XXII TRIPLE HELIX INTERNATIONAL CONFERENCE PROCEEDINGS

A CATALYST FOR CHANGE: Discover the Impact of Science and Technology on Regional Innovation and Socio-Economic Development

Hosted by the SA Innovation Summit  |  Cape Town Stadium  |  South Africa

THANK YOU TO OUR PARTNERS
FOREWORDS

PROFESSOR HENRY ETZKOWITZ
PRESIDENT, TRIPLE HELIX ASSOCIATION

We celebrate the Triple Helix return to Africa, after a hiatus from Addis Ababa and Nairobi. In Cape Town, these coming days, we will address the renewal of the Triple Helix Concept and explore its relevance to South African reality. Can knowledge based innovation assume a leading role in driving forward economic and social development in circumstances where it is just assuming a legitimated role?

We answer “yes” wholeheartedly, while recognising the need to address obstacles beyond the usual and cross varied “death valleys” to teach the promised land of flourishing innovation and entrepreneurship.

LET THE TRIPLE HELIX DEBATE AND COLLABORATION OPEN!

DR AUDREY VERHAEGHE
CHAIRPERSON, SA INNOVATION SUMMIT
TRIPLE HELIX CONFERENCE ORGANISING COMMITTEE

Dear Innovators from near and far.

Welcome! The Triple Helix Conference is the first event of The 2019 Innovation Festival hosted by The City of Cape Town.

This catalytic week started with peer reviewed papers, presentations and a Phd Colloquium that are in line with the 2030 Sustainable Development Goals. The local Catalyst for Change Committee is spearheading this conference, with an aim to collect material on what an Entrepreneurial University means in the African context. The outcome of this gathering will be presented in the form of a Manifesto that will be tested in industry at the 2019 SA Innovation Summit. The data received from the Innovation Festival will be presented to policy makers at The National Science Forum taking place in Tshwane this December.

I hope this action will inspire you to carry the content expressed at the festival and instil the learnings within your home cities and collaborate for positive change across the world.

The Triple Helix Conference gives us the perfect space to take ideas to the world through collaboration between creators, enablers and implementors. You are welcome to stay for the week and meet role players in industry and investors at the SA Innovation Summit that can help take your ideas into market.

I hope you enjoy your stay in our beautiful country.
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PROF ELENA LAROCHE:
Creation of a Knowledge Portal: A Collaborative Project Between University and the Community

DR PATRICK EBONG EBEWO:
Influence of Entrepreneurial Environment on University Student’s Entrepreneurial Intentions

KARLA LIBOREIRO:
University-Industry Interaction for Innovation: A Case Study in University Laboratories in Brazil and United States

PINKIE ZWANE:
Generating Resources for the University of Eswatini (UNESWA): A University of Choice for Sustainable Development in Southern Africa

ARTUR VILAS BOAS:
Building Builders: Entrepreneurship Education from an Ecosystem Perspective at MIT

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DR IL-HAAM PETERSEN:

ASSOC PROF MARCELO AMARAL:
Governance on Technology Parks in Brazil: A Triple Helix Practice

PROF CHRISTIANE GEBHARDT:
“PHYSCIS FOR FOOD” Interdisciplinary Agro Science for Soil Protection and Food Safety. A Participatory Governance Model in Regional Innovation.

NRF SDG LAB PROJECTS
Supporting Wedged Fish Farming Post-Projects Activities for Tampolo Reserve Towards Sustainable Activities

PATRICK LABY (Researcher, ESSA):
Citizen Implication for Clean Seaside City Towards Sustainable Tourism

R. NTSHA ANDRIATSOHAINA (Researcher, ESSA-Forêts):
Harnessing the Demographic Dividend for Enhanced Food Security and Disaster Risk Reduction

FELIX DONKOR (University of Witswaterand):

THEME 5 & 6

CHERYL LEGGON:
Technology, Racial Inequality and Innovation Debate in the United States

SANGAMITRA CHAKRAVARTY:
Collaborations to Develop and Deliver Frugal Innovations Addressing Critical Health Challenges: Case Studies from Medical Devices Sector in South Africa

PROF CHUNYAN ZHOU:
Triple Helix, Multiple Helix and Triple Helix Twins

MANDY LARINDIKI:
Developing an Inter-regional Innovation Collaboration, the Role and ‘Anti-role’ of Proximity: The eDIGIREGION Story

PROF YASSER BUCHANA:
Innovation Collaboration Mechanisms Enabling Innovation Performance In A Triple Helix Regional Innovation Ecosystem: Evidence From South Africa

PEDRO GILBERTO ALOISE:
The University-Industry-Government Relations for Economic Revitalization: The Case of MobiCaxias (Brazil)

PLENARY 3

THEME 5
PROFESSOR EMANUELA TODEVA: Professor of International Business Strategy & Innovation, St. Mary’s University

14:45 – 15:15
PLENARY 1

THEME 1

PROFESSOR CHUNYAN ZHOU: Director, International Triple Helix Institute

15:15 – 16:45
PAPER PRESENTATIONS

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PLENARY 1

16:45 – 17:00
TEA/COFFEE

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XOLISA TANIA MAGAWANA:
Understanding How Innovation is Defined in the Informal Sector using a Participatory Research Methodology

PROF KRISHNA GOVENDER:
Towards Rebirth in Organisational Change and Development: A Southern Voice

MAPHOLE LOKE:
The Sustainable Restoration of Historic Masonry: Robben Island

ABIGAIL CHIVANDI:
The Effect of Online Travel Agencies (OTA) on Brand Relationships in Low and High-End Hotel Groups

DR EVERALDO FRANÇA:
The TH of Innovation in the Technical Courses Integrated to Middle School - Government, Academy and Industry Together in Construction of Intervention Proposals for Family Agriculture

DR ZANETOR AGYEMAN-RAWLINGS:

PLENARY 1

18:05 – 18:35
KEYNOTE:
The Triple Helix’s Theoretical Progress and Practice in China

PROFESSOR CHUNYAN ZHOU: Director, International Triple Helix Institute

18:35 – 19:05
KEYNOTE:
Behavioural Triple Helix

PROF RICCARDO VIAL & PROF HENRY ETZKOWITZ
Professor: Behavioural Economics, University of Milano Bicocca & President, Triple Helix Association

LEVEL 04 19:15 – 21:00
PLEASE JOIN US FOR THE WELCOME RECEPTION HOSTED BY THE NATIONAL RESEARCH FOUNDATION

Cape Town is the Number 1 Start-up City in:

- Emerging Economies
- A Center of Knowledge in Innovation
- Ease of Access & Great Infrastructure
- Global Appeal & Unparalleled Scenic Beauty
- Value for Money
- Cosmopolitan & Great Tourism
19:00

DR CHRISTIANE GEBHARDT: Head of Global Initiatives, Malik International AG

11th Africana Post Graduate Academy and its Contribution to Local Development

ASSOC PROF MARCELO AMARAL: Associate Professor, Fluminense Federal University

PROF RICCARDO VIALE (Professor: Behavioural Economics, Herbert Simon Academy)

DR SERGIO PAULINO DE CARVALHO (Senior Intellectual Property Specialist, National Institute of Industrial Property)

PROF HENRY ETZKOWITZ: President, Triple Helix Association

Panel Members: DR JIM BEDDOWS – Ambassador, Embassy of the Republic of Korea

11:00

DR ANTONIO CLAUDIO NÔBREGA: Professor & Rector, Fluminense Federal University

PROF CHUNYAN ZHOU: Director, International Triple Helix Institute

AUDREY STOLZE: Researcher & Doctoral Student, Munich University of Applied Sciences / Strascheg Center for Entrepreneurship

Panel Members: DR ANTONIO CLAUDIO NÔBREGA – Professor & Rector, Fluminense Federal University

PROF BRANCA TERRA: Professor, Rio de Janeiro State University

PROF MICHAEL KAHN: Extraordinary Professor, Stellenbosch University

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DR SERGIO PAULINO DE CARVALHO (Senior Intellectual Property Specialist, National Institute of Industrial Property)

11:30

DR JOEL SSETIMBA (Makerere University)

EVANS TEMBO (ENVAROS)

DR PATRICIA GOUWS:

Chair:

Additional Offers

11th Africana Post Graduate Academy

DR CHRISTIANE GEBHARDT: Head of Global Initiatives, Malik International AG

DR ADRIAN SOLOMON: Technical Production on the Theme

PITCH & PERFECT

LEVEL 00 | VIP LOUNGE

LUNCH IS SERVED ON LEVEL 00

12:00 – 15:00

TEA/COFFEE

ADDITIONAL OFFERS

BUSES DEPART AT THE PODIUM ON LEVEL 02

10:00 – 16:00

PITCH & PERFECT

LEVEL 00 | MAIN STAGE

20 Regional Finalists: One winner – THE PITCH IS ON TO FIND THE BEST!
A SPECIAL THANK YOU TO OUR LOCAL ORGANISING COMMITTEE, THE CATALYST FOR CHANGE, AND THE INTERNATIONAL SCIENTIFIC COMMITTEE FOR THEIR SUPPORT IN HELPING MAKE THIS CONFERENCE A SUCCESS.

CATALYST FOR CHANGE COMMITTEE

- Chairwoman: Audrey Verhaeghe
- Bennie Anderson (Da Vinci Institute)
- Erika Kraemer-Mbula (University of Johannesburg)
- Joseph Senona (former Department of Science & Innovation)
- Lungelwa Kula (NIPMO)
- Mammo Muchie (Tshwane University of Technology)
- Michael Kahn (Stellenbosch University)
- Michael Nxumalo (National Research Foundation)
- Mlungisi Cele (National Advisory Council on Innovation)
- Nonkululeko Shinga (Department of Trade & Industry)
- Paul Plantinga (Human Sciences Research Council)
- Senisha Moonsamy (Technology Innovation Agency)
- Temba Masilela (Human Sciences Research Council)
- Thokozani Simelane (Human Sciences Research Council)

INTERNATIONAL SCIENTIFIC COMMITTEE

- Chairman: Henry Etzkowitz
- Scientific Advisor: Marcelo Amaral
- Abbas Jamie (former Aurecon, South Africa)
- Adrian Solomon (South East European Research Centre, Greece)
- Adriana Ferreira de Faria (Federal University of Viçosa, Brazil)
- Andre Hattingh (North-West University, South Africa)
- Andrea Mineiro (UNIFEI and UFLA, Brazil)
- Audrey Stolze (Munich University of Applied Sciences, Strascheg Center for Entrepreneurship, Germany)
- Bennie Anderson (Da Vinci Institute, South Africa)
- Branca Terra (Rio de Janeiro State University, Brazil)
- Christiane Gebhardt (Triple Helix Association, Switzerland)
- Chunyan Zhou (Triple Helix Association, China)
- Dany Tonelli (UFLA - University of Lavras, Brazil)
- Denis Gray (North Carolina State University, USA)
- Dimitrios Corpakis (South East European Research Centre, Greece)
- Doret Kruger (North-West University, South Africa)
- Elma Van der Lingen (University of Pretoria, South Africa)
- Erika Kraemer-Mbula (University of Johannesburg, South Africa)
- Han Woo Park (YeungNam University, South Korea)
- Heather Goode (Da Vinci Institute, South Africa)
- Henra Mayer (Da Vinci Institute, South Africa)
- Irina Dezhina (Skolkovo Institute of Science and Technology, Russia)
- Ivone Muocha (Ministry of Science and Technology, Mozambique)
- John Ouma-Mugabe (University of Pretoria, South Africa)
- Josep Miquel Pique (La Salle - Ramon Llull University, Spain)
- Karen Viviana Barranon Navarro (Universitat Autònoma de Barcelona, Spain)
- Krishna Govender (Da Vinci Institute, South Africa)
- mammo muchie (tshwane university of technology, south africa)
- Marcos Lima (Skema Business School, France)
- Mario Landman (Da Vinci Institute, South Africa)
- Mariza Almeida (Federal University of the State of Rio de Janeiro, Brazil)
- Mark Deakin (Edinburgh Napier University, UK)
- Marla Koonin (Da Vinci Institute, South Africa)
- Michael Kahn (Stellenbosch University, South Africa)
- Michele Coletti (Grenoble Ecole de Management, France)
- Norrin Halilem (Laval University, Canada)
- Pablo D’Este (INGENIO (CSIC-UPV), Spain)
- Panagiotis (Panos) Ketikidis (The International Faculty of the University of Sheffield CITY College, Greece)
- Puleng Makhoalibe (Henley Business School, South Africa)
- Rahmat Ullah (Satha, Pakistan)
- Rene Pellisier (Da Vinci Institute, South Africa)
- Riccardo Viale (Triple Helix Association, Herbert Simon Society and University of Milano Bicocca, Italy)
- Roberto Rivas Hermann (Nord University, Norway)
- Tariq Durrani (University of Strathclyde, UK)
- Victoria Galan-Muros (University-Industry Innovation Network, The Netherlands)
- Wim Vanhaverbeke (Neoma Business School, France)
- Yuzhuo Cai (Tampere University, Finland)
- Zineb El Andaloussi (National School of Management of Tangier ENCGT, Morocco)
Triple Helix Conference 2019: A Catalyst for Change
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Theme 1:

The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas
Taking it to the Next Level: Understanding System Level Results in Clusters – The Case of Vinnväxt

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas

Presentation: Oral

Emily Wise (Lund University), James Wilson (Orkestra and Deusto Business School), Madeline Smith (The Glasgow School of Art)

Background and Research Purpose:
The Evolution of Cluster Policy For nearly three decades, regions and countries around the world have employed cluster-based programmes as part of their industrial, innovation and regional development policies (OECD 2007, 2010, 2016). Cluster-based policies are expected to deliver not only strengthened knowledge-sharing and collaboration resulting in stronger firm-level innovation and productivity, but also more efficient and competitive regional innovation systems. Although cluster initiatives are often seen as focusing on innovation and growth in firms, cluster policy has always aimed at influencing the system: bringing together triple helix actors to increase regional competitiveness, encourage diversification and ensure resilience. In recent years, we have witnessed an increased use of cluster initiatives to address broader regional and national aims for skills development, entrepreneurship, digitalisation, industrial modernisation, internationalization and sustainable development (Wise and Johansson 2012; OECD 2016; Wilson et al. 2017). The more ambitious expectations placed on cluster initiatives is driven by the transformation of innovation policy (Weber and Rohracher 2012; Schot and Steinmueller 2017) and may also be seen as an indication that policymakers are convinced that investments in such collaborative programmes yield far-reaching results. Evaluation of Complex Innovation Programmes with more ambitious objectives, cluster programmes can be positioned among other types of complex innovation and system transition programmes (CITPs) – larger-scale and longer-term efforts involving a variety of stakeholders across different parts of society, with the objective of acting together to undertake broader socio-technical transitions (Arnold et al. 2018). Such programmes (combining strategic intelligence and shared visions, hard and soft infrastructures to coordinate across multiple levels of governance and stakeholder groups, and continuous evolution over time) are needed to achieve the broader aims that are characteristic of ‘third wave’ transformative innovation policies (Weber and Rohracher 2012; Schot and Steinmueller 2017). The complexity of objectives and long-term nature of these programmes puts new requirements on the role of and approach to evaluation (Arnold 2004; Hummelbrunner 2011; Magro and Wilson 2013, 2019; Caffrey and Munro 2017). In addition to monitoring efficiency, effectiveness and relevance, evaluation of CITPs also needs to monitor progress and inform the direction of the systemic change process underway – adopting a realist (or developmental) approach to evaluation (Arnold et al. 2018; Patton 2016). Realist evaluations use mixed methods, try to understand the context of the initiative, and evidence outcomes and impacts over time. They may require working with stakeholders to co-develop a set of performance metrics that are specific to the initiative and that use new means of gathering, storing and making sense of data to ensure that the evaluation results support further development (Patton 2016; OECD 2017). System-level results in clusters despite deep experience with cluster policy implementation, practitioners still struggle with
monitoring and evaluation of these systemic instruments. Current approaches focus on evidencing firm-level benefits and fail to capture the added value of collaboration and contributions to broader systemic change (Wise, Wilson and Smith 2017). Yet we witness increasing interest in exploring and tracking the contribution of cluster initiatives to broader system-level effects. Examples include the analysis of economic ripple effects of clusters in the Norwegian Innovation Clusters programme (Røtnes et al. 2017), and ongoing attempts to apply Porter and Kramer’s (2011) shared value concept to cluster dynamics in Catalonia and the Basque Country. However, there is no clear understanding of what is meant by ‘system-level results’ of clusters, nor an approach for evidencing and tracking these results over time. In order to address this gap, this research (in progress) aims to define a set of system result categories for clusters and to test an approach for reporting and monitoring these results. It does so through a pilot with five cluster initiatives supported by Sweden’s Vinnväxt programme. Approach Since its initiation in 2002, Vinnväxt has promoted sustainable growth in regions by bringing together triple helix actors in long-term, collaborative initiatives designed to contribute to the development of internationally competitive regional innovation environments in specific growth areas. Over time Vinnväxt has developed an increasing focus on the innovation environments’ contribution to restructuring and renewal, as well as to the sustainable development goals in Agenda 2030 (Kontigo 2016; Vinnova 2018). The cluster programme provides funding and other support services over a 10-year period, to be used for institutional development and needs-driven R&D to strengthen the cutting-edge competence of the various Triple Helix milieus. Five percent of Vinnova funding should be used for strategic and reflective learning, providing external “constructively critical” coaching and supporting analysis for the initiative’s management, as well as documenting the effects the initiative has on the system. Strategic learning tasks are conducted by action researchers or consultants and serve as a complement to the programme’s monitoring and evaluation system. Annual reports comprise one part of the overall monitoring and evaluation system for Vinnväxt. Each year, Vinnväxt process leaders (or cluster managers) must provide detailed information on actor-level engagement and outputs, collaborative projects that have been initiated, and various types of system-level results. Among other questions, Vinnväxt initiatives are asked to list “important happenings” in the innovation system (e.g. new establishments or investments, research infrastructures), explaining what role (if any) the cluster initiative has had. This element of annual reporting has proven challenging, as Vinnväxt initiatives have different interpretations of what qualifies as an “important happening” and varied approaches to developing their annual lists. It is also difficult to follow and communicate progress over time, to compare and learn from other Vinnväxt initiatives, and to highlight the contributions that Vinnväxt initiatives make to broader system-level transformations. In recognition of these challenges, Vinnväxt programme management initiated a “meta action research” project to develop a common and theoretically-grounded understanding of system-level results, as well as a more structured and harmonised method for evidencing system-level changes over time. This would, in turn, inform and support Vinnväxt initiatives’ strategic efforts, enable better use of data collected through annual reports, and foster increased visibility of contributions to broader system-level effects. An initial phase of research focused on developing a common conceptual framework: the “Cluster Programme Framework of Effects” (Wise, Wilson and Smith, 2018). This distinguishes between three levels of effects (actor, collaborative initiative, and territorial system). In the second (ongoing) phase of research, the focus is on defining a set of system result categories for clusters as well as testing an approach to monitor these results (in annual reporting). This is being pursued through a pilot with five Vinnväxt initiatives. Through documentary analysis and semi-structured group interviews, a set of system result categories was agreed and integrated into the annual reporting templates for testing. After annual reports have been finalized, a second round of analysis and semi-structured group interviews will be held to gain insights and recommendations for the future.

**Preliminary Findings:**

There are several preliminary findings from this research, both in terms of defining a set of system result categories for clusters as well as establishing a structured approach for reporting and monitoring these results. Cluster managers agree on their mandate to work with system-level outcomes and reached consensus on a list of seven system result categories and definitions/examples. Moreover, a preliminary analysis of reports from the five initiatives in the pilot confirmed that they do contribute to a variety of system
level results, with a notably strong role in bringing together actors in the system, establishing new partnerships, developing longer-term collaborative platforms for strategic action and developing/attracting new R&I infrastructure. There were varied “system result profiles” across the five pilot initiatives, driven by the strategy of the initiative (and its role relative to others in the regional innovation system). The pilot also provided insights on the approaches for documenting and categorizing system level results that will guide more efficient strategic learning practices in the future. The research highlights that cluster initiatives play a role in mobilising and bringing actors together, catalysing ideas and coordinating/following-through on various actions that are aimed at driving long-term processes and influencing systemic change. The research also highlights the importance of having a structured approach to strategy that includes developmental evaluation. Given that system-level results take a long time to realise, it is important to track the process and document milestones to provide dynamic evidence of change.

Conclusions Relevance/Implications:
This first attempt at monitoring system-level results has generated an approach that can be further developed in the context of cluster programmes as well as other complex/collaborative innovation programmes. The research results will contribute to improved ‘developmental evaluation’ practices, helping to inform ongoing processes of systemic change and highlighting the role that cluster initiatives play. The elaborated system result categories, as well as the approach to evidencing system-level change, may also be relevant for use in other complex/collaborative innovation programmes.

Limitations (and Future Research):
The results of this research have provided both a set of system result categories and an approach to developmental evaluation practice for a cluster programme. However, in order to develop a more stable approach to evaluating system level results, this test should be replicated over time and in other contexts.
Student Entrepreneurship, University Ecosystems and Regional Development

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century's Economic Development Agendas
Presentation: Oral

Riccardo Fini (University of Bologna), Azzurra Meoli (University of Bologna), Maurizio Sobrero (University of Bologna), Mike (Wright)

Over the last years, research has highlighted the growing importance of students’ entrepreneurial activities, emphasizing the role of student startups. Two key aspects emerge to date. First, student startups are important because they might signal universities’ quality and attract talented faculty and students; second, they can support local and regional economic development by generating high-growth ventures (Wright et al., 2018). Yet, scholars have mainly focused on individual characteristics to illuminate the determinants of student entrepreneurship – i.e., the creation of new ventures by students - (Martin et al., 2013), and scant attention has been devoted so far to the role of context. We believe the time is ripe to shed lights in this regard, as academic entrepreneurship is a context-dependent-process, influenced to a great extent by environmental characteristics both inside and outside universities (Bercovitz and Feldman 2008; Bergmann et al., 2016; Wennberg et al. 2011). In recent years, universities have adopted several mechanisms to foster students’ entrepreneurship, creating - more or less- supporting entrepreneurial ecosystems (Hoppe, 2015; Kuratko, 2005; Walter et al., 2013). An entrepreneurial ecosystem is defined as the set of actions implemented by a university to foster the creation of innovative and entrepreneurial efforts (Hayter, 2016). Indeed, universities can put at place different strategic actions to foster students’ entrepreneurial activities, including entrepreneurship courses and programs, incubators, entrepreneurial competitions, and other supportive mechanisms (Wright et al., 2017). Preliminary evidence suggests that universities with more developed entrepreneurial ecosystems are associated with a greater start-up gestational activity (i.e. nascent entrepreneurial actions) by both students and graduates. Beside the university context, the regional environment affects the creation of new ventures because of the need of acquiring resources and find potential customers (Davidsson and Honig, 2003; Mosey and Wright, 2007). Regional context includes cultural, social, political and infrastructural characteristics, and a wealthy region positively affect the rate of start-up creation (Reynolds et al., 1994). Studies concerning the determinants of entrepreneurship show the relevance of regional contexts in boosting new venture creation processes (Davidsson and Honig, 2003). By focusing on students’ start-ups, Bergmann et al. (2016) show that the regional context does not affect the individual propensity to become entrepreneur (i.e. desirability phase) but it becomes relevant in the execution phase (i.e. feasibility phase). To date, scholars have focused on either university entrepreneurial ecosystem affecting start-up activity (Mustar et al., 2006; Holstein et al. 2016; Wright et al., 2017) or regional characteristics fostering the creation of new firms from students or early graduates (Bergmann et al., 2016; Wright et al., 2017). Yet, we know relatively little about the relationship between university entrepreneurial ecosystems and regional characteristics, their cross-fertilizations, and their joint impact on student entrepreneurship. In this paper, we first define and measure
which bundles of the university ecosystem elements are most effective to foster student entrepreneurship. Then, as regions vary in terms of their development and entrepreneurial attractiveness, we explore how these combinations vary across different types of regions. Specifically, our research question is: to what extent university entrepreneurial ecosystem either complements or substitutes for various regional characteristics in fostering the creation of student startups?

We test these arguments using unique longitudinal survey data covering almost the entire population of university graduates from the 64 leading universities, located in 20 different regions in Italy. In particular, to address our research question, we collect data on student startups (i.e. number of startups created by students for any given university), university entrepreneurial ecosystem information and regional characteristics. Data on student startups has been collected as part of the annual survey of Italian graduates managed by AlmaLaurea, an inter-university consortium which collect data from universities graduates of Italian universities. The survey gathers detailed information on demographics, university- and professional-career information. In particular, students fill the questionnaire shortly before graduation, usually a month before graduation date, with an average yearly response of about 94%. One year after graduation students are further polled to collect information about their employment status. In this paper, we focus on the cohort of students graduated between September and December 2014, from the 64 universities included the sample. In 2014, in Round 1, we collected data from 61,115 students. In December 2015, one year later, we surveyed the respondents again, reaching 23,456 individuals, collecting information about their start-up activities. Data on the environmental and regional characteristics are retrieved from Eurostat (www.ec.europa.eu/eurostat), i.e., the statistical office of the European Union that provides statistics at country, regional and province-levels to allow comparisons between countries and regions. Moreover, we collected additional information on each Italian region from the Italian National Institute of Statistics (ISTAT, www.istat.it). Finally, to complement our dataset we gathered university-level information from the TASTE database (Bolzani et al., 2014) which stores primary and secondary longitudinal data on Italian academics. The dataset includes information on the population of Italian universities, and their personnel, internal policies, departments, patenting and spinout activities. Consistent with our conceptual framework, our dependent variable is operationalized as the number of students’ startup created for each university in 2015. Our independent variables are operationalized at both university and regional levels (as of 2014). At university level, we account for the academic spin-out activities, the existence of a TTO, the entrepreneurship courses; at the regional level, we measure the GDP for each region, the employment rate and innovation index. Preliminary evidence suggests the existence of substitution effects between university and regional characteristics and their joint effects on students’ startup creation.

This study aims to shed lights on both university and regional determinants of students’ entrepreneurship. In particular, it addresses the characteristics and role of university entrepreneurial ecosystem for the creation of students’ start-ups, and the way in which they interact with regional characteristics. The results might bear implications for policy design on entrepreneurial ecosystems, as they shed lights on the complementarities and substitution effects of university and regional features. Finally, as the majority of studies are based on Anglo-Saxon countries, this research, by focusing on Italy, will add new knowledge to the vibrant conversation on student entrepreneurship.

