *Implementation Science*. 2013 May 16;8(1):52.

19.4 Determinants and effects of university-industry collaboration in Latin America

Katherine Santos¹

¹Arizona State University, USA.

PURPOSE

The study aims to conduct a comparative analysis of the determinants and effects of university-industry cooperation in Latin American countries, emphasising how the socio-political and techno-economic dimensions of a country and its innovation system (Dutrenit et al., 2019), influence the likelihood and outcomes of the relationship between these actors.

Considering the following hypotheses:

Hypothesis 1: the likelihood of firms establishing collaborative relationships with universities will be higher in national innovation systems with higher accumulated technological capabilities.

Hypothesis 2: Innovation cooperation in less developed innovation systems such as those in LAC is more related to incremental than radical innovations.

DESIGN / METHODOLOGY / APPROACH

Source of information

To test the hypothesis, an analysis is conducted based on micro-data from manufacturing firms between 2014-2016 extracted from innovation surveys in eight Latin American countries (Argentina, Chile, Colombia, Ecuador, El Salvador, Paraguay, Peru and Uruguay). The data are collected from the Harmonized Latin American Innovation Surveys Database (LAIS) developed by the Inter-American Development Bank IDB (Crespi et al., 2021).

Methods

To study the determinants of university-firm collaboration we use a probit model estimated for each type of country defined according to the classification of Latin American innovation systems proposed by Dutrenit et al. (2019): 1) biased towards techno-economic spheres (ARG, CHI); 2) biased towards sociopolitical spheres (SLV, PER, ECU, PYR), and 3) more balanced systems (COL, URU). The dependent variable is whether the firm maintains collaborative relationships with universities. The explanatory variables are: R&D investment intensity, sector, public support for innovation, formal protection of innovations and size.

To evaluate the effect of university-firm collaboration on innovation, a probit model will also be used, with radical (new to the market) and incremental (new to the firm) innovations as dependent variables and university-firm collaboration, R&D investment intensity, sector, public support for innovation, formal protection of innovations and size as independent variables.

FINDINGS OR EXPECTED OUTCOMES

It is expected to validate the aforementioned hypotheses and to contribute to previous evidence that has shown that the cooperation of companies with universities has positive effects on the innovative performance of companies, but especially in the development of products with a high degree of novelty that require more complex knowledge, whose development is more feasible in universities (Nieto and Santamaría, 2007; Cheng and Shiu, 2015).

In addition, a comparative analysis will be made of the 8 countries analysed where it is expected to find similar results between countries according to their characteristics.

ORIGINALITY / VALUE

This study aims to be the first empirical evidence at a comparative level of the relationships between universities and the private sector in emerging economies (8 countries), which will serve for the redesign of public policies on science, innovation and technology, as well as for the rethinking of the role of universities in the economic development of the region.

PRACTICAL / SOCIAL IMPLICATIONS

In most Latin American countries, the promotion of open innovation is a central strategy to promote the improvement of the innovation capabilities of their firms, and several innovation policies have

focused on promoting collaborative work between the actors of national innovation systems, especially between the scientific and productive sectors (Álvarez et al., 2019; Moraes Silva et al., 2020). However, empirical evidence on the determinants and effects of this strategy on the innovative performance of firms is still scarce. In this sense, the results of this study would contribute, first, to deepen the understanding of how the institutional contexts and different economic structures (Cetindamar et al., 2009; Kruss and Visser, 2017) of Latin American countries affect the cooperation between these two agents of the system and its possible outcomes. Second, the results provide support for the definition of public policies for innovation in general, and for the promotion of open innovation in particular, that take into account the specific realities of the Latin American economy.

DIRECTIONS FOR FURTHER RESEARCH / LIMITATIONS

Given the results of this study at a comparative level, it will serve in a second stage to identify the barriers that impede such collaboration, as well as being an input to identify whether the countries analysed have similarities and whether or not the context affects such collaborations (either at government level or at the level of internal policy within universities).

KEYWORDS (3-5)

Open Innovation, University-Industry Relationship, technology transfer.

REFERENCES

- Álvarez, I., Natera, J. M., & Castillo, Y. (2019). Generación y transferencia de ciencia, tecnología e innovación como claves de desarrollo sostenible y cooperación internacional en América Latina. *Documentos de Trabajo*, 2019. <https://doi.org/10.33960/issn-e.1885-9119.dt19>
- Cetindamar, D., Wasti, S. N., Ansal, H., & Beyhan, B. (2009). Does technology management research diverge or converge in developing and developed countries? *Technovation*, 29(1), 45–58. <https://doi.org/10.1016/j.technovation.2008.04.002>
- Cheng, C., & Shiu, E. (2015). The inconvenient truth of the relationship between open innovation activities and innovation performance. *Management Decision*, 53(3), 625–647
- Dutrenit G.; Natera, J.M; Puchet, M & Vera-Cruz, A. (2019). Development profiles and accumulation of technological capabilities in Latin America, *Technological Forecasting and Social Change*, 145, 396- 412. <https://doi.org/10.1016/j.techfore.2018.03.026>.
- Kruss, G., & Visser, M. (2017). Putting university–industry interaction into perspective: A differentiated view from inside South African universities. *The Journal of Technology Transfer*, 42(4), 884–908. DOI: 10.1007/s10961-016-9548-6
- Moraes Silva, D. R. D., Lucas, L. O., & Vonortas, N. S. (2020). Internal barriers to innovation and university- industry cooperation among technology-based SMEs in Brazil. *Industry and Innovation*, 27(3), 235-263. <https://doi.org/10.1080/13662716.2019.1576507>
- Nieto, M. J., & Santamaría, L. (2007). The importance of diverse collaborative networks for the novelty of product innovation. *Technovation*, 27(6–7), 367–377. <https://doi.org/10.1016/j.technovation.2006.10.001>

20



AWARDS

AWARDS TRIPLE HELIX CONFERENCE 2023

20.1 BEST CONFERENCE PAPER AWARD

Engaging for Sustainable Development and Transformation– Exploring the concept of Transformative Academic Institutions

page 38

Authors:

Patricia Canto-Farachala, Orkestra, Deusto Foundation and Deusto Business School, Spain

Madeline Smith, The Glasgow School of Art, Innovation School, UK

Emily Wise, Lund University, CIRCLE and Collaboration Office, Sweden

20.2 BEST PRATICAL INNOVATION CASES

NGOs: Core actors for green innovations

page 75

Authors:

Marco Ferretti, Parthenope University of Naples, Italy

Chiara Cannavale, Parthenope University of Naples, Italy

Cristina Pietronudo Maria, Parthenope University of Naples, Lorenza

Claudio, Parthenope University of Naples, Italy

ESG implementation in a healthcare organization: The case study of Assuta Medical Centers

Authors:

Yossi Weiss, Ariel University, Israel

Ruti Berger, Assuta Health Services Research Institute, Assuta Medical Centers, Israel

20.3 EARLY CAREER RESEARCHER AWARD

Do Role Models Matter Across Fields? The Influence of Entrepreneurial Role Models on Entrepreneurial and Scientific Passion and Perceived University Entrepreneurial Climate

Author:

Malte Stulgies, PhD Candidate, RWTH Aachen, Germany



TRIPLE HELIX

JUNE 26-29 XXI CONFERENCE