References:
Operationalisation of University Community Engagement Activities towards Reciprocal Relationships

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas

Presentation: Oral

Dr CM Niesing (North-West University), Prof P Bester (North-West University), Mr MO Spies (North-West University), Me DJ Matsietso (North-West University), Me M Thomas (North-West University), Me K Smit (North-West University), Mr K Liwewe (North-West University)

Purpose:
Higher education institutions are mainly responsible for three core functions. Community Engagement (CE) has been identified as one of these functions, complimentary to teaching-learning and research activities. The function of CE is, in essence, multiple helix systems as it includes four main role-players namely universities, the Department of Higher Education (DoHE), industry partners in terms of research and funding as well as local communities. With increasing pressure from the higher education sector for successful sustainable CE activities, a shift from previously applied top-down approaches (one-way approach) to a two-way approach (top down and bottom up) is required. The interaction between the higher education institution and their communities is furthermore needed to facilitate a partnership in mutual learning. The focus of CE moved away from supporting communities towards a mutually beneficial relationship of knowledge co-creation through teaching-learning and research activities. While there are some suggestions regarding a field of practice for CE, a lack of conceptualisation of CE activities and practical research examples of engagement exists, creating a gap for an accepted framework that can guide and measure impacts of CE. Since 2011, the Africa Unit for Transdisciplinary Health Research (AUTHeR) of the North-West University (NWU) managed and coordinated the Wellbeing INnovation (WIN) platform. The WIN platform is seen as the CE flagship for the NWU and the Faculty of Health Sciences (FHS) and included seven schools and research units within the FHS and enabled over 18 projects in predominantly resource-poor communities in Vaalharts. Reflecting on the engagement process of the WIN platform through an NRF funded University Community Engagement project, the perceptions of both academics involved in CE activities and the community as recipients indicated that CE occurred in silos within the same faculty. Various projects were implemented in the same communities without the different units being aware of the others’ CE activities within the community. This practice of fragmentation enables various risks factors for the optimal functioning of the multiple helix systems. The most vulnerable of these being stakeholders’ relationship management.

Design/Methodology/Approach:
AUTHeR is a transdisciplinary research unit that includes multiple scientific disciplines focusing on solving real-life problems also called ‘wicked problems’ through active collaborative input from multi-level stakeholders outside academia. Transdisciplinarity as a method seeks transcendence of disciplinary perspectives into a broader framework through a systems approach requiring practical engagement with issues of immediate concern aiming to result in the highest form of integration. The multiple helix systems involve multiple disciplines within academia, government agencies on all levels, industry partners
and community members through a participatory approach. A critical reflection on the CE strategy of the WIN platform created conversational spaces for actors from both the community and university to explore perceptions, networks, adequacy and impacts of CE activities within WIN. This reciprocal conversation was facilitated through (i) an exploration of the functioning of the social networks of the different actors from academia as well as the community and (ii) SWOT analysis of the CE activities in the applicable communities. One of the main gaps identified in the functioning of the WIN platform was the fragmented approach adopted by different units within the FHS attempting CE activities that resulted in replication of activities, wastage of resources and overexposure of communities to CE and research activities. Findings Implications: In response to the critical reflection on the CE strategy of the WIN platform in order to develop a framework for CE with the purpose of enhancing the functioning of CE as one of the core functions for a transdisciplinary unit, AUTHeR developed the Community Integrated Research office. The primary role of this office is to coordinate CE activities within the FHS. Within AUTHeR a holistic approached is implemented towards CE referred to as Community Integrated Research (CIR) with the following functions: • CIR Logistics office: A centralised office to support all the CE logistics within the faculty. The support of logistics enables sharing of resources and limits overexposure of communities. This function includes all CE activities for research and application purposes (for example the organisation of transport and workshops). The management of stakeholder relationships remains a crucial aspect of successful CE activities. Therefore, one of the functions of the office includes the development of a centralised database that includes all the different stakeholders in the multiple helix systems. To enable tracking of activities and resources and to develop a foundation for measurement and evaluation of impact on communities, another function includes the collection of feedback data for impact measurement purposes. The office includes the functions as the custodian of records and data within AUTHeR. • CIR Field office: This function is responsible for facilitating practical field research. The management of the relationships with stakeholders is one of the core functions of the field office. This function includes the entire process for successful field research from gaining access to a community; obtaining permission and consent; identification and recruitment of participants; and practical field work, data collection, and dissemination of results to the participants. The functioning of this office includes support to researchers and students in terms of field worker training, transcription services as well as translation of interviews and research documentation. • CIR M&E office: The DoHE and the NWU require the measurement and evaluation of the impact of CE interventions and research. These interventions should align with the CE policies of the NWU as well as national policies like the National Development Plan. The feedback reports generated in the previous two functions serve as resources for data to measure the impact of the CE activities managed in the CIR office. The M&E office is responsible for the monitoring functions of finances for CE activities within AUTHeR. This function is in the process of developing a system for the development of indicators to measure the sustainable impact of interventions and research over time. • Implementation of expertise (IoE) office: The IoE office is responsible for the coordination of training programmes and workshops to provide training for researchers and students with the aim of enabling community integrated research. These training programmes include workshops and short learning programmes on qualitative research methodology, the use of qualitative data analysis software and community development programmes. The functions mentioned above are supported by the Community Integrated Research Laboratory (CIRL) that supports various research methods with equipment including voice recorders, video recording equipment, interactive whiteboard technology and cameras.

Originality/Value:
The CIR office enables the operationalising of CE activities systemically. It is allowing for the protection of stakeholder relationships, as well as the measurement and evaluation of the sustainable impact of these activities according to set indicators. The CIR function allows for the inclusion of multi-level stakeholders and enables an environment that facilitates a mutually beneficial relationship.
Bridging the Community Technology Gap: The Social Greenhouse™

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century's Economic Development Agendas

Presentation: Oral

Dr CM Niesing (North-West University), Prof P Bester (North-West University)

Purpose:
At the end of the previous century, there was a global shift towards a collaborative fight against global poverty and inequality that came in the spotlight due to a technological revolution enabling the free flow of information amongst individuals and countries. Poverty can be described as a ‘wicked problem’ due to the incomplete knowledge on how to solve the problem, the number of people and opinions involved, the scale of the impact of the economic burden and the interconnected nature of poverty with other problems. The United Nations identifies the fight against poverty as the first Sustainable Development Goal. In a South African context, the South African government formulated the National Development Plan that strategized a long-term perspective on sustainable development in support of the sustainable development goals. Various strategies initiated by the South African Government supports multiple helix approaches to facilitate implementation of the National Development Plan. These include funding programmes to support research and development. These developmental interventions resulted in the implementation of various research-informed interventions in communities in South Africa for over 20 years, without having a tangible impact on poverty alleviation. Most of the technologies developed through these research programmes were rejected by the local communities and failed market entry. The Africa Unit for Transdisciplinary Health Research (AUTHeR) implemented various programmes over 15 years. Best practices identified through these interventions and in literature led to the identified community technology gap. Intervention based research in AUTHeR resulted in a design thinking process to bridge the community technology gap.

Design/Methodology/Approach:
AUTHeR is a transdisciplinary research unit that includes multiple scientific disciplines focusing on shared problems referred to as ‘wicked problems’ and the active input of practitioners from outside academia. Transdisciplinarity seek transcendence of disciplinary perspectives into a broader framework in a systemic way that requires practical engagement with issues of immediate concern aiming to result in the highest form of the integrated project. The multiple helix systems involve multiple disciplines within academia, government agencies on all levels, industry partners and community members through a participatory approach — decision-making capacity for the involved stakeholders. Contributing to reaching the Sustainable Development Goals through implementing the National Development Plan requires sustainability research. Sustainability research or sustainability science facilitates resolving real-world sustainability issues by combining research on the ecological and social components and involving diverse forms of knowledge in the research process. Understanding sustainability is a complex issue as it is multiple things at once. It may be a goal, an ideal, an umbrella, and a sub-discipline of multiple disciplines. Sustainability is fundamentally transdisciplinary. The protocol followed in the intervention research followed the Intervention Mapping process for developing effective behaviour change interventions. The process
consists of six steps and related tasks, based on behavioural change theories. Participatory Action Research was included as a methodology in the research programmes to enable multiple helix approaches, including the community as an active participant.

Findings:
The research resulted in a process to bridge the technology community gap namely the Social Greenhouse™. The process consists of five phases each including a toolkit to enhance the results of the process. Phase 1 results in the needs solution matrix. The needs solution matrix enables merging the developmental needs of the community with the assets and technology available within it. According to the Sustainable Livelihood Approach, there are five types of capitals available for sustainable development in each community namely: financial; human; social; natural; physical. The challenge towards sustainable community development can be identified as limited access of individuals and groups in communities to these assets. This results in a divide between rich and poor that emphasise the need for sustainable development. The benefit of the needs solution matrix is embedded in the optimal use of scarce resources for sustainable development in communities. The outcomes of the needs solution matrix can include an asset-based community development plan, relevant sustainability indicators and a collaborative definition of sustainability for the project. The main aim of the needs solution matrix is to make the value of the intervention visible in the shortest period. The toolkit identified to facilitate the needs solution matrix includes: needs analysis/impact assessment based on the identification of assets in a community through asset mapping; the exploration of the social networks in the community; stakeholder identification; the development of an Asset Based Community Development Plan and community profiling. Phase 2 consists of a participative design process in the development of a solution. This process includes a participatory action research process of various cycles with all stakeholders included in the process. Failure of programmes in the past was mainly because of a top-down approach to the development of a solution. The focus was on the development of the technology/system/ process; the end user was excluded from the design process. Different needs of different communities that include their cultural practices will influence certain aspects of the design of a solution. Therefore, these aspects need to be taken into consideration by involving them from the inception. The benefit of this phase includes: Limiting rejection of products and technology; increase early adoption of the innovation; Design flaws and cultural taboos can be minimized, Critical gaps are avoided through using an easy/sensible/understandable process; Practical implications are considered, instead of only theoretical implications. Participatory Action Research forms the basis of implementation of this phase. Phase 3 enables the implementation of innovation in other communities. This phase enables contextualised adaption for replication. The working solution in the second phase will now be contextualised for replication in other communities. The process enables adoption of the technology or solution to a broader audience to prevent the rejection of the innovation. This phase is supported through intervention research methods. Phase 4 is linked to the indicators developed in Phase 1 and allows for monitoring and evaluation throughout the first three phases of the process. The indicators developed in Phase 1 are refined throughout the process and enables real-time measurement of the impact of the process in the communities. Up to 90% of innovations fail for various reasons. Real-time monitoring and evaluation throughout the process allows for timely adaption and limits the rejection of an innovation. The benefits include: community integrates and adopts innovation; faster return on investment; decreased change management costs; higher consumer satisfaction levels and sustainable development. Phase 5 measures the long term sustainable impact of the innovation by using the short term indicators to measure the impact over time in different settings. The benefits include greater return on investment; improved long term planning strategies; a clear picture of the truly sustainable impact on the community. Sustainability planning and prediction are achieved by the identification of sustainability indicators (with the collective community and stakeholder input); long term measurement of impact over time; sustainable impact toolkits built into all phases throughout the process. Implications: This process accepts that communities are complex, sensitive, yet robust. The aim is to facilitate sustainable development in communities through the strengthening of community assets, do not focus only on needs. The strengthening of assets is achieved by enabling sustainable livelihoods. Sustainability is not a once-off but a process and can only be measured over time.
because single impact measurements can be misleading. A holistic approach, multiple helix systems and participatory methodologies are essential to the facilitation of sustainable development. The ideal is a hybrid bottom-up and top-down approach, working with community forums to facilitate a sustainable impact. Originality/Value, The Social Greenhouse™, provides a social innovation process that guides the development of interventions and technologies to facilitate measurable long-term sustainable impact in communities aligned with international developmental strategies.
Science, Technology and Innovation Parks: A comparative analysis between scientific and technical production on the theme

**Category:** 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas

**Presentation:** Oral

**Marcelo Amaral** (Fluminense Federal University), André Luis Furtado da Hora (Fluminense Federal University), Nathan Messias Ribeiro (Fluminense Federal University), Leandro Cunha (Fluminense Federal University), Jéssica Souza Maia (Fluminense Federal University)

**Purpose:**
Under the aegis of the knowledge society, which values the creation and flow of knowledge as a source of innovation and value, to the detriment of traditional means of production (Castells, 1999), innovation environments such as science, technology and innovation parks (STIP) are presented as ecosystems that provide fertile ground for generating value around innovative ideas (Amaral, Gray and Faria, 2016, Fagerberg and Srholec, 2008, Etzkowitz and Zhou, 2017). The article aims to analyze the evolution of scientific publications, carried out by academic researchers, and technical publications, carried out by PCTI managers, focused on research on the subject. The objective is to know the origin of these authors (institutions and, countries) and to classify the most relevant themes of these publications for comparisons.

**Design / Methodology / Approach:**
The study is based on the bibliometric analysis technique, to draw a comparison between academic production published in scientific journals and periodicals, and the technical and professional production carried out by professionals in the congresses of International Association of Science Parks and Areas of Innovation (IASP). The study focused on the period between 2007 and 2018 depending on the availability of data. We selected 479 articles indexed in the Web of Science database, of which, after selection, they were reduced to 177 publications (excluded articles about hosted companies, developed technologies; focus on the management of the innovation environment), and 572 congress papers (some papers were also excluded; in general focusing on public policy). The articles search was conducted in the WOS, and for the IASP material, a publication base was constructed from the annals of its events. The bibliometric analysis used MS Excel and involved the identification of authors, countries, institutions, STIP and publication themes from the reading of titles, abstracts, and keywords (Araújo, 2006). Regarding the categorization of the articles, the authors proposed, in an arbitrary way, 25 topics related to the study of STIP. This listing was constituted from the titles of the sessions in congresses, keywords in the publications and themes of special editions of academic journals, among others taking into account also the mastery of the authors on the subject. Findings: Among the findings that deserve the attention it was identified: 1) Growth in the recent interest of academic researchers on the subject (after 2015), however, the number of academic publications is still limited (177 in 12 years; even 479 is still low); 2) The scientific production focused on the study and analysis of STIP as a whole is diversified, due to the complexity of the factors covered and the heterogeneity of actors and relationships involved in these environments; 3) The presence of countries such as China, Taiwan, and Spain as the ones with the highest academic production (40%); and Spain, Brazil and the
United States as the ones with the highest technical production (35%) suggested that the growth of innovation environments and the economic development is moving synergistically on these countries. Spain, Brazil, the United States, China, the United Kingdom, Iran, and Italy, appear in both sets of publications; and 4) The focus on different themes, with 40% of academic publications focusing on four themes "Management and transfer of technology and knowledge", "Academic incubators, startups and spin-offs", "Characteristics and dynamics of parks" and "Public policies of and for innovation" compared to the practitioners, in which 25% of the work focused on the themes "Characteristics and dynamics of parks", "Study of the impact of parks on regional development" and " Tools and platforms to stimulate innovation ". In both cases, it is possible to focus on the macro environment (relation between the STIP, the government, and society). As expected, the academic authors also addressed conceptual issues (technology transfer) while managers emphasized issues more related to operational management. More interestingly, the organizations that house the authors of scientific and professional productions on STIP have origins mainly in the same countries, also revealing the proximity between governments, companies, and universities regarding the scientific production, investments, and operation in STIP at these nations. Research limitations/implications: This is a theoretical study with limitations related to the methodological cut-off (search terms and techniques used) and the sources used.

Practical and/or Social Implications:
The work has several possible impacts. For the IASP and similar entities (national associations such as ANPROTEC, APTE, among others) it can serve as an evaluation of their events and signalize a strategy of themes to be incorporated, as well as allowing bridges to be made with the academy. For the academy, the findings help to identify new topics for research. For the parks and public managers, it allows a perception of the relevance of the theme in each country and the level or maturity of the articulation between the actors. Originality / Value: No similar study comparing academic researchers and STIP managers has been identified in the literature. Thus, it is an innovative work that can contribute to the academy and managers of STIP and public policies.

The Entrepreneur and Entrepreneurship - The Elephant in the Room

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas
Presentation: Oral

Ms D Kruger (North-West University), Dr CM Niesing (North-West University), Prof P Bester (North-West University)

Context:
The abstract reports on Phase 1 of a PhD study, the literature review. The purpose of this conference proceeding is to rationalize the meaning of the concept entrepreneurship within the transdisciplinary approach and the sequentially mixed method methodology towards developing a transdisciplinary entrepreneurial toolkit with the focus on low-skilled individuals.

Purpose:
The concept entrepreneur and entrepreneurship have different meanings to different people, and after seven decades there remain incongruence globally on a conceptual definition of entrepreneurship, depending on the focus of the one defining it; and from which perspective, most researchers tend to perceive and define entrepreneurs using the premises of their disciplines. For example, the economist has associated entrepreneurs with innovation, whereas the behaviourists have concentrated on the creative and intuitive characteristics of entrepreneurs. In 1971 Peter Kilby compared those researching the entrepreneur and entrepreneurship to the creatures in the Winnie-the-Pooh children’s book, where the animals go hunting for the mysterious creature, the “Heffalump”. Although they claimed to know about the “Heffalump”, none has ever captured one nor do they know what it looks like. Many claims that they have caught sight of him and report that he is an enormous elephant like, although they disagree on his particularities. Searching for the true meaning of entrepreneur and entrepreneurship is like a Heffalump, and the researcher took a time travel back to the 17th century, to chronologically explaining the economic roots, exploring some of the early thinking and the different ways in which entrepreneurship was defined. Understanding entrepreneur and entrepreneurship caught the interest of a variety of disciplines such as anthropology, history, management, psychology, sociology, and economics.

Design/Methodology/Approach:
The researcher used the 7 steps of the comprehensive literature review to ensure the objectivity of the research process. Starting with the conceptual exploration of the existing literature focusing on the history/school of thought and evolution of the entrepreneur and entrepreneurship. The population contains all available national and international literature, making use of an all-inclusive sample publication date 1970-present, regarding the history/school of thought and evolution of entrepreneurship. All literature coherent with the search criteria were added to Atlas.ti to code and map the selected data sources. Microsoft Excel was used to chronologically keep track of the information added.
Findings:
The term entrepreneur has a French origin “entreprendre” which means to undertake. Richard Cantillon 1680-1732, was the first economist to acknowledge the entrepreneur as a key economic factor as mentioned in his posthumous “Essai sur la nature du commerce en general” first published in 1755. Cantillon defines entrepreneurs as individuals who purchased goods at a certain price, used those goods to produce a product and then sold that product at an uncertain price. Risk and uncertainty play a central part in the theory of the economic system. Francois Quesnay 1694-1774, as with Cantillon, he viewed the entrepreneur as the bearer of uncertainty, but he took a step further to conclude that the entrepreneur must have the capacity of economically combining the appropriate goods and services to the end of his greatest profit. Adam Smith, 1723-1790, he explained that nations are getting rich through changes in the division of labour. Using Smith’s insight, entrepreneurship can be defined as the study of human actions that lead to changes in the division of labour. Anne-Robert Jacques Turgot 1727-1781 was the French Adam Smith, he begins the preliminary thought of the theory of utility, which envisaged the concept of diminishing marginal utility. He made an additional distinction to Cantillon’s ideas by identifying that ownership of capital and the act of entrepreneurship can be two distinct functions of entrepreneurial pursuit. Nicolas Baudeau 1730-1792 was one of Quesnay’s disciples. He stressed the point that was already put forward by Quesnay the entrepreneur’s energy, ability, knowledge and to be willing to operate rationally by using the most productive methods will determine the economic success. Jean-Baptiste Say 1776-1832, he builds onto Cantillon’s idea by saying that the entrepreneur is the pivot on which his view about the economic system turned. Say define the entrepreneur as the coordinator of the system, acting as an intermediary between all of the other agents of production and taking on the uncertainty and risk, the profit the entrepreneur gained was the reward for the risk taken. Alfred Marshall 1842-1924 collected various ideas to entrepreneurship and labelled the entrepreneur as a coordinator, superintendent, uncertainty-bearer, although he discussed the entrepreneur’s role, he did not state the unique function of the entrepreneur. Marshall describes the entrepreneur as an individual who seeks opportunities to minimise cost. He also introduced the innovation function of an entrepreneur. Ludwig von Mises 1881-1973, defines an entrepreneur as the acting individual, the action seems to change the future. Mises solved the entrepreneurial task by introducing human action and stated that entrepreneurship consists of the creation of a previously unperceived opportunity tapped into this opportunity and taking action to achieve the opportunity. Joseph Alois Schumpeter 1883-1950, most of the modern thought on entrepreneurship, can be traced back to Schumpeter. Schumpeter focuses on economic development and the role of the entrepreneur in the development process. He defined an entrepreneur as the innovator, the individual who introduces new combinations of production factors. John Maynard Keynes 1883-1945, is the father of the Keynesian economics that developed during and after the Great Depression, in an attempt to understand the Great Depression. Keynes argued that the demise of the entrepreneur was imminent and that investors had become short-termism who sold their assets at a whim on financial markets that had developed to high degree liquidity. Frank Hyneman Knight 1885-1972, focused on uncertainty, risk and knowledge and relating them to profit in entrepreneurship. Uncertainty is a ubiquitous aspect of business decisions because production takes time and decision-making on inputs has to be taken now to create outputs in the future. Friederich August von Hayek 1899-1992, challenged the assumptions of equilibrium theory as being unrealistic he shifted the attention from objects of value to subjects that do the valuing. He tried to understand how individuals successfully coordinate their actions, involved in the complex expanding division of labour with only local and idiosyncratic knowledge. He stated if the entrepreneur’s judgement is correct, then the greater the psychological barrier, the more profit is likely to be made for if other people share his optimistic estimates, they then will compete for the same resources, driving up their buying price, and eliminating the margin from which the entrepreneur derives his profit. Julian B Rotter 1916-2014, introduce Locus of control, a further investigation into the psychology of the entrepreneur is the social learning theory that fits the study of entrepreneurial personality, which analyses the interaction of individuals with their environment. David C McClelland 1917-1998, asked the question if personality has a future, as it is an issue that has raised by scholars of entrepreneurship with regards to the so-called entrepreneurial personality. McClelland addressed the issue of methodology, as he suggested
that a significant portion of research use independent criteria of cognitive variables, and this could be unreliable. He calls for greater use of implicit measures that can attract unconscious personality traits. William Jack Baumol 1922-2017, pointed out that the discovery of the attributes of an entrepreneurial personality is promising but is outside the purview of economic theory. Baumol’s contribution to entrepreneurship and small business economics is from a growth perspective. As a result, an institutional environment that encourages productive entrepreneurship and human experimentation is the ultimate determinant of economic growth. Israel Kirzner 1930, stressed the market process and alertness, he undertook the venture to explain the distinction between economic change and innovation. He claims that the psychological profile of Schumpeter’s entrepreneur is valid, and so is the idea of the entrepreneur as a creative destructor.

Conclusion:
Entrepreneurship is a complex phenomenon; therefore the researcher adapts to a transdisciplinary approach combine entrepreneurship, entrepreneurial education and psychology of behaviour to address the complex problem of unemployment amongst low-skilled South Africans. The complexity of the research problem with its multiple disciplines requires an approach that will address all the aspects of the research questions. The decision to implement a mixed method design is based on the value of using both quantitative and qualitative methods of data collection above the use of a single process in answering the research questions. The findings proved that one discipline cannot explain the entrepreneur and entrepreneurship, an effective and productive collaboration of different human sciences are essential to understanding the process of entrepreneurship.
Developing A Protean Career Approach To The Creative Industries Curriculum: A Case Study of TUT’s Faculty of the Arts in South Africa

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas

Presentation: Oral

Kennedy C. Chinyowa (Tshwane University of Technology)

(i) Research Problem:
The increasing global drive towards a knowledge-based economy is compelling universities to shift from a teaching, learning and research focus to an entrepreneurial paradigm. Etzkowitz, et al (2000) have argued that the emergence of the ‘entrepreneurial university’ has been a response to the importance of the knowledge economy in local and global innovation systems. As an academic institution, the university has come to be viewed as a creative incubator and transfer agent for innovative knowledge and skills. Under the current stringent financial climate and dwindling research funds, universities are being compelled to pursue entrepreneurial strategies for the sake of survival. Thus, the university is gradually ceasing to be an insulated ‘ivory tower’ but a core player within the knowledge economy by producing and disseminating new ideas for the creative economy. This paper will examine how the Faculty of the Arts at Tshwane University of Technology (TUT) in Pretoria, South Africa has developed a new creative industries based curriculum in response to the drive towards the knowledge economy. The paper will focus on the Faculty’s attempts to shift its existing curriculum from the creative arts towards creative industries.

(ii) Methodology:
The paper draws its illustrative paradigms from the creative industry related exhibitions, technical productions, workshops and performances that were showcased during the Faculty’s Arts Festival that was held in September, 2018. More data will be collected from the Faculty’s creative industry ‘friendly’ curriculum based on such creative arts disciplines as music and dance, drama and film, entertainment technology, fashion design, graphic design and multimedia, fine and applied arts.

(iii) Impact:
Ruth Bridgstock (2007) asserts that universities need to develop creative industries ‘driven’ curricula that can provide students with work integrated learning (WIL) experiences. The paper hopes to provide options for universities to focus on graduate employability by introducing domain specific knowledge and skills that foster workplace based training, develop career identities, instill personal responsibility and create self-management skills among their students.

(iv) Results:
The paper seeks to demonstrate the nature of the contemporary ‘entrepreneurial university’ that can be able to forge strategic alliances with government, industry and civil society in order to contribute to the growth of the country’s creative economy.
Medical Device Development In South Africa: Do Our Governing Institutions Support Innovation?

**Category:** 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century's Economic Development Agendas

**Presentation:** Oral

Faatiema Salie (University of Cape Town), Kylie de Jager (University of Cape Town), Tania S Douglas (University of Cape Town)

**Purpose:**
South Africa's medical device market is dominated by large foreign multinational corporations, with approximately 90% of all products being imported. In 2013, total imports for the medical device industry was valued at R11.07 billion, and total exports at R1.08 billion (Deloitte, 2014). This figure shows some local activity and opportunity in the medical device market in South Africa. Local activity in medical device development has been investigated in recent studies. Chimhundu et al. (2015) and de Jager et al. (2017) have measured the extent of intra- and inter-sectoral collaboration between actors, as well international collaboration and the influence of international actors in medical device development in South Africa. Actors contributing to scientific knowledge generation (as judged by journal publications) for medical device development in South Africa have been found to be largely from the university and healthcare sectors, with the industry and science and support sectors playing smaller roles (Chimhundu et al. 2015; de Jager et al. 2017). Industry actors made a larger contribution towards technological knowledge, as judged by patents (Giglio, 2017). The studies highlighted above do not address institutions that promote knowledge development and exchange among actors in medical device development in South Africa. Institutions are considered to be the “rules of the game” in society and are the humanly devised constraints which shape human interaction (Hekkert, et al., 2011). Institutions may be formal or informal. Formal institutions (legislation, norms and standards, etc.) are those rules which are codified and may be enforced by an authority, whereas informal institutions are shaped by the collective interaction of actors (Hekkert, et al., 2011). Institutions may facilitate, promote, or hinder actor participation. In this research paper we explore government institutions to promote knowledge development and exchange among actors involved in medical device development in South Africa. We pose the question: Are the governing institutions of medical device development in South Africa supportive of medical device innovation?

**Methodology:**
The government departments playing a role in medical device development in South Africa include the Department of Health, the Department of Science and Technology (DST), the Department of Trade and Industry (DTI) and the Department of Higher Education and Training. The websites of these departments were searched for institutional documents. As institutions were reviewed, references were found to other institutional documents, in a snowball referral system, which covered organizational, sectoral and governmental levels. We report only on organisational entities with government mandates. This extends to science councils, which are government-mandated research organisations that may pursue tasks described as medical device development. The websites of known science councils were searched for institutions addressing medical device development in South Africa.
Findings:

Institutions from government departments referred to the National Development Plan Vision 2030 (NDP2030) (National Planning Commission, 2012), which contains the South African government’s long-term strategic goals for South Africa. NDP2030 identifies 11 focus areas, one of which is “Improving Health”. Government policies that explicitly address medical device development include the Bio-economy Strategy (DST, 2013) and the Industrial Policy Action Plan (IPAP) (DTI, 2018). The Bio-economy strategy aims to coordinate development initiatives among different actors in the innovation chain, to contribute towards opportunities, resources and outcomes in agriculture, health and industry and the environment. Within its health scope, the Bio-economy strategy identifies the development of medical devices as one of the key interventions to address the South African burden of disease. It explicitly mentions government’s approach in using the “quadruple helix” model to integrate existing role players from government, university, industry and civil society into a coordinated system. The civil society referred to here may include healthcare actors. IPAP2018 speaks to the creation of a medical device manufacturing industry. In particular, it mentions the establishment of a Technological Innovation Cluster Programme to promote collaborative initiatives between industry, government and universities to enable high-impact industrialisation in the medical device sector. Through the Technological Innovation Agency, a Medical Device and Diagnostic Technology Innovation Cluster (MDDTIC) is to be established as a national initiative to exploit resources across South Africa with the aim of stimulating and intensifying innovation and competitiveness within the medical devices sector. One of the targeted outcomes of the MDDTIC is to promote medical device manufacturing which addresses diseases of strategic and economic importance in South Africa. The cluster model advocates for the participation of actors from the public and private sector, with successful implementation of the cluster’s objectives dependent on collaboration across the innovation chain. Government has also started regulating the medical devices market in South Africa, through The Medicines and Related Substances Amendment Act 14 of 2015. Regulations would be enforced through the newly formed South African Health Products Regulatory Authority (SAHPRA). Two science councils play a central role in medical device development in South Africa, namely the Council for Scientific and Industrial Research (CSIR) and the South African Medical Research Council (SAMRC). The CSIR is governed by the Scientific Research Council Act 46 of 1988. The CSIR supports industrial development and enhances the capabilities of government in the areas of service delivery, policy development and information management (CSIR, 2015). In the health technology space, the CSIR has long-term objectives of combating the high burden of disease through the development of cost-effective bio-therapeutic technologies and health infrastructure, and developing a portfolio of medical devices, sensors and information systems. The CSIR has recently been tasked with the development and implementation of the Cloudnostics platform which would provide connectivity, life cycle management and data analytics capabilities to any medical device manufacturer (CSIR, 2017). The CSIR also provides research support for the National Bio-economy Strategy, where it has begun the investigation into the creation of a medical device and diagnostic incubator aimed at assisting local medical device manufacturers regarding manufacturability and adherence to local and international standards (CSIR, 2018). The SAMRC is governed by the South African Medical Research Council Act 58 of 1991. The responsibilities of the SAMRC include, among others, performing and financing research and research facilities. The SAMRC is the largest health research funder in South Africa. One of the strategic goals of the SAMRC is to support innovation and technology development to improve health. An indicator of this goal is the number of innovation and technology projects which are funded by the SAMRC to develop new diagnostics, devices, vaccines and therapeutics (SAMRC, 2018). The SAMRC funds several health research programmes, including programmes focused on health innovation, through strategic partnerships, and grants managed by the Grants Innovation and Product Development Unit. Research programmes selected for funding focus on major health issues impacting South Africa and the rest of the world. One particular programme related to medical device development is the Strategic Health Innovation Partnership (SHIP). SHIP is a health technology product development programme, a partnership between the SAMRC and DST, which funds and manages innovation projects focused on the development of new drugs, treatments, vaccines, medical
devices and prevention strategies (SAMRC, 2017). SHIP facilitates, through partnering with local universities, science councils and private sector, the translation of research output into improved health outcomes and/or social benefit. SHIP, together with the SAMRC’s Technology Transfer Offices, develops pathways to facilitate the movement of new products from the laboratory to marketplace.

Research limitations/implications:
The study only focused on the institutions of the South African government, to which actors partaking in medical device development in South Africa may ascribe. It does not extend to the institutions of actors from sectors such as healthcare, university and industry, who, together with government, may influence the medical devices landscape in South Africa.

Practical and social implications:
We have highlighted government institutions aimed at promoting knowledge development and exchange for a medical devices ecosystem in South Africa. A commonality in the institutions is the promotion of medical device development towards addressing diseases which are of importance locally. Furthermore, there is an acknowledgement that development of medical devices requires the input of different actors, and initiatives are geared towards supporting cross-sectoral collaboration. Science councils like the CSIR and SAMRC have been tasked with providing platforms for supporting the medical devices industry, including funding mechanisms for research at organizations from different sectors. While government has set the groundwork for the promotion of a local medical devices ecosystem, the challenge now lies in ensuring that all actors participate in the innovation chain, while shaping and redefining the governing institutions towards supporting impactful innovation.

References:
The Role of Technology Commercialisation in the Operationalisation of Innovation and Industrial Policies in South Africa

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas

Presentation: Oral

Nontombi Pearl Marule (Department of Trade and Industry)

Innovation has been and continues to be recognised as central to promoting and supporting sustainable economic development; as such, South Africa has set the goal of becoming a knowledge economy. This is an economy that succeeds in producing knowledge and transforming itself into technology-based from resource-based economy that will stimulate growth and development of the country, while creating sustainable employment opportunities. The two key policies designed to drive strategic economic development in South Africa are the Innovation Policy and the Industrial Policy.

This paper considers the role of technology commercialisation strategy and how it can be utilised as a model for cooperation and collaboration to ensure achievement of the objectives of the Innovation and Industrial policies and present a homogeneous approach to policy implementation. The data was collected through a field survey of small, medium and micro enterprises (SMME’s) which are technological oriented. Additional information was gathered through an in depth, semi-structured interviews with selected stakeholders within the innovation landscape.

The research findings confirm that commercialisation is the most significant and critical step of the innovation value chain, supported by collaboration and linkages of the innovation system players and it requires effective co-operation from both public and private entities. Successful technology commercialisation justifies efforts, funds and time committed to research and development and it propels enterprise development, spurs industrialisation, enhance enterprise technological capability, efficiency and competitiveness, create investment opportunities, and make research more demand driven. Keywords: innovation, technology commercialisation, sustainable economic development
Patenting Activity for Orthopaedic Device Innovation in South Africa

**Category:** 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century's Economic Development Agendas

**Presentation:** Oral

Faatiema Salie (University of Cape Town), Kylie de Jager (University of Cape Town), Tania S Douglas (University of Cape Town)

**Purpose:**

Medical device development involves different sectors – universities, healthcare and industry (Hicks & Katz, 1996) each of which plays a different role in the innovation chain. Collaboration between these sectors results in knowledge transfer and access to capital across sectors, while ensuring that developed technologies address patient needs and reach the market. South Africa's medical devices market is dominated by large foreign multinational corporations, with approximately 90% of all products being imported (Deloitte, 2014). Sixty-five percent of medical devices categorised “Surgical Appliances and Surgical Supplies”, comprised “orthopaedic appliances”. An orthopaedic medical device refers to a part, implant, prosthetic or orthotic which is used by the body for injuries, or diseases, of the body's musculoskeletal system. The primary purpose of these devices is to provide stability and mobility. Of the top ten most imported groups of medical devices into South Africa for 2013, four groups were classified as orthopaedic devices, with a combined value of ZAR 1.8 billion. Of the top ten most exported medical devices, only one group was classified as orthopaedic devices, with a value of ZAR 50 million. These figures highlight the substantial value of imported orthopaedic devices and shows limited supply of such devices on the part of the domestic medical device market in South Africa. A recent study on the scientific knowledge base for orthopaedic device development in South Africa identified (organisational) actors, the sectors to which they belong, characterised actors’ relationships, and investigated the presence of international actors (Salie, et al., 2019). The study applied the technological innovation systems (TIS) framework, exploring knowledge development and knowledge exchange functions, using co-authorship on scientific publications as an indicator of actor collaboration. We build on this work by presenting a network analysis of actors contributing to the technological knowledge base of orthopaedic device development through patent activity.

**Methodology:**

Patents for orthopaedic device innovations from South African actors were retrieved from LexisNexis Total Patent for priority dates between 1 January 2000 and 31 December 2015. Actor collaboration networks, at the organizational level, were drawn using co-inventorship data from patents; actors were connected to each other if they appear as co-inventors on a patent. Collaboration networks were drawn and analysed using UCNet 6 (Version 6.573) (Borgatti, et al., 2002) and NetDraw (Version 2.152) (Borgatti, 2002). Network analysis metrics were employed to identify dominant actors in the network and provided information about the number of instances of collaboration that have occurred between actors. These include density and group density, degree centrality and betweenness centrality. The presence of international actors was investigated using Binz et al. (2014)’s nationalisation index.
Findings:
The patent network dataset comprised 62 patents between 2000 and 2015. Fifty-seven organisational actors were identified. The actors are largely South African (61%) and are represented in almost equal numbers from the university, healthcare and industry sectors. A similar number of local and international university sector (L=7; I=9) actors are represented. The number of local healthcare (L=14; I=7) and industry (L=14; I=5) actors present is twice that of their international counterparts. The patent network is sparse, with a density of 0.090, indicating that only 9% of all possible connections in the network have been made. The network consists of 22 components; ten of these are self-reflecting single-actor components, and a further seven components comprise only two actors. The university, healthcare and industry sectors have varying degrees of intra-sectoral collaboration, measured by their within-group densities. Industry actors collaborate most with, and show preference for collaboration with, other industry actors; university actors show preference for collaboration with other university actors; and healthcare sector actors collaborate to a lesser extent with actors from the same sector. The strongest inter-sectoral collaborations, based on between-group densities, were between the university-industry and university-healthcare sectors, however, there were many instances of inter-sectoral collaboration in the healthcare-industry sectors. There were very few instances of collaborations comprising the university, healthcare and industry.

Discussion: While the network is sparse, there is evidence of collaboration between actors of different sectors for technological knowledge development for orthopaedic device innovation. The number of healthcare actors involved in orthopaedic device innovation in the patent network is substantial; more than a third of the actors identified belonged to the healthcare sector. In the scientific publications network of Salie et al. (2019), approximately 38% of the actors were from the healthcare sector. Healthcare sector actors therefore make a considerable contribution towards knowledge development for orthopaedic device development in South Africa. This finding is not necessarily new. Both Hicks & Katz (1996) and Lander & Atkinson-Grosjean (2011) highlighted the importance of healthcare actors (or hospitals) in the biomedical innovation system. The South African healthcare system has public and private healthcare facilities. In the patent network, both public (4) and private (10) healthcare actors make contributions. The public healthcare actors are largely academic hospitals (Steve Biko Academic Hospital, Groote Schuur Hospital, and Charlotte Maxeke Johannesburg Academic Hospital) that are linked to research-intensive universities. They form part of multi-actor network components. The private healthcare sector actors on the other hand largely operate on their own, or with one other actor, and contribute to the large number of components in the network (Stellenbosch MediClinic is the exception). This was not the case in the scientific publication network where private healthcare actors were integrated into multi-actor components in the network. When comparing the healthcare actors of the scientific publication networks of Salie et al. (2019) to the patent networks, seven local healthcare (3 public and 4 private) actors appear in both networks. All of these seven healthcare actors had either high degree centrality or high betweenness centrality in the scientific publications network. These public and private healthcare actors in the scientific publications network were linked to the research-intensive universities, an exception being Morningside MediClinic, which had betweenness centrality lying on the path connecting two research-intensive universities. These findings suggest that, in the technological/patenting domain, collaboration potential exists for private healthcare actors. A step needs to be taken in tapping into the network of hospital groups or with healthcare actors already associated with universities, to maximise the potential of their technological endeavours.

Research limitations/implications: Patents and publications serve as indicators of different types of collaboration. As the industry sector was expected to be more likely to patent than publish, patent data would better illustrate knowledge dynamics in that sector. The patent network identified further actors involved in orthopaedic device development in South Africa, and the relationships between them.
Practical and/or Social Implications:
Local private healthcare actors make a considerable contribution towards orthopaedic device development in South Africa. However, not all of them exploit inter-sectoral collaboration with university and industry actors, which supports medical device development. We have highlighted the collaboration potential which exists.

References:
The Relevance of the University-Industry Collaboration towards Economic Development: A Systematic Literature Review from 2000 To 2018

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas

Presentation: Oral

Besart Latif Hajrizi (South East European Research Centre (SEERC)), Panayiotis Ketikidis (South East European Research Centre (SEERC)), Lenny Koh (Sheffield University Management School), Adrian Solomon (South East European Research Centre (SEERC))

Purpose:
This systematic literature review aims to show the significance of Inter-organizational relationships between university and industry as an important mechanism on encouraging knowledge exchange and driving innovation processes. It also focuses on several effects such as geographical proximity, by analyzing the relation between distance and the quality of the relation, and obstacles, exploring the influence of different mechanisms in lowering barriers related to the orientation of universities towards the industry. The systematic review covers relevant articles published between 2000 to 2018 to answer the following research questions related to university-industry co-creation but with a core focus on: • What is the new role of the Universities and Firms towards innovation? • What is the relation between geographical proximity and organizational forms and types of interaction between university and industry? • What are the motivations and barriers to the university-industry co-creation? The main objective of the study is to establish fundamental knowledge on the aspects of university-industry collaboration, such as the relation between geographical proximity with organizational forms and types of knowledge interactions, the new role of universities and firms and motivations and barriers of university-industry co-creation.

Design/Methodology/Approach:
Guided by the above-mentioned objective, the study follows the method suggested by Tranfield et.al. (2003) to carry out the review. We started by identifying all relevant articles produced from 2000 to 2015. The aim is to bring together interactive and existing evidence-based studies that are relevant to the research being undertaken, irrespective of their published location or disciplinary background. Based on the basic principles by Thorpe et al., 2005 behind adopting systematic review methods are: 1. Transparency: Research study is recorded, and every criterion of relevance against retrieved lists of studies are meant for inclusion (Denyer and Neely 2004). 2. Clarity: Any reader interested in "audit trail" on how the review arrived at the final list of studies, a series of searches is presented (Tranfield et al. 2003). 3. Focus: Formulated questions are closely related (Pittaway et al. 2004). 4. Unification: To inform policy and practitioner perspectives the review methodology is designed in a broad scope of dissemination (Leseure et al. 2004). 5. Equality: The review makes no distinction in principle between the type and nature of journals and other publication outlets. (Pittaway et al. 2004). 6. Accessibility: The reviews are accessible in the form of reports and searchable databases outside the specialists and academic community (Thorpe, 2005). 7. Broad coverage: Sophisticated electronic databases allow reviewers to cover broad forms of publication. 8. Synthesis:
Findings:
This paper mainly shows the appropriate methods which foster and intensify the Inter-organizational relationships between universities and industry. This systematic literature review covers relevant articles conducted from 2000 to 2018. It investigates in depth the relation between geographical proximity with organizational forms and types of interaction between university and industry. It also identifies the key characteristics of an entrepreneurial university and presents the new role of Universities and Firms towards Innovation. This paper shows the role of university-industry collaboration to the transformation of a university from teaching to research and thence to an entrepreneurial institution to better exploit its knowledge and innovation capacity, but even the role of the internal business environment towards innovation. The main recommendation for further research is to investigate other interrelated factors towards innovation from the perspective of the triple, quadruple and quintuple helix for the case of developing economies.
University-Led Technological Platforms: Comparative Insights of Two Universities’ Organisational Adaptation in the Wake of Smart Specialisation

**Category:** 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas

**Presentation:** Oral

**Purpose:**
Universities’ contribution to regional development and innovation is widely recognised. Their role in activating regional knowledge dynamics through their interaction and collaboration with a multitude of actors is viewed as transformative, positioning them as one of the three most territorially relevant institutions alongside industry and the state (Etzkowitz & Leydesdorff, 2000; Gunasekara, 2006). This is particularly emphasised in academic conceptualisations like the Triple Helix model, and in new policy paradigms like smart specialisation, where universities are attributed a central role in regional innovation policy processes. Capable of identify and potentiating regional knowledge assets and latent areas of value for prioritised investment, they are expected to be key agents throughout the smart specialisation strategy process, guiding entrepreneurial discovery, matching industrial and research resources, and developing regional capabilities (European Commission, 2014; Foray et al., 2012). Given increased expectations for universities to engage in the regional innovation landscape, especially by the most recent policy paradigm, this has reinforced the need for organisational change in academia. Universities have sought to create closer ties with other institutions and stakeholders and frame their action towards the surrounding territory more strategically. Besides the broader institutionalisation of the «third mission» of regional engagement, complementing the more traditional academic missions of teaching and research (Etzkowitz & Leydesdorff, 2000; Zomer & Benneworth, 2011), the creation of offices specifically designated to manage knowledge transfer and other collaborative activities have been a common practice across higher education institutions to strengthen these relations and outreach functions (Arbo & Benneworth, 2007; Etzkowitz, 2002). More recently, a new organisational structure within the university seems to have emerged in the face of such challenges. For universities to better align their research and engagement activities with regional priority areas, and concomitantly boost collective capabilities among actors in the region, they have created sector-specific formal networks between academics, businesses, public government authorities and other organisations. These cluster- like structures – designated in the cases herein analysed as technological platforms and strategic research communities – formulate an attempt to move beyond bidirectional and punctual university- industry relationships toward more dynamic, knowledge-based and complimentary configurations that can act as ecosystem connectors. These differ from regular clusters as they are not led by businesses nor have industry necessarily at their core (Rosenfeld, 2002). They also do not follow common definitions of technological platforms, as they are not a policy-led instrument (Proskuryakova, Meissner, & Rudnik, 2017). They consider a similar objective, namely the structuring of research in accordance with large scale challenges (European Commission, 2004), but the technological platforms herein referred are led not by policy directives and government authorities but, instead, by the
university, as a way to provide a strategic orientation to its activities and organise broader collective and regional innovative dynamics. This paper aims to explore the organisational adaptation of two universities as they assume these increasing expectations in regard to regional innovation policy. It seeks to understand the motives and context for the creation and development of specific organisational structures – technological platforms – their objectives, and their effective role in the regional innovation landscape.

Through an analysis of the technological platforms (TPs) of the University of Aveiro, Portugal, and the strategic research communities (COREs) of the Autonomous University of Barcelona, Catalonia, both established around the years of 2013-14 as the smart specialisation framework was becoming operationalised, this paper reflects on these bodies as an attempt to link an institutional mission with a new regional policy and economic framework, and how, in doing, so they have the potential of becoming ecosystem connectors and leadership vehicles within the region.

**Design/Methodology/Approach:**
Considering its explorative and interpretative character, this paper follows a qualitative research approach. It employs a comparative analysis of two case-studies of universities in different regional and national settings, with each individual case first being examined in-depth and then these being compared to explore similarities and differences among them. These are the University of Aveiro (Portugal) and the Autonomous University of Barcelona (Catalonia), where these technological platforms have been established to structure academic research and engagement endeavours in the region. This paper draws from 26 (13 in each case) semi-structured interviews conducted in both contexts between 2017 and 2019. Interviewees included academic and support staff of both universities as well as external partners connected to these platforms (companies, industrial associations and local and regional government). The focus was to understand each university’s engagement with the smart specialisation policy process, their organisational adaptation and alignment with the strategy, the role of these platforms in framing the university’s activities, and their impact on regional innovation. This permits the investigation of the extent to which these initiatives operate to match the specialisation domains of the smart specialisation strategies in the region, as well as the nature and focus of these platforms’ activities.

**Findings:**
Preliminary findings suggest the creation of these technological platforms was heavily influenced by the regional innovation and smart specialisation discourse and, inclusively, by broader European debates on societal challenges and associated funding opportunities. The COREs of the Autonomous University of Barcelona have particularly been influenced by the latter, primarily acting as an internal network of the university to facilitate and potentiate EU funding applications. Their focus areas, albeit still few, are expanding on topics within the Catalan smart specialisation strategy: cultural heritage, employment and occupation, smart cities and mental health. The technological platforms of the University of Aveiro, on the other hand, are greater in number and besides certain very particular sectors (plastics and moulds, high pressure), they are generally related to regional priority areas, namely forest, agro-food, sea, connected and smart communities, sustainable housing, cycling and mobility. In both cases, the technological platforms are very active, and owe much of their success and regional outreach to support staff, who act as connectors and managers of the network, and were considered by interviewees as key in coordinating and motivating the academic personnel, and in also fomenting long-term contacts with external partners. Research limitations while the utilisation of two case-studies permits more reliability in the study, the fact that these are two universities both located in southern European countries may limit the generalisation of the findings. Similarly, given that some of these technological platforms were created quite recently (the most recent one is in UAB, having been established in October 2018), it is still early to assess the extent of its impact on the territory’s research and innovation landscape.

**Implications:**
By exploring the role of university-led technological platforms and strategic research communities the authors expect there to be a broader consideration of university’s role in regional development, but also a
openness to try different forms of working collectively and in network to further innovation endeavours. Originality Technological platforms as bodies created and led by universities are unexplored in the literature. As previously explained, they are more commonly referred as a policy instrument, and while similar, their operationalisation and objectives are quite different from those of cluster initiatives, usually also led by industry. Therefore, this paper seeks to contribute to the literature on regional systems of innovation, internal organisation of higher education institutions, and stakeholder networks, while simultaneously adding to the debate on regional policy driven by smart specialisation.

References:
Study Program Innovation in the Triple Helix Context: The Case of the Cooperative Study Programs at a German University of Applied Sciences

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century's Economic Development Agendas
Presentation: Oral

Benjamin Schiller (Baden-Wuerttemberg Cooperative State University Stuttgart, School of Business), Prof. Dr. Liudvika Leisiytė (TU Dortmund University, Center for Higher Education, Professorship of Higher Education)

Purpose:
Within knowledge-based society, Triple Helix (TH) has been identified as a catalyst for change and as a tool fostering innovation. In a triadic relationship between university, industry and state, university has been ascribed a more prominent role in the advancement of socioeconomic progress. The hybridization of three actors creates new forms for the production, transfer and utilization of knowledge (Etzkowitz, 2008; Etzkowitz & Leydesdorff, 2000; Etzkowitz & Zhou, 2017). An example of this hybridization can be found in the Entrepreneurial University (Clark, 1998; Etzkowitz, 2013). This type of university has flexible structures and functions as ‘boundary spanner’ in the TH context. Studies have shown that entrepreneurial universities actively engage in technology transfer and commercialization of knowledge via patenting, spin-off creation and other research commercialization activities (e.g. Leisiytė & Fochler, 2018). Knowledge dissemination between university and industry via university teaching in the TH context has merited less attention (Burkhart-Kriesel, Weigle, & Hawkins, 2019; Normann & Pinheiro, 2018; Roper & Hirth, 2005). Thus, this paper aims to understand the emergence of the new organizational forms in teaching and learning that enhance TH linkages. We draw on the example of innovation in cooperative study programs (CSPs) at a German university of applied sciences (UAS). The CSPs are a specific type of programs, which are delivered partly at university and partly in industry. They are seen as contributing to socioeconomic development in Germany as they supplement the existing higher education system as a ‘bridge builder’ between vocational training system and higher education system (Krone, Mill, Schütz, Ratermann, & Hähn, 2015). The case of German CSPs at UAS is highly pertinent to understand the hybridity in the knowledge dissemination taking place at university, as the rationale, design and structure of the CSPs are developed in close cooperation between industry, university and government. In this paper we pose two questions: 1. How are cooperative study programs structured and which stakeholders are involved in shaping these structures? 2. How does innovation in cooperative study programs occur and what are the mechanisms that foster it? We answer these questions by drawing on the TH literature, especially on the notion of an ‘emerging hybrid organization’ (Champenois & Etzkowitz, 2018; Etzkowitz & Zhou, 2017) where we distinguish between two organizational levels in our study: the ‘program level’ as well as the ‘institutional level’. The ‘program level’ concerns development and operation of CSPs. The ‘institutional level’ incorporates the university as an entity interacting with stakeholders with the goal to shape framework conditions for CSPs that respond to industrial needs.

Design/Methodology/Approach:
We carried out a longitudinal three-year case study (Yin, 2014) of a UAS in Germany. We carried out 30 semi-structured face to face interviews with professors responsible for the creation of the CSPs, industry representatives engaged in cooperation with the university and policy-makers responsible for CSPs in a highly industrialised state. Further, we collected pertinent corporate documents, regulations and studied university and company websites in the period 2016-2018. The interviews lasted from 25 to 75 minutes, were transcribed verbatim and analysed using MAXQDA software. The interview and document data analysis was conducted based on Mayring’s (2008) qualitative content analysis method.

(Preliminary) Findings:
Structure of Cooperative Study Programs: Our case selection uses business administration and nursing, representing two distinct models of CSPs in Germany. The business administration case follows the so-called ‘practice-integrated model’ whereby university and industry exercise a structured coordination of two learning venues. Nursing represents the model, combining higher education and vocational training whereby university, hospital and nursing school exert a structured coordination of three learning venues. Studying CSP innovation leads to a distinction between curriculum and capacity layers. At the curriculum layer, we observe different innovation intensities. Firstly, program head professors (PHPs) shape ‘profile modules’ and in this way can change the program to a certain extent which results in a ‘slight innovation’. Further, PHPs may also amend or newly develop a course or a new field of study – which may lead to ‘significant innovation’. Secondly, an amendment or new development of a degree course or a ‘field of study’ within a degree course marks a step of ‘high innovation’. In both cases decision-making lies in the hands of university’s committees even though PHPs take the lead in shaping these programs. Within the committee system stakeholders from university, industry and government deal with design and innovation of the curricular. At the same time, these can take place only with the prescribed frame of the institutional system accreditation, provided by Central Evaluation and Accreditation Agency (ZEvA). On the capacity layer, a course marks a capacity unit for 30 study places. Government funds a total number of courses and performance measurement is done through occupancy rate. University links courses to curricula and arranges ‘degree courses’ following industry’s needs. Course allocation may promote innovation. Stakeholders roles: University reveals two different professors roles: PHPs and university management professors (UMPs). PHPs bear responsibility for a degree course and ensure the capacity to deliver it. PHPs play an important role as ‘editors’ in curriculum development and ‘conduct’ degree courses. Furthermore, PHPs operate as ‘intermediaries’ in dealing with stakeholder expectations. Student enrolment numbers in these courses measure PHPs success. Thus, PHPs interest is to shape an attractive curriculum. They do so through offering popular topics and thus they ensure well-attended courses. UMPs have an interest in maintaining an industry relevant CSP portfolio and have to proof occupancy of courses towards government. Thus, as ‘facilitators’ UMPs collaborate with PHPs supporting curriculum innovations. In addition, UMPs foster capacity utilization as ‘agents’ towards government. UMPs appoint PHPs for operation of CSPs and both take part in decision-making as members of the committee system. Industry appears in the shape of HR managers or training officers and coordinates CSPs in collaboration with PHPs. We observed industry obtains a university membership. Hence, industry is represented through the university’s committee system and takes part in decision-making. Industry representatives are perceived as ‘clients’ who provide valuable feedback regarding the CSP curricula quality. Industry plays a role as a ‘catalyst’ for innovation based on the views of industrial interviewees. This can be observed in how much degree programs are supported by the industry through co-teaching and practical training as well as through their role in setting the number of study places in CSPs. Government is represented in the university through the involvement of the ministry of science officials in the committee system and takes part in decision-making. Government officials play a ‘rule maker’ role through regulation of CSP framework conditions via the Higher Education Act. They are also important in terms of funding study places of CSPs. Ministry appears as responsible body for university and regards university as subordinated organizational entity, fulfilling policy goals. Depending on these in the particular year, the ministry acts as ‘principal’ and funds additional study places. Curriculum innovation and mechanisms that foster it: Business administration case: In the business administration faculty a new course was introduced due to the increasing demand of new digital qualifications for industry. An initial
trigger to create a new course was a decline in study numbers among the existing degree courses. In addition, industry demanded modified qualification requirements. PHPs initiated a business administration curriculum amendment through a new ‘field of study’. PHPs appear as ‘editors’ of curriculum amendments and involve industry as ‘clients’ and ‘catalysts’. Industry’s role as ‘clients’ can be observed in its feedback on curriculum proposed innovations. Its catalyst role is exemplified through supporting curriculum innovation in the formal decision-making process. UMPs ‘facilitate’ the innovation process through the university’s committee system and through approval of an altered distribution of courses. Within an adjusted framework, PHPs develop new courses based on the updated curriculum. In this way, university and industry shape study program innovation through an integrated transformation process. Nursing case: To prevent an imminent supply shortfall caused by demographic change, government changed the nursing occupation law. The amendment aims to introduce academic qualification for nursing and suggests CSPs as suitable concept. Through ties to government and industry, university adopted this requirement early on as an ‘agent’. PHPs in nursing developed a study program curriculum and involved nurses from hospitals and policy-makers as ‘clients’. Regional government acted as a ‘principal’, providing additional funding, coupled to the goal of securing supply of nursing junior staff. In the nursing program, university and government shape study program innovation in a principal-agent process.

**Implications/contribution:**

Our case study of the innovation of CSPs at a German UAS indicates an empirical example of the commercialization of study programs in the TH context. Both studied program innovations show how the ‘hybrid organization’ emerges at an entrepreneurial university and what roles do different actors play in this process. University functions as an ‘intermediary institution’, interacting with industry and government responding to the needs of these at the local and regional levels through study program innovation. Our contribution provides empirical evidence regarding the complexity of roles TH actors play in study program innovation and reflects on the limits of hybrid organization in teaching and learning at universities.
Research Groups of a Brazil Public University and Its Contribution to Local Development

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas

Presentation: Oral

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Purpose:
The University of Berlin (now Humboldt University), in 1810, pioneered incorporating research as a mission, provoking the First Academic Revolution (Prota, 1987). Over time, universities began to provide structural support for innovation and also incorporated the formation of local leaders in the university agenda. This movement was called the Second Academic Revolution (Etzkowitz et al., 2008). In different periods, the same process occurred in Brazil in public universities. Created between 1920 and 1960, initially had as main mission the education. Since the 1960s, research activities have been incorporated with postgraduate programs, and since the 1990s Brazilian universities have become collaborators of an economic development model based on management efficiency and innovation as a way to improve competitiveness (Maculan et al., 2009). Thus, universities began to collaborate with the communities in which they are inserted helping to develop them politically and economically, including contributing to adjust the local culture to a new reality. Etzkowitz (2006) speaks of an entrepreneurial university model in which the university actively participates in the regional innovation strategy. It contributes to a research base with commercial potential, has tradition in the generation of startups, a corporate ethos without a campus, and contributes to the development of policies that help to differentiate intellectual property ownership and to the development of profit sharing and the regulation of conflicts of interest. In practice, any university has the potential to help industrial development, regardless of mission level. However, only the entrepreneurship of a university has the ability to complete a trilateral interaction between university, business and government (Etzkowitz, 2006), contributing mainly to the growth of the locality and the country in its economic and social aspects. The search for development brought a new nomenclature for the university: "Entrepreneurial University", characterized by conforming advanced technology and facilitating the process of technology diffusion through intermediaries, such as technology transfer offices, business incubators and technology parks, with the aim of stimulating the generation of new companies (Rothaermel et al., 2007). However, Arza (2010) argues that environmental characteristics can affect the continuous development of university-enterprise interaction. The author cites some of the limitations of this interaction process: the Latin American context in which Brazil is inserted - a region marked by inequalities - with a poor educational system, science and technology policies that do not favor university-business interaction, presence of companies with low innovative capacity and non-knowledge-based production structure. Ferreira et al. (2013) complements the types of difficulties: cultural differences between educational institutions and companies, differences in objectives, lack of incentives in universities to support this relationship, administrative and bureaucratic procedures, lack of experience of university researchers in the productive sector, lack of structure of rewards and limited time available by researchers. Rapini (2007) poses the situation of companies and
acknowledges that many are trying to innovate more and are aware of the lack of qualification of their professionals, while there is an academic inability to identify the demands of the market and propose necessary solutions. Given the above, the aim of this paper can be defined as: 'Identify the level of economic-social interaction of the research groups of a Public University with the region in which it is located'. For that, a case study was carried out at the Federal University of Juiz de Fora (UFJF), a medium-sized institution, located in the city of Juiz de Fora, in the state of Minas Gerais, Brazil. Juiz de Fora is the main municipality of a region with approximately 2 million inhabitants. Based on Rapini's (2007) premise that leaders of research groups are individuals qualified to establish dialogue between university and society, research groups will be treated as units capable of collaborating for the development of the region in which they are located in this paper.

**Design/Methodology/Approach:**

This is a research of an applied nature, with an exploratory and descriptive objective, since it aims at understanding a social group and explaining a contemporary phenomenon. The first stage consists in the application of questionnaires to the leaders of the UFJF research groups that are part of the Directory of Research Groups in Brazil, linked to the National Council for Scientific and Technological Development (CNPq), to understand their field of activity and how much these can promote cooperation in the social and economic environment. The second stage consists in the application of semi-structured interviews with the UFJF managers to understand the instruments adopted by the university to promote academic interaction with society, its main projects and partnerships, motivations and barriers. At the same time, there is documentary research in the UFJF public access registries and also the public access registers of UFJF research groups, which are part of the Directory of Research Groups in Brazil, linked to the National Council for Scientific and Technological Development (CNPq). The treatment and analysis of the data follow the proposition of Triviños (1999): pre-analysis, analytical description of the data and interpretation. The data obtained were transcribed or tabulated and generated descriptive and inferential statistics using SPSS - Statistical Package for Social Science (Hair Jr. et al., 1995).

**Findings:**

The university has activities that meet what Etzkowitz (2006) treats as an entrepreneurial university model, however, the results do not allow to affirm that UFJF is an institution that actively participates in the regional innovation strategy. One can affirm that there is potential for this to occur but at present there are sparse initiatives that are not enough to recognize the UFJF as a research base with commercial potential, as a place with tradition in the generation of startups. Still in relation to the entrepreneurial university, the UFJF has individuals who can contribute to the elaboration of policies that help to differentiate ownership of intellectual property and did not identify actions that contribute to the development of profit sharing and the regulation of conflicts of interest. Regarding the influence of the external environment on the results, it can be stated that the elements pointed out by Arza (2010), which can affect the university-company interaction, are present in the region where the UFJF is located, however, in a smaller proportion than in Brazil. The education system in the region has a supply and quality superior to the national average and there is a production structure based on knowledge, with predominance for services in the areas of education and health. As for the presence of companies with innovative capacity, for the most part, they are based on the adoption of more modern processes and equipment, not on their development. In relation to the influence of the internal environment on the results, it can be affirmed that the elements pointed out by Ferreira et al. (2013), which can affect the university-company interaction, are identified in the UFJF structure. Therefore, there are differences between university and business objectives, there is a little support for the university-company relationship, university researchers do not have experience of interaction with the productive sector, there are many administrative and bureaucratic procedures, the rewards structure is deficient, in addition to the time available for individuals to meet the demands of companies. The results indicate the existence of some characteristics of an entrepreneurial university in the UFJF, however, are not enough to be treated in this way. Aspects of the internal environment and the external environment contribute to this
and lead to the following question: If there are some initiatives that can be treated as entrepreneurs in this environment, what to do so that this behavior is replicated and, at some point, is predominant in university? The deepening of the analyzes could generate subsidies that make possible a better understanding of the performance of research groups and university managers, as well as instruments that can stimulate the greater insertion of the UFJF in the socioeconomic context of its region of influence. As a complementary result, it may be possible to identify which research results have the greatest potential for use in the economy, stimulating university-company interaction.

References:
The Triple Helix, R&D and Productivity Slowdown – A Comparison of Different Industries

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century's Economic Development Agendas
Presentation: Oral

Michael Rothgang (RWI - Leibniz Institute for Economic Research), Bernhard Lageman (RWI - Leibniz-Institute for Economic Research)

Purpose:
The contribution analyses and compares how the interplay of firms, research organizations and governments shapes the relationships between R&D and productivity growth in three industries in Germany: The automobile industry, mechanical engineering industry, and tele-communication services. These three industrial sectors have to meet technological challenges which are connected with the appearance of disruptive technologies. Governmental action on the national and European level endeavours to adjust the institutional framework to the changing technological environment and has become – in the case of the automobile sector – a driver of R&D efforts by business firms by setting increasingly demanding statutory thresholds for environmental emissions. At the same time, the German Federal government supports efforts to reinforce the links between industry and academic institutions, for instance, by supporting industrial clusters or by encouraging universities and public research institutes to cooperate with industrial firms. In the public discourse, it is often assumed that there is a very narrow link between R&D as a major driver of technical evolution and productivity growth. Some recent contributions have discussed this relationship and came to the conclusion, that R&D was rather central for productivity growth. The purpose of our analysis is to perform three industry case studies that ask, whether such a close relationship between R&D and productivity really exists. The assumption that is tested is, that productivity growth on industry level results from a complex interplay of government, universities and research institutes with business firms. We ask, how this interplay works in different industries and what similarities and differences can be found.

Design/Methodology/Approach:
In a first step, the analysis is based on statistical evidence that is drawn firstly from results of recent studies and, secondly, own econometric calculations based on a comprehensive firm database (Amadeus) containing data on German enterprises. We combine this evidence with qualitative results from expert interviews in order to analyse the relationship of firm R&D, inovation and productivity development. In a second step, the influence of government interventions and activities of universities and research institutes and the diverse interactions of firms, state and academia on productivity development are scrutinized. In the cases of the automobile industry, we look at the influence of government intervention at the example of interventions that promote E-mobility and their probable effect on future productivity growth based on a simulation study.

Findings:
The contribution finds that a detailed consideration of sectoral innovation systems is helpful for understanding the role of R&D as driver of productivity growth. We show that parts of the Triple Helix exert
influences on the outcomes of R&D on productivity growth. This interdependence is quite different in the three analysed different industries: - In the automobile industry, production is organized in a way that results in large productivity growth due to learning by doing in production. State regulations (like requirements for e-mobility) give impulses for product and process innovations. These lead to new impulses that influence productivity growth, although the direction is not always clear from the beginning. Research by universities and research institutes is focused mainly on product innovations that also exert influences on industry productivity. - In the mechanical engineering industry in Germany, the possibilities to realize productivity growth in production are restricted by smaller batch sizes in production. University research focused on new production technologies (industry 4.0 – internet of things in manufacturing) doesn’t necessarily lead to higher productivity in machinery as the products become more complex. The influence of state regulation differs between the different markets for products of the machinery industry. While the influence of the government is quite similar in some share characteristics with the automobile industry (agricultural machinery), the influence of government in others is more important in respect to its influence on international trade. - Productivity growth in the communication service sector is driven by the adoption of technologies that were produced in other sectors (especially in the electronics industry). The vast productivity growth of recent years has partly been driven by new network technologies, partly by the government that set new market framework conditions. The role of university re-search mainly has been indirect. Though the sectoral innovations systems are marked by considerable differences, there are similarities between these sectors with regard to an interplay of market forces, governmental influences and universities/research organizations. This interplay has intensified due to technological evolution, mainly the appearance of disruptive technologies, and increasing competitive pressures originating from the development of global markets. Our analysis concludes that there is, from Triple Helix perspective, no simple relation between R&D and productivity growth. However, we find different patterns of how R&D directly and indirectly influences productivity. In the future, more empirical work is required which takes into account sectoral constellations and the interrelationship between policy, business firms and research organizations.

**Research limitations/implications:**

There are some limitations to our analysis. Due to the complexity of price adjustment of the productivity data, each possible dataset has its limitation for analysis. This is especially the case for machinery, but also for telecommunications Services - although for different reasons. In addition, although the industries we looked at reflect the diversity of the economy, they only represent some – in the German context important – General triple helix patterns that can be found. So, the possibility to directly translate the results to other parts of the economy is limited and would need further analysis. Practical and/or Social Implications: Increasing productivity growth has been one focus of government R&D and innovation policy in the past. Productivity growth is closely related to economic welfare and thus one core aspect of long-term economic growth as such. Our analysis shows that the value of R&D promotion consists more in that it helps the economy to address social goals in a much more general way. At the same time, when we aim at productivity growth, we should focus on complex processes that take place in the interplay between firm-internal development patterns, knowledge increase through university research and the framework for economic activity that is developed by the government. Originality/Value Although there are a lot of studies on determinants of productivity growth and its relationship to R&D and innovation, few contributions take a systemic look at the patterns that lie behind productivity growth. Especially the role of universities and the state (especially in respect to shaping the framework for firm activity) have not been scrutinized on a comparative base for the analysed three sectors yet. At the same time, few studies have connected the cross-sectoral triple-helix perspective with an analytical look on the relevant developments inside the individual firms. Our analysis shows that the combination of a cross-sectoral systemic triple helix view with a firm-internal perspective brings new insights into the mechanisms that shape productivity growth at industry level and in the economy.

**References:**

BMWi – Bundesministerium für Wirtschaft und Energie (2019), Nationale Industriestrategie 2030.
Creative Collaborations between Academics and Practitioners - Case Study: Integrated Projects of International Business Bachelor Program

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas
Presentation: Oral

Xiao Peng (The Hague University of Applied Sciences)

Collaborations between academics and practitioners can lead practitioners to a higher efficiency, and at the same time simulate new scientific discoveries for academics. However, these two different groups often experience difficulties in learning from one another (Rynes, Bartunek, & Daft, 2001). Therefore how to creatively connect academics and practitioners remains challenging. In International Business bachelor program, The Hague University of Applied Sciences, integrated projects are developed and implemented through the four years program. We use this as a case study to show how can academics and practitioners collaborate and learn from each other.

The main purpose of the integrated projects is to let the students practice how to solve business problems from their academic skills which they learn from the program. There are critical benefits at the same time for academics and practitioners. During the integrated projects, the educators observe and reflect on what are the essential knowledge for the international business students, therefore ensure the diffusion of the current knowledge and create new knowledge for academy. The practitioners provide substantial business problems for the integrated projects. In the short run the practitioners seek for the best solutions or ideas for their business problems, in the long run they seek for best equipped graduates.

This case study describes the design of the integrated projects with the learning line: students apply and integrate their newly developed skills and knowledge in solving more and more complex business problems in a more and more complex and authentic environment. Moreover, this case study analyzes and evaluates the integrated projects from three parties: students, educators, and practitioners, to find out if the academics and practitioners do collaborate and learn from each other effectively via students’ projects. Finally this case study recommends how to creatively link academics and practitioners by introducing integrated projects in an educational program.
Innovation Triple Helix Cases at a Brazilian Public University

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas
Presentation: Oral

Antonio Claudio Lucas da Nobrega (Universidade Federal Fluminense), Andrea Brito Latge (Universidade Federal Fluminense), Marcelo Gonçalves do Amaral (Universidade Federal Fluminense), Ricardo Henriques Leal (Universidade Federal Fluminense)

Purpose:
In the last 15 years Brazil established a legal framework (laws and decrees) aiming the improvement of innovation effectiveness in the country. The first one, called “Innovation Law,” was edited in 2004 (Brasil, 2004) and regimented by a decree of 2005 (Brasil, 2005). More recently, a “Constitution Amendment for Science and Technology” was approved in 2015 (Brasil, 2015). This Amendment was followed in 2016 by a “New Law of Innovation” (Brasil, 2016), a revision of the Innovation Law of 2004, which was regimented through a decree edited in 2018 (Brasil, 2018). All this regulation aims to stimulate science, technology, and innovation improving the linkages among universities and research centers, known as Science and Technology Institutions (ICT’s), with the productive country system. In order to coordinate the innovation initiatives in the public ICT’s, the “Innovation Law” established that these organizations should create Nuclei of Technological Innovation (NIT), to act like Technology Transfer Office (TTO), to coordinate the innovation policy and promote innovation initiatives within these institutions. The primary mandates for these offices are: 1) to stimulate and manage the intellectual protection of the innovation developed in the ICT; 2) to manage business incubator offices and ventures support; 3) to coordinate the participation of the ICT in science and technology parks initiatives; and 4) to stimulate the interaction of the ICT with companies in the production system aiming the development of innovation activities. Another critical objective of this legal framework is to give legal support for promoting public funding of innovation initiatives developed jointly by ICT’s and companies, in a typical Triple Helix approach. Since 2000 UFF has a Technology Transfer Office (TTO) responsible for the management of Intellectual Property created inside the university. In 2009, UFF took the strategic decision to create an Agency of Innovation, named AGIR, inside the Vice-Rectorship of Graduate Programs, Research, and Innovation, as an umbrella to the whole of innovation activities performed in the university. The activities were the development and management of a business incubator, the monitoring social technology innovations, the development of a science and technology park and the enhancement of the interaction with companies through joint innovation projects development. The purpose of this work is to describe and analyze Innovation Triple Helix initiatives underway at the Agency of Innovation of Universidade Federal Fluminense (UFF) in recent years. The approach of UFF/AGIR changed in the last three years to enhance collaboration and the competences of startups to raise funds to R&D. UFF is one of the largest public universities from the Brazilian federal system and its activities has a significative impact in the state of Rio de Janeiro and serve as an inspiration to other ICT in the country.

Design/Methodology/Approach:
It is applied research with a descriptive and exploratory focus. Initially, documentary research was carried out to reconstruct UFF/AGIR’s trajectory. In a second stage, examples of projects and activities with Triple Helix interaction were studied, based on documental research, participant observation and interviews
conducted from January to March of 2019 with the startup companies navigating in UFF’s networks. It also analyzed the legal framework with a focus on technological and innovation development. The technical procedures used were bibliographic and documentary research. For the analysis, the deductive methodological approach was used.

Findings:
This research found several initiatives to do be reported: 1) The first successful Triple Helix initiative at the UFF/AGIR was originated from a public call launched by the Brazilian National Council for Research (CNPq), in July 2018. The objective was to grant doctorate scholarships to research and thesis developed together with companies with a focus in a technological aspect. This program, called Academic Doctoral for Innovation (DAI), was the first national institutional program of CNPq aimed to improve innovation in Brazil through the development of a jointly university- industry doctoral thesis. In order to attend this public call, companies from UFF’s network were contacted, and ten doctorate projects were defined to be developed jointly by UFF and seven companies. The partner companies contribute to the development of the project with a minimum value (counterpart). 2) The second successful Triple Helix initiative was accomplished by startups at the UFF/AGIR business incubator. Currently, UFF/AGIR has three startups incubated and seven more tenants which will start the incubation process this semester. UFF’s business incubator has a history of more than twenty years of activities with weak results. The change of managerial approach in the last years is improving the performance in terms of incubation success and supporting of companies’ network development and fundraising. 3) In 2018, public calls were launched by the Industrial Federation of Rio de Janeiro State (FIRJAN) together with the Support Service for Small and Medium Enterprises (SEBRAE), institutions partly supported by government funds. These calls aimed to finance innovation projects for different industrial segments based on the State of Rio de Janeiro. These projects should be jointly developed by the startup with one of the R&D centers of the National Service of Industrial Apprenticeship (SENAI) located in the State of Rio de Janeiro. The UFF/AGIR promoted the approach among FIRJAN, SEBRAE, the incubated startups and other startups from UFF’s network. The call was very competitive, and two projects proposed by UFF’s startup were granted with financial support. 4) Another public call to support startups projects was launched at the end of 2018 by Rio de Janeiro State Foundation for Research Support (FAPERJ), with one of the UFF incubated startups selected. 5) The last project at UFF/AGIR with Triple Helix approach is the development of an open Technological Park at Niteroi, a city close to Rio de Janeiro, where UFF’s headquarter and three campuses are located. This project, named Peninsula of Innovation, is being developed together with Niteroi City Hall and local and national companies with the key concept of an urban park recovering old houses and buildings that are degraded and unoccupied in a central area close to the UFF’s campuses.

Research Limitations/Implications:
The experiences are relatively new and need to be followed and studied in the future. Practical and/or Social Implications: For each of the initiatives described above, the practical results are: 1) In the DAI public call launched by CNPq to fund doctoral scholarships in joint projects with companies -> UFF was granted with the ten applied projects, the most significant number allowed to be offered to one institution. Five of the projects are in the biotechnology fields, developed together with four companies with objectives to develop, improve or reduce costs of pharmaceutical products to be used in laboratory test and diseases control. The other five projects are in information technologies themes, to be performed together with three companies, aiming to gamify managerial systems and to improve Business Process Managerial Systems. The projects have the thesis themes already defined jointly by UFF and the companies, and it is in the stage of selecting and indicating the students for the scholarship, which will be done through August 2019. The values granted in this program sum up to US$ 330,000.00 for the ten scholarships from CNPq and company’s counterpart of US$ 75,000.00. 2) In the FIRJAN/SEBRAE INOVA INDUSTRIA public call -> Two startups selected. In both cases, the projects should be developed together with SENAI’s R&D center. The incubated startup is developing a health and safety innovative solution, and the project was granted US$ 40,000.00. The other startup will develop a project to scale up an enzyme production to reduce its production costs, with the
granted sum of US$ 80,000.00. 3) In FAPERJ public call the incubated startup will develop innovative products to be offered for crime elucidation to the police and security market. For this project, the funding is US$ 65,000.00, and some trial products are already being tested. 4) In the Peninsula project, it has been already identified close to fifty houses in the area which could be potentially occupied by companies. Another activity underway is the prospection of potential companies to be in the park. This conceptual step is expected to be concluded by the end of 2019. The success of these ongoing initiatives will be measured in the next three to five years through the following parameters: 1) DAI scholarships: conclusion of the doctoral thesis with positive impact in company’s performance and absorption of the students in the companies 2) Incubated companies: improvement in startups’ revenues and profits leading to their graduation 3) Peninsula Project: launch of the project with at least 5 companies in the park The initiatives will be closely monitored in order to mitigate identified limitations to the success achievement. Summarizing, in this paper are described successful Triple Helix experiences developed at the UFF/AGIR with total granted funds close to US$ 600,000.00. It is also described ongoing ambitious Triple Helix initiatives to turn UFF a reference as an entrepreneurial university. References: Brasil (2004, 2005, 2015, 2016, 2018), Presidência da República Federativa do Brasil, Casa Civil, Subchefia para Assuntos Jurídicos, Lei nº 10.973, 02/12/20014, Decreto nº 5.563, 11/10/2005, Emenda Constitucional 85, 26/02/2015, 11/01/2016 e Decreto nº 9.283, 07/02/2018 UFF/AGIR (diversos anos). Relatórios Anuais (annual report).
Higher Education Institutions (HEIs) have entered an area of turmoil, due to demand-response imbalances. Exogenous forces from the meso and macro environments, as well as endogenous forces from the universities themselves are constantly creating new demands (Clark, 1998). In recent decades, many countries have conducted reforms in their higher educational system, including changes in financing schemes that led to the emergence of new types of institutions. One example is the Entrepreneurial University model (Salmi, 2001), which is seen as a response to economical, societal and technological demands of knowledge societies. The actual transformation process of universities into entrepreneurial universities needs to be understood in incremental terms, as change happens in experimental and adaptive ways (Clark, 2003). Past studies have attempted to describe this process, by understanding the mechanisms, endogenous and exogenous forces in place or its economical impact. Studies have also looked at past and on-going changes in education policy, education systems and organisational transformations in universities around the world. Institutions have tried emulate epitomes such as MIT and Stanford. This has pushed towards a global convergence, even though there are limitations of replication strategies, due to differences in universities external environment and internal resources and capabilities (Etzkowitz and Leydesdorff, 2000; Jacob, Lundqvist and Hellsmark, 2003; Etzkowitz, 2004; Lazzarotti and Tavoletti, 2005; Urbano, 2011; Stensaker and Benner, 2013). Furthermore, literature reviews have attempted to summarize what is known about this phenomenon from different perspectives (Laredo, 2007; Clauss, Moussa and Kesting, 2018). However, still little is known about the ways in which higher education institutions transform themselves into entrepreneurial university, particularly in pragmatic action-oriented terms.

Therefore, this paper presents a systematic literature review (SLR), aiming to provide collective insights that help develop confidence in the knowledge status quo with the pragmatism of serving both academic and practitioner communities (Tranfield, Denyer and Smart, 2003). Specifically, this SLR tries to answer the following questions: 1. How is a HEI transformed in an Entrepreneurial University? 1.1. Can steps/actions taken by HEIs be identified and clustered into an action-framework? 1.2. Can facilitation and barring mechanisms be identified and associated to each stage of the process? 2. Which gaps and white spots can be identified in the understanding of the transformation process of a HEI in an Entrepreneurial University? This SLR adopts a replicable and transparent search process of published studies on Entrepreneurial Universities, applying recommendations derived from medical science, since this field has made significant contributions to improve the quality of literature reviews (Tranfield, Denyer and Smart, 2003). In the iterative review process qualitative studies emerged as constituting the main literature body on
Entrepreneurial Universities. Therefore, I chose meta-ethnography, as SLR method, for its suitability to facilitate the formation of hypotheses on the transformation process of HEIs by interpreting metaphors around selected case studies. The method enabled the emergence of an action-framework by “combining empirical evidence, conjecture and (my own) expert practitioner insights” (Noblit and Hare, 1988; Lee, Hart and Watson, 2015; Noyes et al., 2018). Meta-Ethnography is an approach developed by Noblit and Hare to enable methodological rigour for synthesizing and deriving substantive interpretations from qualitative studies, in the form of reciprocal translations, enabling a line of argument that produces new insights or models that interpret findings across multiple studies. It translates concepts across individual studies by critically examining multiple accounts of a specific phenomenon to develop inductive and interpretive knowledge synthesis, aiming to extend existing theory or develop a new one (Noblit and Hare, 1988; Atkins et al., 2008; Campbell et al., 2011; Booth, 2016; Booth, Sutton and Papaioannou, 2016). In this sense, meta-ethnography as an analytical synthesis extends the contextual borders of single cases, empowering and expanding contexts across cases and even across disciplines (Doyle, 2003). For the review process, I adopted the original seven steps, proposed by Noblit and Hare, in an overlapping and iterative way (Noblit and Hare, 1988), while following enhanced meta-ethnography strategies for case selection, analysis and synthesis (Doyle, 2003). After defining and delineating the topic and research questions (Step 1), I selected the studies to read (Steps 2 and 3) by searching the databases SCOPUS and EBSCO. Afterwards, I determined how the studies were related (Step 4), by following the recommendation to apply selective case boundaries to increase rigour (Doyle, 2003). This resulted on a final selection of 36 publications, reporting on 44 HEIs from 21 countries. Through in-vivo coding on the software ATLAS.ti, I identified common themes across studies, HEIs and countries, and categorized them. Near the end of this step, initial assumptions about the relationship between studies can be made (Noblit and Hare, 1988), which means I could, based on the emerging categories, assume what were the stages of HEI transformation process to propose an action-framework. Next, I translated studies into one another (Step 5), treating the accounted narratives as analogies and synthesized translations (Step 6) to determine if the type of translations, metaphors and concepts encompass those of other accounts. It allowed me to translate and compare accounts around the 44 HEIs experience in becoming entrepreneurial universities to populate each assumed stage of the action-framework with rich narratives. Last, I expressed the synthesis (Step 7) by following up-to-date reporting standards and recommendations for meta-ethnography studies (Doyle, 2003; France et al., 2014; Noyes et al., 2018). The resulting action-framework explains how HEIs are transformed in Entrepreneurial Universities and is depicted by the exogenous and endogenous forces impacting in a four-stage institutional transformation process. The four stages are: (1) Ignition: Exogenous and/or endogenous force(s) ignite the process. A vision is set; (2) Sensitization: A small steering group develop the first offers, which differs in each HEI and are based on the initial trigger, the HEI’s own history, available resources and capabilities. These first offers can be interpreted as “pilot experiments” towards the vision. This phase is mainly characterize by building a new culture of innovation in collaboration with external stakeholders (i.e. Triple Helix model); (3) Consolidation: Expansion of the successful experiments (e.g. education offers, research activities, transfer and support measures). This phase is mainly characterized by the development of physical infrastructure and formal processes; (4) Institutionalization: The consolidated offers (teaching, research and services), processes and infrastructure become an integral part of the institution. Internal and external stakeholders are integrated.

The emerging innovation culture becomes an integral part of the HEIs values and positioning. The actual cut-point between the phases are fuzzy, as the development speed can make them overlap, especially in case of government push and/or obtainment of purpose-specific funding. Furthermore, the process is not linear, it is iterative, being represented by an “institutional innovation loop” (from consolidation back to ignition). This loop demonstrates that the transformation is actually continuous and never-ending, always being impacted by emerging forces in the form of demands from internal and external stakeholders and changes in the macro-environment (e.g. political, economical, societal or technological pressures). It can be assumed that the loop is a key success factor to HEIs transformation process, as it possibly minimizes the impact of what has been described in some case studies as “success paradox”, “doomed to be
entrepreneurial” or “organisational inertia”. This SLR is limited in the sense that it might not satisfy all requirements for an audit trail, since it combines empirical evidence with conjecture and my own expert practitioner insights. However, up-to-date reporting guidelines and the framework GRADE-CERQual, that systematically assesses methodological limitations, adequacy, coherence and relevance of data supporting the review findings, have been employed and shall improve confidence in the final qualitative evidence synthesis (France et al., 2014; Lewin et al., 2018; Noyes et al., 2018). Moreover, the propositions were built upon identified cases and examples published in peer-reviewed literature. The validity and applicability of the action-framework still needs to be empirically tested by confronting it with past, current and planned actions from a larger number of HEI’s going through the transformational process in different contexts, being one of the identified opportunities for a future research agenda. This SLR contributes to the knowledge body on entrepreneurial universities, by aggregating case studies in a systematically manner, following recommendations for methodological rigor from natural sciences and hence increasing confidence in the second and third-order interpretations that led to the main findings. Furthermore, this SLR is original as it proposes an action-framework. This is a significant practical contribution, due to its pragmatic approach. HEI’s administrators may apply it as an analytical framework to better understand their own transformational process and compare it against benchmarks or competitors. At the same time, it also has the potential to be used as an institutional strategic planning tool, since the continuous observation of forces can lead to the identification of opportunities and produce insights for institutional innovations that ignite a new transformational wave.
The Role of the National University of San Marcos (UNMSM) In the Establishment of the Triple Helix Model in Peru

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century's Economic Development Agendas
Presentation: Oral

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Objective:
Interaction among Academia, Industry and Government under the Triple Helix philosophy the development of the 21st century in Peru and Latin America is framed within the knowledge-based economy, and the participation of Academia, Industry and Government in the economic development of society. The active presence of Academia, as a key actor, that not only provides education and research, but also innovation based on new technologies that compete nationally and internationally, is allowing Peru to grow continuously for the well-being of all Peruvians and society in general. To further promote the role of Academia in the innovation economy in Peru, the National University of San Marcos (UNMSM) created in 2012 the Center for Innovation and Entrepreneurship of the School of Industrial Engineering. In 2017, its name was changed to "1551 – Incubator of Innovative Companies" (1551), as part of the commemorative activities of UNMSM’s 466 years of existence. Establishment of the Triple Helix model in Peru The global knowledge society will gain its true meaning if it becomes a means to serve a more desirable goal: the construction of worldwide connected societies of knowledge, which are sources of development for all, and above all for the least developed countries. Despite still being behind, according to the latest economic development indexes, Peru has advanced in the last decades in new information and communication technologies - a fact that has created new conditions for the emergence of Knowledge Societies. Our proposal is aimed at strengthening Academia in the framework of the Triple Helix model, concentrating our activities and efforts with the help of schools of Industrial Engineering that are members of the Council of Faculties and Schools of Industrial Engineering of Peru—CONFINI (Consejo de Facultades y Escuelas de Ingeniería Industrial), and through them with all the regional governments across Peru. It is within this context that the UNMSM - the most important educational reference in Peru—plans to continue to lead the national innovation agenda, among all public universities and beyond. Our aim is provide access to information for all as well as real and permanent freedom of expression reflected by the “ability to identify, produce, process, transform, disseminate and use of information”. Leadership of the UNMSM in the deployment of the Triple Helix Model in the Regions of Peru We believe that the Triple Helix model can be implemented in a country in Latin America (Peru) and the Andean region, taking advantage of the increased promotion and leadership in research and innovation. The establishment of the Triple Helix model in Peru is a joint effort as evidenced by the commitment of its three key components (*). From the perspective of the ACADEMIA, THE NATIONAL UNIVERSITY OF SAN MARCOS - UNMSM, launched the Triple Helix initiative on October 23 in 2018 with the goal of reaching to all universities in different regions of Peru. One of the main objectives of this initiative is to educate universities in regions in Peru on the Triple Helix model so that they can commit themselves to lead the implementation of the model in their regions. The UNMSM will support and assists them in teaching, research and innovation practices, and in generating the necessary skills to be a real support to key national INDUSTRY sectors and the local and central GOVERNMENT, that will constitute the TRIPLE HELIX in Peru. This experience will determine how
the UNMSM, with plenty of history, trajectory and permanent concern for social and economic growth and development, can serve as a case of management of the Triple Helix model in other Andean regions, in the short term, extend it to other countries of Latin America. An ongoing activity of this initiative is the creation of round tables with invited speakers from the industry, the government and the academia. As a preview of possible agenda items and objectives of implementing the Triple Helix model in Peru, we have considered the following activities: a. Formation and promotion of entrepreneurial universities. b. Development of science and business parks. c. Promotion of government-industry collaborations to address the needs of the private sector and related institutions. d. Transmission of knowledge and talent between university, industry and government. e. Promotion of a culture of multidisciplinary research through workshops, seminars, etc. f. Strengthening of the link between the institutions and individuals, "R + D + i" in Academia, Industry and Government. g. Improvement of national competitiveness through partnerships between Academia-Industry, Industry-Government and University-Government h. Creation of learning and training spaces in geographical regions of the Triple Helix in Peru

Design Methodology Approach:
1551: Incubator of Innovative Companies and their development in Peru 1551, Peru's leading business incubator, was the first to be recognized by the public sector. On October 23, 2018 with the participation of the President of the Republic, Martin Vizcarra, in representation of the central Government; Mr. Roque Benavides, President of the National Confederation of Private Business Institutions-CONFIEP representing Industry; and Dr. Orestes Cachay Boza, Rector of the UNMSM representing Academia, launched the "Triple Helix - Peru, Towards the Knowledge Society" initiative. Speeches delivered were downloaded and available at. (http://www.1551.pe/assets/triplehelice.pdf). - Articulation of 1551 in the Triple Helix On many occasions, the Triple Helix model has been argued that it could only work in developed economies and countries. Nevertheless, it's certain that times have changed and the economic and the social disparity between LATAM, USA and EU is not the same as two or three decades ago when Triple Helix model was launched. The Triple Helix model and experience that Peru presents is a unique model of innovation given that today there is greater knowledge activity, economic development, even better conditions for intellectual and culture protection. 1551, recently requested the three sectors to promote economic and social development. These included joint interventions among Government, Industry and Academia in activities, such as: --"Cluster for the Manufacture of a Light Rail Transit (LRT)" that considers the participation of the National Society of Industries (SNI), the Ministry of Production and the Ministry of Transport and Communications; in addition to the regional universities in the country -- A collaborative project founded on Entrepreneurship and Innovation to control Extreme Poverty, Malnutrition and Anemia in Peru. It has also been proposed to the Central Government for its execution: represents carrying out with the inhabitants of the poorest districts, trout fish farms, hatcheries of guinea pigs and quail, as well as orchard of many other different products rich in iron, which serve as food for local people. -- Development of Round Tables and Workshops by 1551 in the Regions of Peru. -- Training and Dissemination of the Triple Helix in regional universities. -- Establishment of links with other R + D + i institutions in the ACADEMIA, INDUSTRY AND GOVERNMENT. - Other initiatives According to the recommendations given by the OECD, the European Union in association with the Government through its Decentralization Secretary of the Presidency of the Council of Ministers has defined proposals to prepare and execute Regional Development and Innovation Strategies (Estrategias de Desarrollo e Innovación - EDIR). Pilot programs have been proposed in 5 of the 24 regions that Peru has (La Libertad, San Martin, Ayacucho, Apurímac and Cusco).

Results:
Taking knowledge and Launching of the Triple Helix by the main actors of Peru The Launch of the Triple Helix - Peru, Towards the Knowledge Society initiative presented on past October 2018, has originated diverse actions by the main actors (Academia, Industry and Government). Such is the case of the "Cluster for the Manufacture a Light Rail Transit (LRT)", that the National Society of Industries has received with particular enthusiasm this initiative. Also, the Presidency of the Council of Ministers has been working in a consensual manner with the EU on the project "Strengthening local development and innovation in the
Regions of Peru*. Because of its importance, Academia (UNMSM) has expressed its interest in collaborating in the development of this initiative; it is of the utmost importance for the development and strengthening of the Regions. - Development of the Triple Helix with the Universities 1551 - Incubator of Innovative Companies - through its program of diffusion of the Triple Helix will deliver Conferences and Workshops in schools of Industrial Engineering associated to the Council of Faculties and Schools of Industrial Engineering –CONFINI, entity that, groups to these at national level. - Others Lastly, we may consider defining the baseline of our development, locating the current situation and determining the different actions to be considered for each activity, then following up to determine the existing development of the Triple Helix in each region, according to the particular model.
Blending Entrepreneurship and Sustainability Education through Post-Oil Economy Lense

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas
Presentation: Oral

Roberto Rivas Hermann (Nord Universitet), Marilia Bonzanini Bossle (Federal Institute of Rio Grande do Sul), Marcelo Gonçalves do Amaral (Fluminense Federal University)

Purpose:
This research paper introduces a competence framework which was tested during a two-week summer school. The course addressed a strategic area of research for all Norwegian and Latin American partners involved: entrepreneurship and regional development in the context of post-oil. The partnership between the research groups in Norway and Brazil is centered around these topics because they provide complementarities in terms of research expertise, international outreach for students in both institutions and university-industries, and linkages in different contexts though facing similar challenges. The course enhanced the educational offering in the four universities involved by developing and testing new curricular methods through action and problem-based entrepreneurship education.

Design/Methodology/Approach:
In order to assess the competence framework, this paper followed an action-research approach which is applied in similar experiences of competence development, for example in sustainability education (Jensen, 2016) or entrepreneurship education (Elo, 2016; Winkler, 2014). Adapting an action-research approach implied that the researcher took a participant observer role (Bryman, 2012). In educational development projects, action-research is often applied following the incremental curricular steps of curricular design, intervention, and analysis. Subsequently, the cycle starts again, and once the analysis of the intervention is succeeded, a new intervention is carried out with its and reflection (Elo, 2016; Jensen, 2016). This paper reports the first three steps, providing the curricular design process with emphasis in the use of the competence framework, the intervention process and the analysis (assessment of the intervention).
Curricular design: The competence framework was adapted to a summer course of 5 ECTS aimed at master level for students in business administration and social sciences (Table 1). The course was part of an education project involving four partners, high education institutions (HEI) in Norway and Brazil. Through this project, the partners aimed to increase management graduate students’ competencies within the overall themes of entrepreneurship and regional development in the context of post-oil economic transition. Network partners in both countries aimed to provide the student participant with real-world cases to work within small group projects, illustrating the private sector’s challenges needed to be solved through entrepreneurial action.

Table 1: Intended learning outcomes of the course
Knowledge - Have an understanding of the hegemonic and counter-hegemonic discourses about extractivism and post-extractivism in the context of Norway and Brazil. - Have a good understanding of the main theoretical approaches to understanding innovation dynamics at a societal level with emphasis on triple helix and innovation systems. - Have a good understanding of the concept of smart specialization and how it might generate windows of opportunities
in Norway and Brazil. - Have an understanding of the entrepreneurial process, with emphasis on entrepreneurial opportunity identification and exploitation. - Have a good understanding of the concept of business models and how they are a tool for entrepreneurs and innovators. - Be familiar with the main aspects of design thinking, new product development and new venture creation - what it takes to be an entrepreneur. Skills - Be able to analyze the main components of innovation systems at a national and regional level - answer questions as what can predict if an innovation system is suited to post-extractive? - Critically outline the consequences of development pathways focused on extractivism at national and regional levels and the implications of smart specialization as a pathway diversification strategy. - Identify the conditions in which specific entrepreneurial ideas can contribute to path diversification and the conditions to exploit the market opportunities around these entrepreneurial ideas. - Be able to use tools like the business model canvas to plan for business ideas in the context of new products, services or processes developed in the context of post-extractivism. Competencies - Have increased their ability to analyze rather complex problems and frame it as a research question. - Have gained competence in collaborating in a teamwork with intercultural groups and using digital learning tools. - Have increased their ability to reflect on and consider theoretical problems in a general sense in research. - Have increased their ability to communicate (in writing and orally) problems, analyses, and results to colleagues, including contributions to academic debates. The course was distributed in three modules as sketched in Table 2. Each session included lectures, but also activities as site visits, presentations from companies or staff from science and technology parks. Also, the course was structured in a way, that most lectures within module 1 took place in Rio de Janeiro, Niterói and Volta Redonda (Brazil) with staff from the partner universities and invited speakers. Module 2, took place in Bodo (Norway), also with the participation of staff from the local university in Norway. Module 3 was shared in both locations, and supervision was provided to the students. This module 3 was organized following a Problem-Based Learning (PBL) approach. The purpose was that students could apply the theory they learned in the classroom to "real-life" problems (Graaf and Kolmos, 2003). The project developed in groups of 4 students was used to assess the learning during the course. Table 2 Course structure Module Sessions Module 1 - the context of post-oil economy transition Session 1: Brazilian perspectives on post-oil transition: challenges and opportunities Session 2: Linking post-oil transition with evolutionary economics Session 3: Regional development, innovation, and entrepreneurship perspectives Session 4: Smart economic restructuring in Norway: Connecting micro and macro Module 2 - identifying and developing entrepreneurial ideas Session 5: Developing entrepreneurial ideas Session 6: Business modelling lab Session 7: Sustainability panel Module 3 - group project Course development and analysis after the course, an in-depth interview was carried out with students who volunteered to do it. A total of nine interviews were performed with a duration of between 25 to 120 minutes, with a total of 450 minutes of recording. The interviews were transcribed verbatim and coded in two iterative cycles (Saldaña, 2009). During the first coding cycle, in-vivo coding of students’ experience was carried out. This inductive approach resulted in 88 items. Subsequently, through axial coding (Saldaña, 2009), these codes were grouped into main categories, inspired mainly by the competence framework, but also around other issues mentioned by the interviewees which were relevant for assessing the course. Seventeen categories were identified and subsequently reduced to five main themes. The purpose was to assess how the different expected elements in the competence framework echoed in the participants' perception of the course. Findings: The analysis of interview data reveals the overall participants' assessment on teaching-learning approaches, main themes tackled by the course, external collaboration, and educational focus. This last section of the paper summarizes the main results within these themes. The participant assessment addressed both "what" was aimed with the course, and the "how" the course learning outcomes were achieved. In sum, this paper provides a better understanding of how sustainability can be combined with entrepreneurship education, by developing a conceptual framework of how to make sustainability education more entrepreneurial oriented in higher education.

Research limitations/implications:
This framework needs more applications to improve the experiences and be validated. However, it suggests that it is not only the entrepreneurship education field which shall integrate sustainability
principles. The results indicate that sustainability education field has its developed concepts, which can integrate entrepreneurship principles perhaps with better outcomes as students gain a better cognitive fit to spot green opportunities.

**Practical Implications:**

This paper also has practical implications, including a framework with potential to design new educational programs combining sustainability and entrepreneurship objectives.

**Originality/Value:**

This paper introduces the concept of the post-oil economy and contributes to the curricular design of courses combining entrepreneurship and sustainability objectives. In this sense, it is not a new proposal but indeed a new experience. The course applied problem-based learning (PBL) as a research approach in order to engage students, along with the senior researchers, in answering research questions (Rossano et al., 2016). PBL will depart from "challenges" in the context of a post-extractive economy transition. The challenges were introduced by the Brazilian and Norwegian researchers, based on their research projects.

Keywords: Sustainability education; Entrepreneurship Education; Brazil; Norway; Economic restructuring; Extractivism; Business School

References


Creation of a Knowledge Portal: A Collaborative Project between University and the Community

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century's Economic Development Agendas
Presentation: Oral

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Purpose:
Knowledge transfer has been the object of many researches and papers in the last decades. The knowledge produced in university is more and more recognized as a major source for the improvement of the performance of organizations. Many models of knowledge transfer have been studied and applied in different contexts, domains or disciplines. Occupational health and safety (OHS) constitutes a recent domain of practice, expertise and research. The OHS field is particular as to the diversity of problems to overcome and the multiplicity of specializations required. The burgeoning interest in this question not only concerns organizational performance, but also attests to the growing political and public preoccupations of health among the population. In Canada, a labour organization has benefited from an innovation grant program to train and support its occupational health and safety delegates. This program aimed to promote occupational health and safety (OHS) prevention by supporting innovative and complementary information and training activities, by making it possible to increase accessibility to all employers and workers, with a particular focus on the clientele less accessible. The labour organization already had a large, well-structured training program for the various OSH delegates in unions. It wanted to ensure continuing education and transfer of learning in daily practice by continuing efforts to reach new and young people in health and safety, as well as to further support the more remote and smaller unions. The labour organization brings together more than 2,000 affiliated unions and 300 000 members. The research team supported, in an action research, the development and implementation of knowledge portal which included a range of resources accessible through the Internet to support action in prevention of OHS delegates. The final purpose of the project was, more specifically, to make available to delegates, via the Internet, OHS training content, by promoting the transfer and integration of learning and by providing delegates with health and safety tools. This article describes the analysis process carried out for the development of a knowledge portal that considers the needs of communities and unions as well as the constraints expressed.

Method:
In order to better understand the environment of the portal, a study of the organizational context of the labour organization was first conducted. This analysis made it possible to study several elements including the mission of the organization, its democratic functioning, its political structure in OHS, its activities related to the prevention, the state of its situation in OHS training as well as the documentation existing in OHS. In order to better understand the training needs of union stakeholders in terms of health and safety, a needs study was conducted. To this end, several group interviews were held with targeted groups of the trade union organization. These include political leaders (4 group interviews), union advisers (2 group interviews) and trainers (1 group interview). Another component of the analysis was devoted to affiliated unions, through group or telephone interviews with OHS delegates from 10 unions (8 group interviews). The choice of the consulted unions was made with the concern for the representativity of the various professional sectors, the
size of the unions (small, medium, large) and the regional origin. During the group interviews, 2 members of the research team noted and recorded the information in order to perform the analysis of the results.

Findings:
Several concerns and constraints emerge from analysis. For the concerns, the results show, in particular, that OHS workers are often isolated and that there is generally little discussion with the union executive committee about prevention. Also, as a result of training, OHS delegates often feel discouraged by the amount of work they are doing and say they do not know where to start. Delegates also consider it difficult to form an OHS committee and structure meetings with the employer to discuss prevention. They also feel they cannot really solve the problems and lack tools to find solutions and guide interventions. Moreover, results show that there is a very high turnover rate among them, which makes it difficult to implement sustainable practices in prevention. On the constraints side, the results show time constraints (multiple roles and tasks, lack of time), cultural constraints (diversity of sectors, diversity of occupations, diversity of union size, language levels, diversity of genders and generations), technology constraints (regionalized Internet accessibility, existing sites and documents, experience with communities of practice), and financial and administrative issues (portal updates, support and follow-up actions). After studying the context and the needs, the results suggest notably, for the creation of the knowledge portal, the need to be coherent with the training course in the classroom, to include a pedagogy that facilitate the transfer of learning, to interest workers of all generations, to ensure the complementarity of actions, to join the delegates in regions, to adapt to the characteristics of the users and to use technologies which will cross the time, the spaces and the connection tools.

Practical Implication:
This knowledge portal is the result of the interactions and collaborations between University and the community. The action research helped to create a knowledge portal that meets the identified needs of union delegates in occupational health and safety. In particular, the educational design of the portal is based on a path that aims to support learners in the exercise of their interventions. The design proposes a prevention intervention structure based on the following 5 steps: 1. Step 1: "I have just been appointed delegate in OHS, where do I start?" 2. Step 2: "How does health and safety work in my workplace? How to prepare for action?" 3. Step 3: "How to act in prevention" 4. Step 4: "How to find solutions?" 5. Step 5: "How to get results?" Also, knowledge is organized and grouped into thematic categories, which allows to deepen the concepts. Several complementary resources (tools, template, video, mentoring, summary schema, checklist, etc.) help to promote the appropriation of knowledge by users. The knowledge portal therefore includes a pathway centered on prevention actions, considering the characteristics of online learning and a consistent teaching approach to the variety of users. Future researches will focus on analyzing the transfer, use and impact of the OHS knowledge portal by unions delegates.
This research aims to analyze the university-industry interaction when it comes to innovation via two case studies in university laboratories of bioengineering and life sciences at the Federal University of Minas Gerais and the University of California Berkeley. Our research methodology is a multiple case study to investigate university-industry interaction focus on the analysis of the university laboratories technology transference to companies and influences of the research infrastructure and facilities. This research used a mixed approach of quantitative and qualitative, and the university research laboratory data were obtained through individual interviews and standardized questionnaires. Mapping research facilities in universities is important to know the equipment, software, materials, human resources, and also to increase laboratory interaction with companies for innovation.

In this research we use the triple helix model of innovation that poses the university as central in this interaction. One of the differentials of this research is that it examines the role of the university research laboratories in this interaction, including cases where there is no patent generation or direct commercial results, but enables significant results for the laboratory and the company. In this sense, these research findings presented the role of the university laboratories leaders and of the research infrastructure in the university-company interaction. Also this research aims to propose a framework analysis for evaluating research infrastructure (facilities) and laboratory team qualification and the impacts on university-industry interaction.

One of the limitations of this study is related to the field of investigation (bioengineering and life science) which cannot be generalized to other areas. The implications of this study include broadening the view of the role of the university research laboratories for innovation and in the sense of to connect the practical research results to industry through boosting the triple helix understanding in university research laboratories.

Category: 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas
Presentation: Oral

Dr. György Kovács (CEU), ()

Europe needs to capitalise on its science and start-ups to compete in global markets increasingly defined by new technologies. Universities play a key role in this process through shaping students’ attitudes towards a more entrepreneurial thinking and risk-taking as well as facilitating more and better interactions with businesses. However, there is a significant difference in defining and the meaning of entrepreneurial university in the USA and Europe (Blenker et al., 2006). The new directive adopted by the European Parliament and the Council will help European universities become more entrepreneurial as well as strengthen the cultural and creative sectors, and bring added value to the European citizens.

The current paper aims to analyze how and through what procedures research organizations, universities and other users will be able to make the most of the increasing number of publications and data available online for research or other purposes. Last but not least, the analysis will explore how the most promising entrepreneurial initiatives of universities evolve without disrupting the quality of teaching and research.
Influence of Entrepreneurial Environment on University Student’s Entrepreneurship Intentions

**Category:** 1. The Role of the Entrepreneurial University and University-Industry-Government Interactions in the XXI Century’s Economic Development Agendas

**Presentation:** Oral

**Dr Patrick Ebong Ebewo (Tshwane University of Technology)**

The purpose of the study was to investigate and attempt to answer the following question: to what extent does entrepreneurial environment effects the antecedents of entrepreneurial intention (attitude towards entrepreneurship, subjective norm and perceived behavioural control)? A sample of 150 graduates from the Arts and Design programme took part in the study and data collected was analysed using Structural Equation Modelling (SEM).

The results provide evidence that subjective norm is an insignificant predictor of entrepreneurial intention compared to attitudes towards entrepreneurial behaviour and entrepreneurial self-efficacy. Perceived environment support was observed to directly relate to future entrepreneurial intentions and it also mediates the relationship between perceived university environment, perceived entrepreneurial abilities and immediate entrepreneurial intentions. It is recommended that policymakers should consider the development of a coherent national policy framework that addresses entrepreneurship for the Arts/creative industries sector.

Future research is recommended to fully evaluate the effectiveness of entrepreneurship education subject components’ impact on students’ attitudes towards entrepreneurship, perceived entrepreneurial abilities and entrepreneurial intentions.
Considering that academies can play a greater role in innovation policy in knowledge societies, some authors propose the expansion of academic responsibilities, where teaching and research play an important role in economic development - the third mission of universities. Other authors assign educational institutions a fundamental role and considering education as an instrument of change, that is, a form of intervention in the world. The project sought to contribute with proposals for intervention for the objectives set forth in the Agenda of Economic Development of the 21st Century, focusing on the rural producers of Family Agriculture in Brazil, mainly in the aspects of income improvement and quality of life and environmental sustainability.

The planning and execution of the project involved three specialist teachers, and an administrative technique, as well as servers from the pedagogical sector. The actions took place within the teaching hours of Agricultural Management in the second semester of 2018, taught in the four classes of the third year of the technical courses integrated to the high school in the Campus Itapina with collaboration of Campus Barra de São Francisco of the Federal Institute of Education, Science and Technology of the State of Espírito Santo - Ifes, involving 110 students, aged between 16 and 19 years. Each class was divided into three groups (Academy, Government and Business), according to the teacher’s orientations and criteria discussed with the students, with reference to the article “The dynamics of innovation: from National Systems and “Mode 2” to a Triple Helix of university-industry-government relations. In each group formed, the students assumed certain functions, such as: administrator, financial manager, marketing manager, people manager, legal advisor, information technology manager and research and development manager. Each week, the groups, in their respective classes and functions, presented basic concepts, sources of consultation and challenges for the construction of strategies, projects and policies that sought to improve the income and quality of life of rural producers of Family Agriculture. Presentations of the solutions to the challenges occurred each week and enabled important discussions and sharing of ideas and information. The main results were the construction of the intervention proposals presented in the final activity and the possibility of contributing to the solution of practical questions. Development of skills and skills of co-working, teamwork, oratory and planning can also be cited. Among the proposals for intervention presented, we can highlight: promote partnerships between Ifes Campus Itapina, Campus Barra de São Francisco and the secretariats of agriculture of the prefectures of the neighboring municipalities to make feasible traineeships...
for students of technical courses in rural properties; promote partnerships between the rural producers of the region and the Ifes Campus Itapina for the development of specific technical solutions of the local productive chains; promote training courses in the management of rural properties for producers in the region, with the participation of student monitors; create a local bill to reduce the municipal and state tax burden of the main inputs of the local productive chains; develop applications that facilitate management and communication among the actors of the local productive chains; promote local, regional and sectoral events in local production chains; incentivate the artisanal agroindustrial production for the aggregation of value in the productive chains; promote marketing consultancies for rural producers with the participation and tutoring of students.

As limitations of the research, they can be cited such as limited resources for the development of study and research activities; results presented based only on students and teachers’ perceptions and autonomy of the main leaderships on the future orientations of a propositive agenda of public policies to improve the current conditions. As a final activity, the groups involved received a challenge that aimed to elaborate and present proposals for interventions. The main criterion for solving this activity was for the proposals to involve directly the government groups ( prefectures, state secretariats and/or federal government), the academy (Ifes Campus Itapina and/or other teaching /research /extension institutions) and the companies (rural producers, cooperatives and/or unions), addressing the main actors of TH.

For the choice of themes, the main problems experienced by the Family Agriculture producers that were in line with some of the proposals of the Agenda 2030 for Sustainable Development were diagnosed. Each class received one of the following themes: family conflicts between technical course students and parents; endividement in family agriculture; feminine rural associations and economic crisis and slowdown in the consumer market. After the presentations, reports were prepared describing all the students’ proposals. These reports were delivered to the representatives of the Colatina Rural Workers’ Union, the Mayor of Colatina and the Director General of Ifes Campus Itapina, to support the development of new public policies aimed at improving income and quality of life of rural producers in the region and in the country. These reports will also be delivered to the Coordinator of the Agricultural Technical Course at the Campus Barra de São Francisco. Considering that the entrepreneurship academy is a key driver in a knowledge-based economy, and an important trainer of social development, this project made possible the discussion of an important developmental agenda among middle school students, which is usually only discussed in undergraduate and specialization courses. By provoking an institutional, professional and academic learning, this project also made possible the accomplishment of the social function in the responsibility of the academy for the regional socioeconomic development.
Theme 2:

Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science
The FIT4RRI Approach to Responsible Research & Innovation Experimentations

**Category:** 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science

**Presentation:** Oral

Dr Adrian Solomon (Triple Helix Association, South East European Research Centre), Prof Emanuela Todeva (St Mary's University London), Prof Panayiotis Ketikidis (The University of Sheffield International Faculty, CITY College)

**Purpose:**
This case study is focused on the concept of responsible research and innovation which is becoming a pressuring trend in the international research realm. The findings are presented based on show-casing the efforts of the European Union funded - FIT4RRI project (https://fit4rri.eu) towards designing a methodology for responsible research and innovation (RRI) experiments. FIT4RRI moves from the assumption that there is a serious gap between the potential role Responsible Research and innovation (RRI) and Open Science (OS) could play in helping Research Funding and Performing Organisations (RFPOs) to manage the rapid transformation processes affecting science (especially the science-in-society aspects) and the actual impact RRI and OS are currently having on RFPOs, research sectors and national research systems. FIT4RRI is precisely intended to contribute in bridging this gap, promoting viable strategies to activate institutional changes in RFPOs.

**Design/Methodology/Approach:**
The methodology of this case study acts on two key factors i.e. i) Enhancing competences and skills related to RRI and OS through an improvement of the RRI and OS training offer (in terms of training tools, actions and strategies) presently available; ii) Institutionally embedding RRI/OS practices and approaches by promoting the diffusion of more advanced governance settings able to create an enabling environment for RRI and OS. With this double aim in view, the FIT4RRI methodology is organised following an overall approach based on three main steps: an analytical strand devoted to understand what is happening in the RRI and OS practice, taking into account general trends, barriers and drivers to RRI and OS, interests and values, advanced experiences; a testing strand (observing RRI/OS in action though 4 co-creation experiments: material science, energy, optical monitoring and data mining) aimed at figuring out possible solutions in terms of training approaches and governance settings; and a proactive strand, promoting changes (i.e. developing training tools and actions and easy- accessible evidence-based guidelines on governance settings functioning as enablers for RRI and OS). Specifically, the RRI experiments aim at bridging the quadruple helix stakeholders in co-creation with research funding and performing organisations in order to induce the institutional change required to properly embed RRI and all its pillars (ethics, governance, gender equality, science communication, open access, open science). The methodology consists of key stages (appraisal, design, implementation, measurement, mutual learning) required to identify, manage and engage the quadruple helix stakeholders as well as of a toolkit with indicators.
(qualitative & quantitative) to measure the success of the experiment with regards to institutional change. Such indicators are shaped around two main areas: Quantitative indicators: Representation of each internal & quadruple helix actor; Interest in RRI of each internal & quadruple helix actor (beginning & end of experiment); Awareness of RRI of each internal & quadruple helix actor (at the beginning & end); Perceived usefulness of RRI of each internal & quadruple helix actor (at the beginning & end); Number of RRI best practices evaluated and highly rated by the stakeholders; Number of internal stakeholders involved in the experiments; Number of quadruple helix consensus solutions (common agreed plans/steps; Number of RRI pillars focused upon; Number of RRI best practices considered for assessment of their potential implementation Qualitative indicators: Policy change recommendations; Organizational change recommendations; Industry/RFPO proposals for collaboration with researchers; Society-driven proposals for collaboration with researchers; Observation of result/best practice multiplication in the quadruple helix ecosystem.

Findings:
Four experiments are currently being implemented (during May 2018 – June 2019) such as: The first experiment is focused on data mining and it is organized by Open University (UK). This experiment aims at engaging the quadruple helix of top academic journal publishers and engage them into enabling open access to large data sets (for data mining purposes). The second experiment is organized by Liverpool University (UK) and is focused on observing how the quadruple helix involved in optical monitoring experiments can work together to enable enhanced public engagement (science education) and ethics considerations. The third experiment is organized by University of Rome “La Sapienza” (Italy) and while working on 3D printing & material science projects, the team aims at investigating matters of innovation governance and citizen engagement in science. The fourth experiment is organized by ISQ (a quality assurance in aerospace service provider from Portugal) and looks into gender equality and governance matters in an energy efficiency experiment. The findings of the four experiments from this case study will elaborate on the following items: • Quadruple helix collaboration incentives around the RRI pillars • Institutional changes required to properly enable the embedment of RRI • Drivers & barriers for properly embedding RRI in innovation projects • A blueprint/methodology for measuring the success of RRI embedment Limitations: The main limitation of this paper consists of the case study approach (with limited and divergent sample) which may not enable result generalization. Nevertheless, the purpose of this paper is to show-case best practice in RRI adoption that could inspire other institutions to adopt RRI.

Practical & social implications:
This case study will provide a practical guide/methodology for institutions interested to adopt RRI in their research & innovation units – enabling them to comply with the international regulations on RRI. Social implications include the promotion of citizen-engagement in research & innovation (citizen science), gender quality and open access to science education.

Originality:
This case study is one of the few efforts available in the literature on RRI in terms of providing an integrated methodology for RRI embedment through various case cross-sectoral and multi-disciplinary case studies.
The Hamelin Rat Trap

**Category:** 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science

**Presentation:** Oral

Abel Mukwevho (Root Rats)

The Hamelin is an innovative multi-catch rat trap that can trap many rats in one unit. It is suitable for farms and informal settlements with a severe rat infestation crises. The rat infestation crises has developed from just being the rat population, to being the actual size of the rats - they've grown bigger, fatter and more frightening. The uncontrollable infestation in South Africa has been the cause of the spread of plagues and diseases from rats. There have also been numerous amounts of stories of people who died from rat bites. Economically, rats are responsible for farmers not being able to harvest and sell their desired produce amounts that are sustainable for them. In informal settlements, rats consume the foods that dwellers have in their storage, which causes a financial burden for the inhabitants. Thus, there is a need to conveniently trap rats in large amounts to reduce the infestation in both farms and informal settlements. This is the objective of The Hamelin.

In 2017, the developers of The Hamelin, proposed to the City of Johannesburg that they adopt The Hamelin as a system for rat eradication in the city's informal settlements and townships. Before the City could adopt The Hamelin, they suggested a 14 day trial of The Hamelin, in comparison with the rat trapping cages that the City currently uses. The trial took place in an informal settlement in the north of Johannesburg. The rat cages were put near The Hamelin, and the same bait was used on both traps - this was so the rat can choose which trap looked more appealing.

After the 14 days, The Hamelin had trapped 82 rats, while the city's cages had trapped 25 rats. Within a year, The Hamelin had trapped over 3000 rats within this 12 month period, The Hamelin managed to trap the biggest rat ever recorded in the history of Gauteng, this rat came in at 600 grams - the size of half a chicken. Currently, in the same informal settlement, with the same number of traps, The Hamelin has trapped over 5 000 rats. The only hurdle we've went through is with animal rights groups, such as the NSPCA. Their argument was that The Hamelin's method of rat eradication is considered animal cruelty. However, after having consulted with our Attorney's, we are of the opinion that The Hamelin's method is not animal cruelty and does not contravene The Animal Protection Act Number 71 of 1962. According to this act rats are not considered animals in South Africa. In addition to this, the animals listed in the first paragraph need to be specifically under the care of a human being or rather be owned by a human being. Furthermore, in paragraph 2 of this same act it mentions rodents, but only in relation to trapping them because they cause damage to property and they spread disease.

The next phase of The Hamelin's business model is the disposal or use of the dead rats and the entrepreneurial opportunities that are facing community members who have rat infestation. Disposing of thousands of rats would require a manner that is environmentally friendly and is not harmful to both the environment and its inhabitants. Thus, carcass composting is the best method for the disposing and use of rats. As opposed to incinerating the rats, which would cause carbon emissions, fertilizing the rats and taking
them back into ground is the most suitable for farmers and food gardens in the townships. The model is to have unemployed community members be the ones who clean the traps daily (as required by the constitution), transport them to a biological waste company for composting, and then have the bags of compost to sell. This, we hope, will help alleviate poverty and create an entrepreneurship culture in townships. Therefore; The Hamelin's current business model is; manufacture and sell traps to municipalities, farms and other customer segments harvest the dead rats and turn them into fertilizer. Empower young entrepreneurial minds in townships by helping them sell rat fertilizer to food gardens that are helping feed the community.
The Role of Policy Level Disability Stigma in Disabled People's Access to Healthcare Services in the Bosomtwe District of Ghana

Category: 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science
Presentation: Oral

Acheampong Enoch (Kwame Nkrumah University of Science and Technology), Anthony Kwaku Edusei (Kwame Nkrumah University of Science and Technology), Peter Agyei-Baffuor (Kwame Nkrumah University of Science and Technology), Reindolf Anokye (Kwame Nkrumah University of Science and Technology), Alberta Nadutey (Kwame Nkrumah University of Science and Technology)

Purpose:
Ghana is a signatory to the United Nation’s Convention on the Rights of Persons with Disability and thirteen years after the passage of the Persons with Disability Act by the Parliament of Ghana in 2006, there are no clear cut policies developed and implemented towards the attainment of quality healthcare for disabled people in Ghana. The purpose of the study was to ascertain the role policy level stigma attached to disability play on disabled people’s access to healthcare services in the Bosomtwe District of Ghana.

Methods: A case study design was adopted with Bosomtwe District serving as a case where a detailed and extensive investigations have been conducted to ascertain disabled people’s access to healthcare services. A qualitative design was carried out in which data was collected through in-depth face-to-face interview through an interview guide. The study population comprised of disabled people and staff of the district health directorate who represent the central government at the district level when it comes to policy implementation. A total of 35 participants (30 disabled people and 5 staff from the district health directorate) took part in the study. Purposive sampling technique was used to select the participants. The data was analysed through multi-level analysis, first, immersion of details and specifics of the data to discover important patterns, themes and interrelationships. Data led analytical principles such as categorization, exploration and confirmation were employed to establish creative synthesis through themes. Data were transcribed from Twi to English verbatim. Cross-case analysis was done on transcribed data to establish patterns and themes that cut across individual experiences in terms of the various disability groups under study and how those experiences are related to policy stigma and access to healthcare by disabled people.

Findings:
The study has found that there are several healthcare policies in Ghana and these policies were for the general population without disability specific healthcare policies. There is also lack of commitment on the part of policy implementers to implement those that had already been formulated. This lack of commitment and absence of disability specific healthcare policy has negatively affected the healthcare access of disabled people. There were reported cases of denial of healthcare services by healthcare professionals but disabled people could not make demand for such services because of the absence of clear-cut disability specific healthcare policies.
Limitation of the study:
The main limitation of the study was that the study was conducted in one single district in Ghana which may not be representative enough of the whole country which has the potential to affect the generalization of the findings. However, because the district health directorate works within the general policy framework of the Government of Ghana, the existence or absence of healthcare policy in the District is assumed to be the case for all districts in Ghana. Key words: Policy level stigma, disabled people, access to healthcare, Ghana
The Triple Helix and Social Entrepreneurship in Addressing South Africa’s HIV/AIDS Crisis

Category: 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science
Presentation: Oral

Michael Kahn (CREST, Stellenbosch University)

Purpose:
South Africa is host to the largest number of HIV-prevalent persons worldwide; it is also host to the largest anti-retroviral therapy (ART) programme in the world. A decade ago, such provision was unthinkable, given HIV/AIDS denialism at the highest political level. This paper investigates the role of social entrepreneurship in reversing this stance by mobilizing triple helix institutions. The actions of a non-governmental organization (NGO), the Treatment Action Campaign, constitute an example of social entrepreneurship that brought the health triple helix and civil society into accord. South Africa's triple helix health institutions have a long enlightenment history, including the world’s first human heart transplant, animal health innovations, and plant pathogen research. This body of work co-exists alongside traditional, often unverifiable, medico-religious practices. The failure of the state to contain and treat the HIV/AIDS epidemic is the more perplexing, given capability to manage large-scale disease such as cholera, and foot and mouth or Newcastle disease in the animal kingdom. From the time it assumed office in 1994, the administration of President Mandela was well aware of the HIV/AIDS scourge, even endorsing a dubious, solvent-based treatment ‘Virodene’ for the disease. It accepted that allopathic treatment could mitigate disease outcomes. Thabo Mbeki then served as deputy president. Allopathy was jettisoned in 1999 when now President Mbeki declared that the aetiology of AIDS was flawed, and rejected the views of the Medicines Control Council, the National Institute for Communicable Diseases, and local and international experts. Mbeki dismissed opinion especially that of Black South African scientists, complaining that there was a tendency to see Africans as ‘natural-born, promiscuous carriers of germs’ (Presidency, 2000). For Mbeki a Big Pharma-led conspiracy undermined the Global South, determined to sell overpriced and toxic drugs. The denialists claimed that AIDS, being a syndrome, was a myth. Instead what was being observed in medical wards was a consequence of poverty, not a virus. Improved health status would come about as poverty was reduced. In these circumstances, with anti-retroviral treatment being denied to most HIV-positive persons, life expectancy that had been on an upward trajectory began to decline. Indeed the population age-gender pyramid shifted to the shape usually associated with a country engaged in full-scale warfare, in which the proportion of males in the age range 18-45 began to fall as a result of premature death. This was the impasse until 2007, embittered politics, coupled with uncertainty regarding a safe and affordable medical intervention. Political market failure hinged on personalities; treatment battled to gain traction. Politics was trumping pharmacological innovation. The irrational ruled.

Approach:
The object of the case study is the manner in which rationality came to bear upon the impasse. More
precisely the focus is the conjunction of the health system of innovation and civil society organizations. This conjunction is situated in the political economy of the day with its own path dependencies and expression of interests. Dependency Theory is applied to contextualize both the past and present innovation ecosystem. Dependency Theory emerged in Latin America roughly a century ago as a means to understand the unfair terms of trade that prevailed between the commodity producers of the South (the ‘periphery’) and the industrialized North (the ‘centre’). It was argued that the resulting dependency extended to all aspects of the periphery, the financial, economic, technological and societal, perpetuating what is termed ‘underdevelopment.’ Peripheral countries must, therefore, look to their own industrial technological development, invoking import substitution and tariff barriers. While South Africa was, and remains, a peripheral economy of the North, as it began to industrialize it became a centre of its undeveloped hinterland, from which it drew in copious unskilled migrant labour. These workers brought in and were also exposed to new diseases. Dependency Theory and associated notions of underdevelopment came to Africa through the works of Leys (1976), Rodney (1975) and Amin (1979). The political leadership of South Africa’s liberation movement was steeped in such thinking that attained its peak of influence as the liberation struggle intensified in the latter half of the 20th century. Being the recipient of high toxicity anti-retroviral drugs would be understood as consistent with the tenets of Dependency Theory. These considerations lead to a first conjecture, namely that Dependency Theory explains the political reaction to HIV/AIDS epidemic, and the role of labour migration in its spread. South African science supports a modest-sized, diversified and open triple helix innovation system (Etzkowitz and Leydesdorff, 2000), including sectoral systems. The latter include health, chemicals, finance and various branches of manufacturing, all of which have a strong dependence on inward technology inputs. Kahn (2019) has shown that the South African system of innovation has, and continues ‘to walk on two legs.’ This was so during the apartheid era and remains so in the present. One leg is characterized by ‘own’ science, a stance consistent with Polanyi’s notion of the Republic of Science. The other leg is ‘state’ science. The second conjecture is that the Treatment Action Campaign (TAC) stimulated the Republic of Science to engage with the HIV/AIDS epidemic.

Findings:
The goal of this work was to understand the roles of the actors of the innovation system – government, civil society, PROs, universities, and the private sector. In keeping with opposition to Big Pharma control of the terms of trade in anti-retrovirals (ARV), the Mandela administration in 1998 invoked WTO TRIPS rules to suspend their intellectual property monopoly, and to open the market to parallel imports. This is a telling example of how anger at underdevelopment in the hands of the North was resisted and is consistent with adherence to the tenets of Dependency Theory. Big Pharma, with support all the way to the White House, sued, and government opposed. Almost simultaneously, the TAC emerged as a single-issue NGO dedicated to the provision of anti-retroviral treatments to mitigate mother-to-child HIV transmission. The TAC adopted the tactics of civil society opposition to apartheid – street protest, occupation of facilities, guerrilla theatre, and the illegal importation of generic antibiotics in defiance of patent infringement claims. Then, as a demonstration of its commitment, the TAC was admitted as amicus curiae in 2001, in support of the state. Next, together with legal academics from the University of the Witwatersrand, an international campaign for the provision of HIV treatment was launched. Big Pharma withdrew. TAC prevailed. TAC went on to secure a Constitutional Court ruling that compelled government to provide mother-to-child HIV infection treatment. These steps failed to convince Mbeki, who continued with his poverty arguments, even when now-retired Mandela issued a public rebuke. In parallel, organized labour added its voice of condemnation at the stance of the Mbeki clique of ministers. For its part, the leading PRO for health science was and is the Medical Research Council (MRC). In 1998, the newly appointed CEO, went head-to-head against President Mbeki, supported by peer PROs who diverted funding to the MRC to fight HIV. Elsewhere, the private sector began to allocate resources to run its own health campaigns and to treat already infected staff. Aspen Pharmaceuticals grew to become the largest producer of generic drugs in the Southern hemisphere. This left the Republic of Science notable for its collective silence. However, much research, was taking place under the radar. The members of the ‘Republic’ organized spontaneously, with international peers, and donors such as the Wellcome Trust, and Bill and Melinda Gates Foundation to get on with the task.
The TAC quickly realized that it required research-based evidence to counter denialism. TAC Annual Reports identify research with local universities, donors and Médecins Sans Frontières. By 2009 TAC research was being used by government and being shared with other countries in the region. TAC staff and associates became co-authors with mainstream researchers (Venter et al. 2012). In other words, the knowledge linkages characteristic of a system of innovation were in evidence. This mobilization capitalized on the unseating of Mbeki that came about as a consequence of AIDS activism and the unhappiness of labour with his economic policies. The new government expanded ARV provision, and the decline in life expectancy was reversed. The HDI shifted from 0.65 in 1995 to 0.61 in 2005 and then up to 0.69 in 2015. HIV was not a purely poverty-driven disease since absolute poverty declined over this period. This supports the second conjecture. Today South Africa has some 4 million people under treatment, and mother-to-child transmission has been virtually eliminated. The TAC is an exemplar of the combination of social entrepreneurship with the triple helix. References Etzkowitz, Henry, and Loet Leydesdorff. 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. Kahn, M J (2019). The contract between science and society: a South African case study. Science and Public Policy Vol 46, Issue 1, Pages 116-125 https://doi.org/10.1093/scipol/scy042. TAC 2009. Annual report March 2008-F ebruary 2009. http://www.tac.org.za/sites/default/files/annual_reports/TACAnnualReport2009.pdf Venter, Francois, et al. 2010. The medical proof doesn't get much better than VMMC. South African Medical Journal 102(3): 124-125.
Civically Grounded Triple Helix: Synergies between Triple Helix and Quadruple Helix

Category: 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science
Presentation: Oral

Yuzhuo Cai (Tampere University)

Purpose:
In social studies, new concepts are proliferating. While our society is under transformation in an unprecedented speed, it is unavoidable, and necessary, to develop new conceptual frameworks to capture the changing nature of the society. However, there is also a risk that scholars incline to invent and use new labels without trying to fully exploit the wisdoms of existing concepts. In other words, new concepts are often treated as replacement of old ones. In such discourse, newly invented concepts tend to become normative with less power in analysis and explanation, while accumulated knowledge around “old” concepts are often ignored since the concepts are considered old. Few studies seek synergies between old and new concepts. This paper is aimed to examine the differences and similarities between Triple Helix model and Quadruple Helix model, and tries to find synergies between the two competing concepts, both popular in innovation studies. The concept of Triple Helix model was originally coined by Etzkowitz and Leydesdorff (1995) to explain the dynamic interactions between university, industry and government (in the form of “taking the role of the other”) for fostering entrepreneurship, innovation and economic growth in the knowledge-based society. The Quadruple Helix model, adding the public or civil society as the forth helix, was initiated by Carayannis and Campbell (2009) along with their elaboration of the concept of Mode 3 knowledge production. There is a seemingly shared view that Quadruple Helix is more timely and suitable for analysing the knowledge-based society 2.0 (Rutten & Boekema, 2012), which strongly addresses socially responsible innovation and the role of citizens. Thus, Quadruple Helix has increasingly become popular in both policy rhetoric and academic discussions. Does the concept of Triple Helix fade off because of its ignorance of civil society? Or is civil society really missing the Triple Helix? Whether some synergy could be achieved by integrating two concepts for theoretical advancement in understanding the nature of our innovative society? This paper will specifically answer these questions based on careful reading and analysing the existing studies on Triple Helix and Quadruple Helix.

Design/Method/Approach:
The study will be approached through literature analysis, particularly comparing and analysing the relevant literature. The literature included in my analysis includes: • Classic literature of Triple Helix and Quadruple Helix respectively written by Henry Etzkowitz and Leydesdorff, and Carayannis and Campbell, • Studies continuously elaborating and developing the theoretical foundations of the two concepts, • Empirical studies applying the two concepts, • Other related studies e.g. on responsible research and innovation (von Schomberg, 2011), socially responsible university (Flipse, 2013) and civic university (Goddard, Hazelkorn, Kempton, & Vallance, 2016). The analysis is not simply for comparing how the two concepts are different to each other. Rather my primary aim is to find what the two concepts share in common and how they can supplement to each other.
Findings:
There are three major findings resulted from the analysis. First, although Quadruple Helix tends to become more attractive, the model has been relatively less used in guiding empirical analysis. Triple Helix, regardless of many criticisms to it, provides feasible analytical tools for empirical analysis. For instance, in Web of Science, the number of annually published studies applying Triple Helix model are above ten times higher than those applying Quadruple Helix. Second, both Triple Helix model and Quadruple Helix are perceived as normative concepts, but deep analysis of the literature of both concepts show such perception is a bit misleading. Triple Helix was originated as a normative concept but after over two decade’s development it has become a more analytical tool. Comparably, the concept of Quadruple Helix is relatively normative. For instance, Triple Helix has systematically elucidated the mechanism underlying the interactions between university, industry and government, strengthened by using various theoretical perspectives, such as, new evolutonal theory (Leydesdorff & Meyer, 2006), institutional theory (Cai, 2015) and social network theory (Villanueva, Molas-Gallart, & Esteve, 2006) etc. While it is seemingly a promising concept, Quadruple Helix faces a problem in empirical analysis: Civil society does not share the same characteristics of government, industry and university, which has more distinctive functions and clearer sphere boundaries. Third, the two concept share quite similar view on the role of citizens in innovation processes, which is the central element distinguishing Quadruple Helix from Triple Helix. Carayannis and Campbell (2009) posit civil society as the forth helix. However, in the Triple Helix view, civil society provides the framework for free and open interaction, association and critique. Thus, civil society is considered too important to be merely treated as an additional helix in the Quadruple Helix. Rather, it is the institutional ground (Cai, 2014, 2015) or “a launch pad for the take-off of triple helix interactions” (Etzkowitz, 2014, p. 19). As a conclusion, the analysis shows that Triple Helix or Quadruple Helix are not a pair of competing concept as they are commonly perceived. Rather each has its advantages and can supplement to each other. I further propose a notion of “Civically Grounded Triple Helix”, which can best build synergies between both Triple Helix and Quadruple Helix model.

References:
The Evolving Role and Relevance of Quadruple Helix in the Health Industry: A case of Growing Need for Inclusive Business Models

Category: 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science
Presentation: Oral

Vidya Oruganti (Grenoble School of Management), Michele Coletti (Grenoble School of Management)

Purpose:
The Evolving Role and Relevance of Quadruple Helix in the Health Industry Extended Abstract Working collaboratively, University, Industry and Government can advance the pace of innovations – these constitute the three spheres of the framework, known as the Triple Helix (TH), which assumes that these spheres are different yet overlapping (Etzkowitz, 2003). Additionally, Champeonis & Etzkowitz (2018) explain that there are two TH configurations: in the first configuration, the components of the TH remain separate, while in the second one, they are synthetized in the so-called hybrid autonomous organizations. A possible analogy is the difference between discrete and integrated circuits in electronics. However, these two configurations fail to accommodate a situation of temporary collaboration of these spheres – where they can act as the various stakeholders, for a short, finite period with specific short-term objectives – for example, research consortia.

We situate our paper in this contextual gap, and explore Quadruple Helix approach in the health industry. The inclusive Quadruple Helix (QH) differs from the traditional TH because it adds the civil society in the form of innovation users as the fourth sphere (Carayannis & Rakhmatullin, 2014). There are two vital reasons for our inclusion of civil society within our study. One, there is growing evidence of users bringing in new design ideas (Thomke & von Hippel, 2002). Involving users in innovation is useful to fasten the process and increase the success rate. For example, in health industry, this is often done through the creation of “test beds” for the assessment and adoption of innovation in the real time patient population (Smith et al, 2016). Two, in the context of growing digital transformation of enterprises, such as Airbnb, Uber and similar enterprises, the end user has evolved from a passive consumer of products/services into an active producer and contributor to the same product/service ecosystem (Baldwin & von Hippel, 2009). Within health industry, this has added an importance of users being producers in technological innovations (DeMonaco, Oliveira, Torrance, von Hippel, & von Hippel, 2019; Hardey, 2007). This is because a single end user’s health journey is fragmented over several stakeholders (hospitals, pharmacies, labs, caregivers, technology providers), which necessitates a strong collaboration amongst different stakeholders for an innovation to serve its purpose – increased value derived by the end user and improvement in the quality of life. It is in this context that we explore the role of quadruple helix as an integral part of framing an ecosystem based business model for an e-health innovation, in this study. In doing so, we specifically address two gaps. One, we explore the contextual gap of quadruple helix within a temporary period, i.e. operationalizing quadruple helix at project level. Two, we build on, and elaborate the role use of quadruple helix as an integral part of designing an ecosystem based business model for innovations.

Research Design:
In this study, as we aim to study project as the unit of analysis, we employ an embedded case methodology...
to analyze the a funded project under the European Union's Knowledge and Innovation Communities' (EU KIC) Health program. This is a relevant approach as the unit of analysis and its context are strongly intertwined (Yin, 2013), and enables us to study a real life phenomena through theoretical lenses. In this processual study, we identify the key incidents throughout the project lifetime and examine the evolving role of quadruple helix throughout the course of the project. We specifically study the dynamics within the quadruple helix framework, implemented through this project and any other roles that the framework plays in addition to an operational framework. We implement qualitative data analysis methodology in our study.

Potential Findings:
Our potential findings indicate that the Quadruple Helix approaches will be increasing important in the health industry, and this could pave way for the involvement and institutionalization of end users (patients and cares) in the innovation processes. Government organizations like the EU KIC Health whose work is to establish and coordinate research priorities and funding projects, could drive this change. This is because, these projects require a number of partners coming from different countries and belonging to the four spheres of the QH framework (University, Business/Hospitals, Government and health authorities, and citizens as beneficiaries and producers/participants of innovation). This seems to support the context of project-based temporary and finite quadruple helix operations. Moreover, in these projects quadruple helix is utilised not just as an existential and operational framework, but also as an inherent tool in designing integrated ecosystem based business models for innovations. Research Implications The findings of this study reveal two key implications. One, there is room to further study and elaborate on the context of temporary and finite quadruple helix settings, such as multi-stakeholder based project consortia. In addition, two, it highlights the need to discuss further the evolving role of quadruple helix, beyond a framework that governs the stakeholders. This emphasizes the evolving roles of industry partners, in addition to their role of producers, and the role of consumers, in addition to their role of passive users. Practical and/or Social Implications Through our specific study setting of health industry, we highlight that in health innovations, there is a growing need for collaborative multi-stakeholder approach to adopt technological innovations. That is while these innovations might not necessarily be social innovations strictu sensu, they demand the active involvement of the civil society and industry partners in diversifying roles.

Originality:

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Improving Medication Adherence in the Elderly: Design Thinking For Inclusive Solutions.

Category: 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science
Presentation: Oral

Nailah Conrad (Biomedical Engineering, Health Innovation, UCT), Nyotu Gitau (Biomedical Engineering, Health Innovation, UCT), Tinashe Mutsvangwa (Biomedical Engineering, UCT), Tania S. Douglas (Biomedical Engineering, UCT)

To increase the quality and duration of life of the elderly, proper management of their health is key; a feat that requires a concerted effort between them as patients and their attending medical practitioners (Sabaté, 2003). This usually entails lifestyle modifications like cessation of smoking, reducing alcohol consumption, eating healthily and increasing exercise. The management of the health of the elderly also usually results in them receiving medication. It is for this reason that the World Health Organisation (WHO) refers to adherence as “the extent to which a person’s behaviour – taking medication, following a diet, and/or executing lifestyle changes – corresponds with the agreed recommendations from a provider” (Sabaté, 2003). This is however not achieved in all elderly patients with rates of non-adherence to medication being estimated to range from ten percent to as high as sixty percent, resulting in adverse clinical outcomes (Anglada-Martinez et al., 2015; Costa et al., 2015). Different factors should be considered when discussing adherence or non-adherence. These include factors related to the patient (their attitudes and social support systems) and to the therapy initiated (combination of drugs and duration of therapy, amongst others) (Sabaté, 2003). Social and economic constraints facing elderly patients contribute to non-adherence. The health ecosystem within which elderly patients seek care contributes to levels of adherence (Costa et al., 2015).

We describe our experience working with a non-governmental organisation (NGO) that provides housing, medical services and a social community for the elderly. Medication is obtained from a government-funded central dispensing unit at no cost to these patients. Residents are recipients of the state pension grant. This ecosystem provides a supporting environment for the residents, yet non-adherence to medication remains a concern in this population. This challenge was addressed in a class project for a master’s-level Health Innovation and Design class. We use the design thinking methodology to engage community partners to create inclusive solutions to health and wellness problems. Design thinking embodies the human-centred approach to problem solving by ensuring that ideas are desirable to users. Design thinking relies on the user or community partner to offer the context and give feedback to ideas being developed, for the creation of a context-specific solution. In the Understand phase, students share their own understanding of the problem. This is followed by an Observe phase where there is direct engagement with the end-user by means of interviews and/or immersive practices, towards developing a deeper understanding of the context of the problem. The students then reframe the challenge based on the information they have gathered and create a new challenge statement in the Define phase. This new statement becomes the basis for new ideas and solution-finding. In the Ideate phase, new ideas are proposed and made into low fidelity prototypes,
which are presented to users in the Test phase. The NGO runs a clinic that is open to residents as well as senior citizens of the surrounding community. They therefore provide much needed care to the elderly of the community, which removes the need for the latter to attend other state facilities which are very often overcrowded with long waiting times. Patients see a doctor every 3 months and prescriptions are refilled as necessary. Chronic medications are provided through the state hospital system and a central dispensing unit packages and delivers the medications. Residents and community patients collect their monthly medication supply at the clinic. This system runs well and provides for the needs of patients. Yet, many residents struggle with the quantity of medication and how to take them as directed. Any change in brand and dosage directions affects adherence. After students engaged with the residents and staff of the residential facility through application of design thinking, the students devised a tracking calendar to measure adherence, as no tracking of adherence was taking place. The tracking system was paper based as a digital solution was not appropriate for the context, considering that mobile devices were not routinely used by the elderly.

Students identified inefficiencies in the way the clinic staff managed prescriptions. Because the prescriptions go to many organisations, i.e. the NGO clinic, the overseeing hospital, and the central dispensing unit, and because no central data management exists, duplication of prescriptions often occurred. The identified areas of inefficiency were a barrier to calendar implementation and were highlighted as potential areas of innovation in future projects. With respect to the tracking calendar, feedback from the residents was varied. Many said they liked the idea in principle and said it would be helpful. But many also said that it looked like too much work and people would not use it. An insight drawn from this research is that the “reminders” provided by the tracking calendar alone would not increase adherence. It was found that further iteration was needed for calendar implementation, in order to improve the uptake and efficacy. In this setting the support and guidance from fellow residents carries substantial weight and if such a tracking tool is too be used, adherent residents who hold a certain amount social capital could be used as champions to promote the use of the calendar. The project has identified a strong relationship between the NGO and the government. The healthcare service provided by the NGO, relieves pressure from the state healthcare facilities. The central dispensing unit is integral to providing medication to the residents in a convenient and timely manner, removing barriers to access and alleviating the traditional last mile delivery problem (USAID Deliver Project, 2011) faced by many. The entire value chain seems well-supported until the medication reaches the intended recipient. The reasons for non-adherence in such a well-supported system are numerous and hard to pin down. Once the patient has their medication in their hands there is still a need for a system that supports them in maintaining an adherent medication regime.

Our study was limited to the NGO residents and a staff member who were willing to be interviewed. Most the residents were adherent in taking their medications and we did not gain access to people who were not adherent, which limited our understanding of the problem. It was not possible, within a class project, to broaden our data collection to all stakeholders involved in the problem such as the district-level clinic receiving the prescriptions and the central dispensing unit where chronic medications are packaged. Through working consistently with the NGO, we are building a relationship and a level of trust. In this project, the residents of the NGO were made aware of the importance of adherence through the engagements with students and potential interventions were presented to the NGO that may assist in improving adherence. The NGO also received a unified picture of their workflows which they may use to make improvements. This work is based on the activities of a masters-level course that uses design thinking to devise health innovations, with the specific aim of engaging with a community partner, thereby giving voice to community needs and generating value for the community.

References:
Innovative Governance and Youth Centred Socio-Economic Transformation in Africa

Category: 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science
Presentation: Oral

Sandile Tshabalala (University of Cape Town)

This paper invites to explore ways and means in which innovative governance is effective towards socio-economic transformation in Africa. The focus of this paper will be on the youth; their realities, challenges and opportunities. This paper intends to analyze theories of governance and argues for innovative governance as beneficial to the emancipation of Africa’s youth. The African Union Agenda 2063 declares that ‘the driving force behind the continent’s political, social, cultural and economic transformation will be the creativity, energy and innovation of Africa’s youth’.

This paper will provide strategies for the implementation of innovative and participatory governance that paves the way for long-term youth-centred socio-economic transformation. It calls for reflection on the existence of enforceable legal requirements alongside the political will and allocation of necessary resources as imperative in achieving socio-economic transformation. What denies the youth of Africa with the opportunity to be capable innovators who can create sustainable solutions? Partnering with the youth requires honesty, foresight and innovation. In other words, societal institutions that seek to work with the youth must understand the lived experience of the youth while partnering with them to improve their lives. Agency cannot be separated nor taken away from the youth of Africa, especially the youth in most marginalized and vulnerable communities. While the youth population of Africa is growing exponentially, this is an added advantage to the urgent need for youth-focused and centred development. Sustainable interventions driven by youth remain crucial to long-term value-creation; the youth of Africa must feel capable of expressing their views, imagination and innovative ideas.

This paper acknowledges that nothing can be done for African youth without their presence and creativity. According to Agenda 2063; ‘the creativity, energy and innovation of Africa’s youth shall be the driving force behind the continent’s political, social, cultural and economic transformation’. As such, the direct socio-economic development of Africa’s youth cannot be delayed nor excused. The urgency for youth-centred innovation is critical throughout Africa given the youthful age structure that presents wide opportunities for rapid economic growth and solid social upliftment.
An Engineering Approach for Expediting Sustainable Development in Developing Countries

**Category:** 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science

**Presentation:** Oral

Bantyehun Tezazu (4EPR Enterprise)

The engineering approach for sustainable development in developing countries is an integrated tackling of three interdependent issues: educational/awareness improvement, economic development, and environmental management concurrently and consistently applied all over the country at the same time. The approach is for getting people engaged with increased awareness and using new tools for boosting their productivity in every activity, enjoying their increased earnings and sharing the expanded benefits with other participants. The engineering approach for completeness is 4EPR (educationally, economically, environmentally engineered productivity revitalization). This paper discusses the method and how it can be applied in a developing country like Ethiopia within the country’s means and resources. The 4EPR approach is a set of interdependent programs designed to unravel a complex set of intertwined socio-economic and technical problems that ravage the ecosystem and keep people in poverty. The engineering approach is preferred because it allows to solve each problem from its root causes with iterative attempts objectively and while making reasonable accommodation to all non-quantifiable constraints. Also, an engineering approach breaks down each issue into its constituent elements and uses practical steps, different kinds of proven tools, procedures, and standards for achieving intended results with better certainty and reliability. The engineering approach explores each factor and formulates practical actions to solve the whole problem. In 4EPR approach, engineering discipline plays the integrating role pulling the skills and experiences from multi-disciplines to achieve an objective solution. For resolving social, economic and environmental issues together, engineering techniques are tangible and measurable actions incorporating vague issues as constraints and addressing the full and expanded problem with iterative processes in the different programs. The engineering program has three major components: technically sound, follows proven methods and flexible (modular, agile and adaptable).

**Process:**
There are four significant steps in the 4EPR process. These are (1) Examining Need and setting goals, (2) Defining the programs (3) Analysing the program choices to select the most appropriate program and (4) Developing the program execution plan and executing it to reach the goals. Need and Goals (1) In countries like Ethiopia, over 80% of the people live in isolated villages. These people are cut off from all kinds of modern civilization. There is no television, radio or any other form of media. Most do not have electricity or clean tap water. Many do not even know what these services are, let alone use these in their daily lives. Their living, which is primarily subsistence agriculture, includes occasional trips to nearest towns that are 2 to 8 hours away for selling their produce and buying their needs. This habit and way of living goes to their children and has continued through generations. Their exposure to another knowledge is from the markets or on their way to market. This exposure also has limited impact because the markets are the confluence
point of similar people and not much current activity as shown in typical local markets. Hence, people live unexposed to improvement tools and ideas. If adults and children knew about how other people in developed places or big cities live, they would wish, aspire and plan their ways to adopt the prosperous lifestyles. Using electricity and other energy sources besides firewood, getting water to their homes, and getting sanitation facilities and services are high priority things in their prosperous lifestyles. Define Programs (2) The three reasons that held people back from increasing their productivity and emerging out of poverty are (1) Isolation from each other (2) lack of usage of technology or lack of industrialization and (3) Dependent on first agricultural practices or lack of modernization of agriculture. These three issues limit peoples’ insight and lack of purpose for productivity throughout the country, and the people continue to stay not making significant progress in comparison to many other countries. The 4EPR approach is to focus on these three causes, study them carefully, analyze them using tools and processes others used in carrying out mega projects and many countries’ development lessons. In the case of carrying out development in the developing world, the task to be completed and the results to be achieved are quite straightforward. The 4EPR approach is for the big deep-rooted solution that addresses the local and international solution at the same time. It is also intended to engage the people in working on the solution, which has a greater chance of success. The 4EPR approach primarily focuses on education or raising awareness as a critical step in increasing productivity.

The purpose, as shown above, is to unlock peoples’ creativity, enthusiasm for the new life and their complete engagement in programs that take them to the goals and beyond. The success of the educational and awareness campaign holds the key to the success of most of the 4EPR approach for a few reasons. 1. A committed, motivated and enthusiastic workforce can create a multi-fold increase in production, earn a high income and pay the investors double-digit rate of return on their investments. Training people with different practical skills and motivating them about their potential future in the new economic sectors is a highly rewarding undertaking. 2. Most people know their life only in agriculture. Attracting these people to a new life in cities is a significant disruption that requires much teaching and explaining. 3. Even recruiting for a new skill and going through fast track-training is difficult the first time. However, it gets better when people see a broad range of benefits. 4. Education and raising awareness applies to all the three programs, catered fully to obtain the best result. Restructuring primarily agriculture-based economic system into diversified and balanced economic sectors through productivity revitalization programs has enormous economic advantages that are attractive to most investors and lenders. The types and numbers of country-wide programs that can be concurrently carried out to engage the people for economic transformation have a well-grounded and profitable economic base.

When completed as per the outlined steps and guidelines to be shown in the complete paper, each program produces a double-digit rate of return continuously for ten to twenty years with the initial investment paid back three to four times over the life of the projects. Moreover, all participants would claim morale benefits triumphing over poverty, disease, human suffering, stunting and the high mortality rate of children and women, and cycles of catastrophic events that are like ghosts to the world community. The quantified economic benefits do not also include the billions of dollars’ worth environmental protection savings achieved through the implementation of sustainable programs. The three economic programs that allow a broad-based, inclusive and integrated transition of people from subsistence agriculture to diversified, sustainable development are urbanization, industrialization, and modernizing agriculture. (3) Analysis and Implementation In the 4EPR process, programs undergo repeated and iterative technical, economic, social impact, financial, uncertainty, do-ability, environmental and other analysis as required. The analysis depth and complexity are increasing with more inputs from stakeholders to refine the estimates including the implementation requirements. Full participation of stakeholders in completing the project execution plan development and throughout the program life cycle carry the program into successful completion. In developing countries, the primary cause of poverty is low productivity, and people’s dependence on subsistence agriculture. The practice has stayed this way for many generations because people live in isolated villages and have not been exposed to improved production tools and methods. Hence, creating
mechanisms for people to come and live together in big cities is the first pillar program.

Building cities have many advantages that can be quantified as benefits to justify the cost of creating the cities. First, providing essential services such as water, electricity, sanitation systems, and other services is cheaper in a city than in distributed areas by a factor of at least two. Second, when people live in cities they trade and exchange more, they have an opportunity to work on what they are good at and acquire what they need by selling their surplus output. (4) Meeting Goals - The 4EPR approach framework encompasses a broad range of lessons learned and technical disciplines in applied science, liberal arts, economics, finance, and sociology fields. These disciplines are used in the analysis, designs, plan development and execution of the programs to achieve the intended objectives. The programs also have integrated performance measurement plans that are regularly monitored to adjust the required parameters and deliver the targeted benefits. This approach establishes engagement, trust, and confidence in the program /project team and demonstrates the technical and financial viability of the project. The 4EPR approach has been discussed in different forums in Ethiopia in the last two years.
Cloud Computing and Mobile Technologies as Service Innovation Capabilities towards Business Growth for Small Tourism Enterprises in Southern African Region

**Category:** 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science

**Presentation:** Oral

Abigail Chivandi (University of the Witwatersrand), Shingirirai Vafana (University of the Witwatersrand), Olorunjowon. Michael Samuel (University if the Witwatersrand), Mammo Muchie (Tshwane University of Technology)

The purpose of the study aimed at assessment of the influence of relationship proneness on cloud computing and mobile technologies as innovation capabilities towards business growth for small tourism enterprises (STEs) in Southern Africa. In spite of increasing research on STEs, they seem to be a paucity of studies interrogated innovation capabilities towards business growth for STEs in Southern Africa. In Southern Africa, STEs lie at the heart of the industry and forms major part of tourism sector and the cornerstones of tourism development in emerging economies. Mobile commerce is viewed as the next generation e-commerce and is referred as to any transactions, either direct or indirect, via mobile devices, such as phones or personal digital assistants (PDAs) (Yazn Alshamaila, Savvas Papagiannidis, Feng Li, 2013). The most significant features of mobile technology (MT) are mobility and portability and the ability to access services ubiquitously, on the move, and through wireless networks and various devices. In spite of the increasing research on STEs, they seem to be a paucity of studies that have interrogated innovation capabilities towards business growth for STEs in Southern Africa. In today's post-modern era the ability to build a competitive network through relationships can be seen as one of the STE's core competencies. Cloud computing (CC) and MT help STEs to develop better marketing networks that build mutually profitable gains through innovation and competitive advantage in the market (George and Bock, 2011). Marketing scholars have suggested that firms should leverage firm–customer/tourists relationships and networking to gain privileged information about customers’ needs and thereby serve them better than competitors (Ndubisi, Malhotra & Wah, 2009). (Gao, Chen, and Deng, 2010) reported that CC is important for STEs since establishing and maintaining relationships with customers fosters customer retention, customer share development and increased profit and business growth. According to Mostert and De Meyer (2010, p. 28) CC/ MT hold benefits for the STEs and its consumers should increasingly focus on building services that are innovation oriented with consumers service orientation, business growth and retaining customer base/business attractions globally. Any form of relationship networking between customer and service provider, thus customer’s attitude towards such a relationship is likely to be of importance, the stronger the customer perceives the importance of MT relationships in general, the more likely customer develop a stronger relationship with service provider (Lombard 2009, p. 410). Mobile commerce is viewed as the next generation e-commerce and refers to any transactions, either direct or indirect, via mobile devices, such as phones or personal digital assistants (PDAs). The most significant features of MT are mobility and portability. The ability to access services ubiquitously, on the move, and through wireless networks and various devices. To date, MTs have been applied to consumer-oriented areas, applications focus on voice communication than wireless data transformation. Large-scale usages are still scare in business world.
specifically to STEs (Gebauer and Shaw, 2004). Although there is a general notion in which MT could be applied in business, very little has been done in exploring how to enhance CC and MTs as service innovation capabilities towards business growth for STEs. Adopting MT may create two kinds of impacts on business operations. It is to facilitate communication among small tourism enterprises and customer. Through enhancement of communicating efficiency and information timeliness, MT can increase organizational productivity and profitability. Re-vitalizing business processes through changing data access patterns in STEs contributes immensely to business growth. The use of (CC) and (MT) can improve business competitiveness, and has provided genuine advantages for (STEs) in tourism sector in southern Africa, enabling them to compete with large firms within the industry (Swash, 1998; Bayo- Moriones and Lera-Lo’pez, 2007). Some of the promised benefits from CC can be very appealing for STEs, which need to maximise the return on their investment and still remain competitive in an ever demanding business environment in the tourism sector (Liu and Orban, 2008). A synopsis of the literature interrogating the past and prevailing business environment in the Tourism/ hospitality industry in addition to the description of the concept of CC and MT is presented. The STEs provides services for three categories of consumers of its services: local tourists, foreign tourists and residence travelling abroad as well as tourists coming into the country (Akbar and Parvez, 2009). The origins of STEs can be traced as far back as the 16th century (Zott and Amit, 2009). Over the ages the origin and development of STEs can be tracked to images of inns, Ale houses and Taverns (Zott and Amit, 2009). Private individuals also began to set up businesses, such as Inns, that offered food and accommodation to travellers. With progression in technology and development there was a rapid change in modes of transport, leading to development of structures of accommodation at terminals and sea side (Medlik, 2003). STEs play important functions by providing business transactional facilities. By virtue of its positive impact on foreign tourists, it is one of critical industry players that provide services contributing in generating of foreign currency (Medlik, 2003). Small tourism enterprise act as major earners of foreign currency and contribute towards balance of payments especially in countries with limited export capacity (Cohen and Levin, 1989) and repeat business purchases by the consumers are realised directly and indirectly through the subsequent diffusion of expenditure by foreign tourist which translate to benefits to the communities of the Southern African countries (Karambakuwa, Shonhiwa, Murombo, Mauchi, Gopo, Denhere, Tafirei, Chingarande, and Mudavanhu, 2011). The recent development of CC and MT provides a convincing opportunity for STEs to outsource Information and Communications Technology (ICT). CC is a model for enabling convenient, on demand network access to a shared pool of configurable computing resources such as networks, servers, storage, applications, and services that can be rapidly provisioned and released with minimal management effort (Yazn Alshamaila, Savvas Papagiannidis, Feng Li, 2013). The fundamental concept of CC is computing in the “cloud”, accessing software, storing data in the “cloud” and representation of Internet/network using associated services. CC and MT is being used by STEs as business mobility strategy in order to acquire a wider market entry, tourists’ information and importantly in growing their business.

Drawing from the literature review and theoretical grounding, a conceptual model/hypothesis were developed. The model consists of four research variables: two variables predictor – CC and MT; one mediator service innovation and one outcome variable – Business Growth of STEs. Research Philosophy took a Positivist Paradigm- Targeted population were Southern African border countries players in STEs. Data analysis utilised SMARTPLS, Tested CFA, Model Fit, Reliability and Validity, Path Modelling and hypothesis. Raosoft calculator for sample size was used to calculate sample (Raosoft Incorporated, 2004). Calculation considered population of approximately 350 STEs officially registered with Southern Africa Tourism Services Association (SATSA), a 5% margin of error, 90% confidence interval and the recommended 50% distribution, and returned a minimum sample size of 184 respondents. Of the 184 questionnaires distributed, 151 returned questionnaires were usable, yielding a response rate of 82%. CC was measured, using a 17-item scale, adapted from Shoniwa (2016), MT measured, using a fifteen-item scale, adapted from Mabinya, (2011) , SI measured, using eighteen-item scale, adapted from Yang, Li and Su (2018) and BG measured using a nine-item scale adapted from Lotz and van der Merwe (2013). All the posited five hypotheses were supported.
Findings postulated that CC and MT has a positive influence on innovation as well as business growth in STEs. CC applied a positive impact ($\beta = 0.697$) and was statistically significant ($t=10.596$) in determining SI. MT exerted a positive influence ($\beta = 0.321$) and was measurably critical ($t=3.751$) in anticipating SI, CC exerted a positive impact ($\beta = 0.296$) and was factually noteworthy ($t=1.983$) in anticipating BG, SI exerted a positive influence ($\beta = 0.642$) and was statistically significant ($t=3.710$) in predicting BG, MT exerted a positive influence ($\beta = 0.030$) and was statistically insignificant ($t=0.431$) in predicting BG. Empirical study provided fruitful implications to academicians by making a significant contribution to the Tourism destination marketing, specifically in small tourism enterprises literature by systematically exploring the influence of cloud computing and mobile technology and innovation towards business growth in small tourism enterprises. Cloud Computing (CC) AND Mobile technology (MT), which includes applications based on cellular (e.g. GSM, GPRS,) and wireless (Wi-Fi,) networks, represents the convergence between two of the most relevant technological emerging trends and provide a tremendous impetus to development of strategic applications for STEs business growth and different industries like transportation (Chen, 2009). This also helps on the managerial implication whereby transactions can be business to business applications (targeted to other firms, business to consumer applications (targeted to final customers, e.g. advertisements based on SMS/MMS) e- catalogues on what the small tourism enterprise offers and networking regionally and at global level (Ting-Peng Liang, Chen-Wei Huang, Yi-Hsuan Yeh, Binshan Lin, 2007). This study therefore, stand to immensely contribute to new knowledge and to the existing body of literature in small tourism enterprises in Southern Africa – a context that is often most neglected by some researchers in developing countries.
Causal Relationship between Financial Sector Development in SMEs and Economic Growth in Southern Africa Region

**Category:** 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science

**Presentation:** Oral

Olorunjowon Samuel (University of the Witwatersrand), Happiness Makumbe (University of the Witwatersrand), Abigail Chivandi (University of the Witwatersrand), Mammo Muchie (Tshwane University of Technology)

**Introduction:**
This study explores causal relationship between financial sector development in SMEs and economic growth in Zimbabwe using annual time series and the Error Correction Model (ECM) framework. Study made use of Unit Root Tests, Cointegration, ECM and Granger Causality Tests. Empirical results from Sunde’s findings revealed that there is bidirectional relationship between financial sector development in SMEs and economic growth. Financial sector development and economic growth has remained a controversial issue in Southern African countries. Economists have different theoretical and empirical views on the causal relationship between financial sector development and economic growth. Patrick (2012) and Levine (2004) support supply leading hypothesis that financial sector development leads to economic growth. Gurley and Shaw (2014) and Goldsmith (2009) ascribe to demand pulling hypothesis which postulates that financial development results from economic growth. Financial development means utilization and use of new technology in innovating which includes widening of financial goods and services, improvement on the availability of information on productive investments, mobilization of savings, facilitating the exchange of goods and services, risk diversification and management and ensuring corporate governance and control, (Gurley & Shaw,2014) and Goldsmith (2009). Times of monetary subsidence have required a basic requirement for innovation, creativity and significantly for small business visionaries. The time has come to remember that the early depression resulted in new technologies /creations that purchased with it new opportunities. Scholastic research and hands-on experience have built up an association among entrepreneurship and innovation. The survival of business people is exceptionally subject to growing new items and administrations. Numerous specialists are seeing economic recession as the best time to concentrate on development and innovation through small medium entrepreneurship. Business enterprise and innovation can be unique and challenging, yet on the off chance that the SMEs can withstand, at that point they can receive rich benefits. Unpredictable thoughts that appear to be unfeasible first and foremost can prompt some incredible advancement. Literature review Business enterprise and advancement both require money related help and backing for it to be effective. Since, they are in charge of financial development; the Zimbabwean Government used to really support the SMEs innovation. For instance, Infrastructural Development Bank of Zimbabwe (IDBZ) had its major mission as provide financial assistance to upcoming SMEs. It was successfully implemented in the period 2010 –2015, Patrick (2016). SMEs and innovation are synonymous key stimulants for monetary development. Coming from innovation perspective, advancements more often than not start change both socially and financially positively. The wider and deeper the market is for example corporate bonds, mortgage bonds and SMEs loans the more developed the financial sector and innovation will shape new business practices within the SMEs. Economic
growth can be defined as increase in nation’s real level of national output due to education/ training, increase in quality of resources and improvements in technology. Increase in a nation’s Gross Domestic Product (GDP) is used to measure economic growth Gurley & Shaw (2014). The liberalization of financial sector was meant to reintroduce the market framework with intention of restoring efficiency, improving mobilization of savings, increasing investment which spurs economic growth. The adoption of ESAP and its successor programs, the Zimbabwe Programme of Economic and Social Transformation (ZIMPREST) which was not implemented for the period 1996-2000, was a remarkable movement in many African countries since it was a requirement by International Monetary Fund (IMF) to all countries which were asking for financial assistance. Contrary to expectations, however, liberalization of financial markets did not improve access. During the Economic Structural Adjustment Programme (ESAP) period from 1991 – 1996 the government adopted reforms under the combined title of an (ESAP). The major objective was to develop the SMEs and improvement of living conditions of the poor by generating sustained economic growth but the programme failed at the niche stage. SMEs and social entrepreneurship came as strategic tool in creativity and innovation in uplifting the living conditions. An important component of these reforms was the mobilization of funds through interest rate liberalization. This was after the government had realized that its strong intervention had affected bank’s competition and efficiency which also reduced the accessibility of funds mainly by the private sector. The financial liberalization policy consisted of reforms which many researchers viewed in quite a number of different dimensions. Some researchers suggested financial liberalization reforms as pursuing privatization of public financial institutions, removal of restrictions to entry into banking, measures aimed at spurring competition in financial markets, reduction of legal reserve requirements, elimination of directed lending, prudential regulation measures, measures aimed at securities markets development and openness of capital account along with interest rate liberalization (Osungton, 1995). The Hyperinflation Period (2006 – 2008) the excessive money supply emanated from the Reserve Bank of Zimbabwe (RBZ) printing money saw the country experiencing a continuous hyperinflation mostly between March 2006 and December 2008. During this period the black market premium widened but it was not easy carrying a bag of money around to go and exchange for foreign currency. As a result, foreign currency speculators perfected their exchange through making large sums of money transfers through their bank accounts. The unstable macroeconomic environment adversely affected the performance of the Zimbabwean financial sector during the crisis period. The Dollarisation Period (2009 – 2015) When the RBZ introduced Foreign Exchange Licensed Warehouses and Retail Shops (FOLIWARS) in late 2008, marking the beginning of official dollarization, banks were not permitted to charge in foreign currency, despite the fact that their expenses were denominated in foreign currency, and this actually increased their real losses due to liquidity constraint and failure to issue liabilities. As a result most of the banks downsized their operations by closing most of the branches in rural areas, which had negative impacts on the dualistic nature of financial resource distribution as it left out the majority of the population without access to banking services (Reserve Bank Annual Report, 2016).

Methodology Approach:
The study used time series econometric techniques to determine the causal relationship between financial development and economic growth in Zimbabwe over the period 1990 to 2016. Since the study used time series data that is subject to non-stationarity, unit root tests were used to test for stationarity of the different variables. The study then estimated the integration (long run) model and then used the residuals that were generated from the long run model to test if co integration (long run) relationship exists among the variables included in the model. After it was proved that a relationship existed, an Error Correction Model (ECM) (short run model) was specified. The Granger causality test determined direction of relationship between variables of interest. Causality in econometrics is defined as the ability of one variable to predict another variable. The two variables, financial sector development and economic growth normally affect each other with distributed lags. The study used natural logarithms to help smoothening time series data and also allowed to interpret coefficients as elasticities. Findings revealed that credit Granger causes GDP growth at 10% and GDP growth Granger cause credit at 1%. GDP growth and liquidity Granger causes each other at 5% showing that causality runs from financial sector to economic growth and vice versa. Policy makers should
focus on policies that affect SMEs development in financial sector innovation since they both positively affect economic growth. Depicting from the findings above, innovation and entrepreneurship is responsible for creating jobs and spearheading economic growth. So, the Zimbabwean government must focus on the following steps to nurture the SMEs. □ Invest in education and training, as development and business enterprise require a shrewd and inventive workforce. □ Minimize boundaries and disentangle methodology for boosting advancement and business. □ Focus on innovative work to assist advancement and business enterprise. □ Attract outside direct venture helps in raising assets for advancement and business enterprise. □ Encourage global exchange that will prompt trade of items, thoughts and markets which is positive for both advancement and enterprise. □ Help the associations to discount the assessment, if there should arise an occurrence of a disappointment in advancement and business enterprise. □ Encourage colleges and research associations to work with the business segment for a common advantage. □ Recognize and reward advancement and business enterprise.

Findings:
The results indicated that both financial sector development indicators are positively correlated with real GDP in the long run. Economic implications indicated that there is bidirectional relationship between financial sector development and economic growth and enhance a strong and flexible legal system that allows banks to allocate resources (credit) more efficiently to SMEs. Credit should be accessed by all enterprise fairly to encourage the development of indigenous businesses through SMEs. Increased competition in financial sector results in increased accessibility to credit due to favourable conditions that are being offered by different institutions in order to attract investors. This increases the level of investments in the economy leading to business growth. It would have been very revealing capturing the impact of the mobile banking products that were introduced in 2012 by the telecomm industry as they increased efficiency in the financial sector.
Fostering Home Care for Community Dwelling Seniors: A Design Thinking and Ethnographic Focus Driven Process

Category: 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science
Presentation: Oral

Jalila JBILOU (CFMNB-Universite de Moncton)

Background:
The world’s population continues to age at an unprecedented rate. The aging business has grown extensively over the past two decades. In the next decade, industries and institutions will need to supply innovative and highly adaptative health care services and programs to keep the boomer population thriving. In Canada, it is projected that 20 to 25% of the population will be aged 65 and over, by 2025; and more than 70% of seniors would opt for ageing at their own home. Frailty refers to a state of vulnerability that includes physiological, psychological and social diminished abilities, reducing the possibility to withstand and recover from an acute illness, injuries and other life stresses. Evidence suggests that frailty may be modifiable and in some cases even prevented. Timely and accurate assessment of frailty is crucial for effective care and preventing/slowing decline in seniors. Primary care providers are well positioned to identify “at risk” community dwelling seniors and enact person-centred collaborative care plans to prevent/slow frailty. Electronic medical records are major assets for primary care quality of services. Implementing a systematic frailty risk-assessment can guide healthcare providers to establish tailored health and social services to ensure quality of life and safety for community dwelling seniors. Addressing frailty at early stages shows positive effects on decreasing recurrent emergency room visits (i.e. revolving door), reducing hospital admissions and length of stays, and preventing early institutionalization (i.e. nursing homes). However, few end-users oriented programs are available and there is a lack of models of care aiming at improving the quality of life of community dwelling seniors by creating a safety net (collaborative care) and generating a sense of confidence and community belonging. According to Tim Brown, “Design thinking is a human-centered approach to innovation that draws from the designer’s toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success.” Design thinking had been widely used in the healthcare industry. This case-study presents a report on a realistic experience led in a small city and aims to identify the drivers and the challenges of implementing design-thinking in a publicly funded healthcare system.

Methods:
Using the Design Thinking Phases (Empathize, Define, Ideate, Prototype and Test) in a non-iterative sequence, through a Triple Helix Framework, we involved stakeholders from various sectors (academics, civil servants, private sector, and community leaders) to design and pilot an integrated model of care to prevent fraility in community dwelling seniors. Mixed method including qualitative data (semi-structured interviews doctors and direct observational analysis from a 12 months multiparties consultative process) and quantitative data (EMR of 600 patients of 65 years and over; and home visits of 30 seniors) were conducted.

Results:
Data analysis revealed that the ethnographic focus of design thinking is a cornerstone when it is time to design community-oriented services and models of care. Involving end-users when designing solutions is key for success, adoption and utility of services and investments (human resources, financial resources and technologies). Seniors health programs suffers from social prejudice and stigma. A better understanding of their needs as well as their strengths and assets is recommended. Five central actions were derived to design a model of care: “Person-centred collaborative care and coordination”; “Effective communication channels and mechanisms”; “An evidence-based risk-assessment tool”; “Research and Medical training in interprofessional collaboration” and “Funding sustainability of the program”. Once the model of care designed and piloted, quantitative results showed high congruence between EMR risk assessment and bedside risk-assessment, confirming the specificity/sensitivity of the EMR risk assessment tool and a higher need for clinical services compared to social services. The home visit was greatly beneficial to draw a better profile of needs and establish a tailored care plan. Resources were identified and engaged in delivering services to the identified elders. The follow-up was done 24 hours, 5 days and 10 days later.

Conclusion:
The design-thinking and ethnography based process was critical for implementing the model of care. This process gave a voice to key stakeholders improving ownership, cohesion and collaborative transactions. The regional health authority found a strategic asset in the model of care and adopted it (currently, the model of care is being scaled-up in the province). The community-based partners were aware of the existing clinical services, and worked collaboratively with other local organizations to identify existing resources and developed an “elderly safety net program”. Some business opportunities were identified and are under exploration. An interprofessional collaboration training workshop was developed and is under evaluation. This learning point came from applying design thinking and ethnography to seniors care.
With the dawn of democracy in South Africa in 1994, there was an emerging and exponentially accelerating force and expectation for societal and organisational change. In stark contrast, 20 years later, South Africa’s economic growth outlook is increasingly negative whilst the quadruple of iniquities of poverty, inequality, illiteracy and unemployment are not dented. The triple helix concept encouraged cooperation and collaboration between three social partners such as universities, industries and government, to contribute to productivity of knowledge-based society – where participants individually and collectively ensure innovations are created and maintained for economic development. Recognising that the creation of jobs is one of the four key challenges (the others being to address poverty, inequality and illiteracy) for South African society, members of communities have started their own cooperative enterprises in value chains of sectors. However in 2018 the economy grew just 0.8% and unemployment hovers around 27% - soaring to over 50% among young people. The answer has to start with education to churn out the correct graduates, followed by correct government-led and industry-linked retraining interventions to make the unemployed employable. The answer has to be led by government particularly in the category of those that have less than matric and are unemployed, which as of 2019 made up 55.5% of the breakdown of the unemployed. However, in a collaborative way social partners can focus in job creating interventions involving small businesses and cooperatives in un-serviced and under-serviced markets of industries in the national economy. However, the disaggregated nature of doing things by government departments rather cooperation and collaboration within themselves and other social partners renders implementation of interventions for the 55% that are unemployed with less than a matric as a challenge whilst other social partners address the other categories of those unemployed that make up the remaining 45%.

This study focuses on social entrepreneurship, with specific reference to cooperatives and their relation to the triple helix pillars of government, industry and education. Social entrepreneurs are not business entrepreneurs working for profit, but people who lead to bring about social change through new community interventions, frequently working cooperatively through groups or enterprises. The research focused on three provinces: Eastern Cape, where government failures in terms of the quadruple imperatives are prevalent, and two provinces, KwaZulu-Natal and Gauteng, where cooperative initiatives appeared to have succeeded. The investigation contributes to an ongoing academic conversation that has been “talking” about social entrepreneurship, particularly through cooperatives, in the context of sourcing and providing school nutritional services in the sector.

The aim of the research was to explore the perceptions and experiences of social entrepreneurs and public
servants in the provision of school nutritional services within the South African context. The ecological systems theory of development was the primary theory used for the analysis of data in this study, augmented by the insights gained from resource dependence theory and public choice theory. The study used a qualitatively interpretive, exploratory-descriptive case study research design, making use of focus groups as the main data collection method. The samples of respondents included registered cooperatives/social entrepreneurs and government officials responsible for the school nutritional services programme. The focus groups transcripts were analysed using NVivo 11 and out of the analysis, a cooperative working group model was developed. The themes that emerged were grouped into three categories of transformation, innovation and sustainability practically related to their interactions with (i) collaborative advantage of entrepreneurial enterprising of knowledge, (ii) operating in industrial value chain of sectors, and (iii) addressing by government economic challenges of exclusion, concentration and abuse of dominance of markets respectively. These led to a social innovation of cooperative framework of a special kind linked to the triple helix cooperation and collaboration between industrial value chains, education and incubation and economic inclusion by government. Recommendations were made in respect of interactions of cooperatives, public servants, officials and other stakeholders. These recommendations focused on practical suggestions of social innovation of game-changing cooperatives as well as how their transformation, sustainability and general innovation ensure a competitive effort in sourcing and providing school nutritional services in the food value-chain industry. Other stakeholders in the national economy are enabled to understand how such a conceptual framework of cooperative and entrepreneurial enterprising by game-changing knowledge-based cooperative function as a social innovation that is supportive to the goal of collaboration of government, industry, and education. The triple helix interactions of government; industry and knowledge and education, is equivalent to a facilitation within restrictive vertical and horizontal practices, and limitation of abuse of dominance in the economy; encouragement of collaboration efforts in food industrial value chain, and provision of requisite technical capability and know-how respectively, to ensure economic inclusion and address unemployment that is underlying the poverty challenges. However, it was recognised that there were limitations to the study some of which are that although the researcher was aware of the difficulty of setting up interviews with officials in different education departments, the actual process was decidedly more difficult and frustrating than anticipated. Information regarding which officials were directly involved in the school nutritional services (SNS) programme in the various provincial districts was often lacking, and officials cited reasons such as examinations and school holidays, as to why the information could not be provided when requested. This necessitated a lot of additional legwork with the information often not forthcoming. One of the challenges that the researcher faced at the interview stage, was whether to hand over the whole interview protocol or ask question by question in order to limit the level of anxiety amongst the interviewees. Other queries that were raised were why a particular province was selected for the study and whether this arose out of accusations and counter-accusations about failures of delivery. Under normal circumstances, these questions would have been easy to answer; however, education departments were wary of these investigations as a number of them had already been conducted by the departments. While it is recognised that this research had limitations, it does nevertheless provide practical answers to the long-standing challenge of why a number of standard cooperatives operating in black communities fail to be sustainable in their operations.

The main conclusions this study draws are more detailed than any previous investigation related to cooperatively working groups particularly in a South African context. All of the conclusions of the study are by nature revealing, particularly read together with the conceptual framework of cooperative and entrepreneurial enterprising by game-changing knowledge-based cooperative and deserve to be questioned and debated. It was the intention of the study to encourage open democratic debate in which different opinions for effective implementation of policies are represented. The model of social innovation, cooperative and entrepreneurial enterprising by game-changing knowledge-based cooperative, is based on the African philosophy, ‘Ubuntu, Umntu Ngumntu Ngabantu’ in its interactions of (i) industrial value chain(s), (ii) government responsibility of creating conducive environment, market de-concentration and economic inclusion, (iii) education/incubation using the power of collaborative advantage based on
knowledge, skills, know-how, experience, talent and passion within a particular industry. Further developments to date: In the South African government policy framework, ‘Social Economy’ is recognised as an important economic sector. The term social economy refers to a range of organisations and economic activities in which social and environmental benefit rather than individual benefit intentionally prioritised. As a result of this study the writer has participated in developing a Green paper that will lead to a White paper for the Minister of Economic Development present to Cabinet for approval and ultimately adopted for implementation. At a National Social Economy Green Paper Consultation Conference held at IDC in February 2019, the Paper guided questions like: • What does the social economy currently do for the country; • What social economy can contribute to economic growth, reducing poverty and inequality, sustainability and social upliftment; • What can government, business sector and educational institutions do to facilitate that contribution; • Why does it need for society to help it do this; • What can the state do to enable the social economy; • Can the state play a big role in fostering modernisation including limiting economic exclusion and concentration in a social economy?

The Paper is now being used to consult widely and being further discussed by multi-disciplinary stakeholders, including the triple helix pillars in various provinces and later considered as a coherent policy of government. The policy is ready for discussion and implementation through leveraging of the social innovation of cooperatives as well as the triple helix of key social partners. The jury is still out to measure the impact of the study and its recommendation for a special kind of game-changing knowledge-based cooperatives and their contributions as models of social innovation for economic inclusion of young people who can contribute relevant knowledge, skills, know-how, experience, talent and passion within industrial value chains of sectors.
Integral Human, Organisation and Community Development: A Roadmap for SEKEM and Egypt for the 21st Century

Category: 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science
Presentation: Oral

Prof K Govender (The Da Vinci Institute), Dr MP Abou El Eisch-Boes (The Da Vinci Institute)

SEKEM is an initiative for sustainable development in Egypt, integrating elements from cultural, societal, economic and ecological life, represents an international model for sustainable development in the 21st century. This paper reports on the SEKEM project which attempts to contribute to the renewal of SEKEM's holistic approach to development. Under the broad theme of 'research-to-innovation,' the central question addressed is how a social innovation like SEKEM can be functionally and structurally understood, designed and institutionalised, in order to move towards the integral phase of the organisation as a living organism. This study required that every part of the ‘system’ contribute intelligently to the overall organisation, serving the purpose of sustainable development in its four independent yet interrelated dimensions of societal, cultural, economic and ecological life. Existing implicit knowledge from community members and employees engaged in the project meant that the researcher was less dependent on centralised leadership structures, which is the norm in the prevailing patriarchal cultural context of Egypt and the region.

This study used the Eastern path of renewal of the integral research approach of Lessem and Schieffer, which is based on their integral world’s model, and combined with other integral theories. The research context at SEKEM is described as a place where different groups of people with different consciousness levels, work and live together, resulting in challenges and opportunities for development. Integral worlds, through the Eastern path of renewal, emphasises the need for recognising individual, organisational and societal development patterns; addressing common shadows and blind spots of each consciousness level while building on its respective strengths. The social context of SEKEM and Egypt is explored through transdisciplinary, transcultural, transpersonal, and transformative analysis on an individual and collective levels, while highlighting the rich cultural roots - from Islam to anthroposophy, from ancient Egyptian wisdom sources such as Hermetics to Greek influences - that provide answers to the burning issues of today's modern world. By building on the intensive activation of the SEKEM community, an innovation ecosystem was formed from a wide range of people embodying different functional roles: stewards, catalysts, researchers and facilitators, all being orchestrated by an integrator.

By following the emancipatory methodology of critical theory, new, emancipatory knowledge was created. This lead towards an integral human and organisational development approach to release individual and collective GENE-ius. Accordingly, SEKEM’s renewed approach to integral human development now incorporates individual storytelling (grounding), consciousness level and complexity handling capacity evaluation (emerging), competence level mapping (navigating) and self-management (effecting). The corresponding rhythm of SEKEM’s integral organisational development includes the dimensions of collective storytelling (grounding), arts and rituals (Cultura Activa) for stimulating consciousness development (emerging), knowledge creation via the integral project management framework (navigating), and the application of lolacracy as a complete system for self-organisation (effecting). All elements on
different levels build on and mutually reinforce each other and help SEKEM to actualise its potential to become a fully functional integral enterprise. All of the above-mentioned elements have been tested in practice following the co-operative inquiry action research methodology. In particular, the researcher focused on different forms of knowledge that can be created and are necessary to drive SEKEM’s development stages. The research outcome is neither intended to be final nor complete, but rather has created and opened a new field of interrelated human and organisational development that needs further research and practice, by building on a stronger integration of SEKEM's inter-institutional ecology. Ultimately, this can lead towards societal renewal based on the concept of economics of love, which SEKEM stands for and is based on its fourfold commonwealth structure.

To fuel this development a SEKEM Transformation Agency and Research (STAR) programme has been conceptualised as an outcome of this work, based on already existing experience with “Trans4m Junior Fellows” and a collaboration with the Young Initiative Program (YIP). With this STAR at the development horizon, SEKEM can engage next generation’s leaders and expose them to an integral journey (experiencing and co-evolving SEKEM’s renewed approach to integral human and organisational development) in theory and in practice. In this way, the intention is to secure the future of SEKEM and to contribute to the sustainable development of Egypt and the World.
The Need for Agile Relationship Lending Between Small Business and Banks towards a More Engaged Relationship: A Case Study in Khayelitsha, South Africa

Category: 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science
Presentation: Oral

Tshepho Langa (The Da Vinci Institute)

Despite the attention given to financing Small, Micro and Medium Enterprises (SMMEs), SMMEs continue to face growth challenges. For instance it appears that the mere provision of finance is not enough through the traditional means of financial statement lending. The key issue appears to be how the finance is managed, both from the supply and demand aspects. Banks tend to be shy of offering finance if they are not comfortable with the ability of small businesses to repay granted loans. This is caused by the level of “opaqueness” of information that the banks have about small businesses (Berger and Ude, 1998:613). This has therefore brought a concept of relationship lending, which can limit the opaque nature of the small business information (Berger and Ude, 1998:613). It is purported that the more the bank can learn about the operations of and have an engaging relationship with small business, the more the bank can better the discretion on granting finance. If banks could have agile and engaged relationships with small business then they would better manage information asymmetry and offer some possible specialised support or engaged partnership between a financial institution and small business.

In addition to the above, the South African government alludes to the notion of developing small businesses. Similarly, banks and the business field have been echoing the same. However, the development of small business is still not at the optimal and desired level in South Africa. Some of the challenges that small businesses encounter, include, lack of access to finance. Underpinning the access to finance is the risk of lending to small businesses run by owners that do not have credentials required by banks. These include, lack of proper presentation of financial statements, which leads to information asymmetry between small businesses and banks. To this end, this paper investigates the extent to which relationship lending exists and how it can be improved in order to probe the information asymmetry problem. The paper was designed to probe problems with information asymmetry between the bank and small businesses towards a more agile solution and engaged relationship. Small businesses that are not proficient in terms of financial reporting fall short of accessing credit from banks, not always because the business is not viable but also because the banks do not have an understanding of their businesses.

This study was qualitative, exploratory, case study based research on two established businesses based in the informal township of Khayelitsha in the Western Cape of South Africa. The researcher utilised semi-structured interviews to extrapolate the data, coupled with a literature survey. The findings suggest that the banks have not understood the role that relationship lending can add to developing small businesses. Transactional lending and insistence on collateral are not viable in a country with a rich history of large population poverty like South Africa. Banks would be at an advantage by sourcing proprietary information using relationship lending as a means of solving information opaqueness. From this study it appears that the relationships necessary for clearing the opaque nature of small business information does not exist. The
length of the relationships has not supported the nature or scope of the relationships, because the business owners seldom meet or discuss their business with their bankers. The businesses applications to banks have proven unsuccessful due to credit records and lack of collateral, however the deeper reason is that the banks did not fully understand the business flow of the businesses, and hence could not develop a risk appetite for granting them finance. The researcher suggests that agility is required by banks in developing countries in order to speed up small businesses’ access to finance. Engaged relationship lending is an innovative way to provide finance as opposed to the orthodox bank lending. Using a relationship matrix as a credit rating tool brings innovation and agility to small business survival and prosperity. If South Africa is to speed up development of small businesses, Relationship lending could be a tool to contributing to that speeding up. A limitation of the study was that due to it being a pilot study, a limited number of SMME’s were reached in a limited area and thus a wider sample should be explored for more reliability and validity.
Preventive Practices to Prevent Injuries by Nurses: From Evidence to Practice

Category: 2. Social Entrepreneurship and Inclusive Innovation in Civil Society: The Role of Design Thinking and Citizen Science

Presentation: Oral

Saliha Ziam (TELUQ University), Elena Laroche (TELUQ University)

Purpose:
Work-related musculoskeletal disorders (MSDs) are a major problem for nurses, despite the availability of robust research on preventive health and safety practices. Caregivers, including nurses, continue to be one of the categories of workers affected the most by MSDs, particularly back injuries, due mainly to tasks associated with patient handling. Several OHS researchers agree that the availability of research findings on MSD preventive measures does not in themselves guarantee their application. Many of these researchers underscored the prime need to better disseminate this knowledge and, in particular, the importance of documenting conditions facilitating the appropriation and application of MSD prevention practices evidence when implemented in the real workers’ context. Studies highlight two types of prevention practices. The first are single-component practices, i.e. focused on a single element. The second are geared towards multi-component interventions involving measures that combine a range of components. Single-component practices include training program-centred prevention practices most of the time, but also prevention practices focused on other single-component interventions such as technical or organizational intervention. Multi-component interventions are a range of interventions of safe patient handling programs, combining training, the use of handling equipment, management policy, risk assessments or specific transfer techniques. But are those programs real applied in practice? Thus, the main objective of this study is to analyze the application of MSD preventive practices among nurses and to shed light on factors that facilitated or constrained this link between evidence and practice.

Method:
To attain this objective, we first constructed a conceptual framework which places the Absorptive capacity and the Promotion Action on Research Implementation in health Services (PARIHS) models at the basis of the study. We then measured the application of prevention practices and its determinants by a questionnaire filled out by 399 nurses in Canada. As other authors, we measured knowledge application as a series of activities. Respondents were asked to assess how frequently they engaged in each four preventive practices over the last 12 months, using a 5-point scale ranging from 1 (never) to 5 (very often). The four preventive practices are: 1- the application of PDSB, a multi-component intervention that includes training and transfer agent; 2- the application of good practices about the use of mechanical assistance for transferring or moving a patient; 3- the application of good practices about assessment of the level of assistance required by the patient before his transfer (e.g. level of mobility, cognitive conditions, etc.); 4- the application of good practices about the inspection of the condition of the transfer or moving equipment. The review of the literature brought us to measure, in nine questions, the factors that are likely to influence the application of preventive practices in organizations. It includes training, tools, meeting, policy and place of exchange between work team. A qualitative component was conducted to validate and enrich the interpretation of the survey results. Thus, two focus groups were conducted. The first with nurses only and
the second with nurses and managers working in different institutions of the health and social services network. The data collected in the two discussions were analyzed using qualitative data processing software (QSR, NVivo, and version 11).

Findings:
For the application of preventive practices, the distribution of frequency of the statements corresponding to the application of the MSDs preventive practices by nurse, shows that they mostly apply often (4) the preventive practices of the MSDs in their daily professional tasks (median of 4 except for the statement on the inspection of the condition of the patient transfer equipment, which obtains a median of 3). Moreover, 73% of nurses report applying the PDSB often or very often. This result reflects the fact that this program is recognized by the Ministry of Health and Social Services in the province of Quebec (Canada) and is even taught in vocational training centers. For the factors that influence the application of MSD prevention practices, the results show that nurses reported that several factors influence the application of preventive practices in their workplace. As a result, they report that the availability of equipment in good condition for the transfer of patients (86%), the training on MSDs preventive practices (85%) and the support to nurses (85%) influence their application of preventive practices. To a lesser extent (59%), nurses report that access to electronic resources on good MSD prevention practices influences their application of preventive practices. Thus, many contextual factors influence whether or not nurses apply preventive practices. Focus group participants confirm this initial finding and note that not enough training hours are devoted to the prevention of MSDs during basic training, particularly with regard to PDSB. Moreover, it appears that the basic training is not in adequacy with the reality of the work lived by the nurses. In fact, nurses arriving in the workplace face more demanding conditions than those in training. They also note insufficient training sessions and reminders, limited knowhow about the use of equipment, few sources of information on MSD preventive practices, and many organizational work constraints, such as a patient-nurse ratio too high. Structural equation method was used to analyze the survey data and more results are coming. Overall, this study shows that the barriers to the application of MSD preventive practices are mainly at the stage of their implementation and not the appropriation of knowledge, which suggests that constraints derive more from workplaces.

Practical Implication:
The results of the study allowed, as a first step, to obtain a complete descriptive portrait of the conditions for putting the preventive measures of MSDs into practice for nurses. The results of the study highlighted the limits of basic training and training in the workplace, and especially their inadequacy to the reality of nursing work. The study also notes the importance of organizational facilitation, including the importance of having evaluation and feedback mechanisms that allow nurses to comply with recommended preventive MSD measures. So, various recommendations from the results could therefore have an impact in improving workplace contexts that allow nurses to better apply MSDs preventive practices.
Theme 3:

Post-Industrial Industrial Policy: Convergence and Fusion of Arts, Creative and Service Industries, Big Data, Artificial Intelligence and Genetic Technologies
Challenges of an Innovation Community in a Developing Country: A Case Study

Category: 3. Post-Industrial Industrial Policy: Convergence and Fusion of Arts, Creative and Service Industries, Big Data, Artificial Intelligence and Genetic Technologies
Presentation: Oral

Andrea Soares Ferreira da Silva (IFRJ - Instituto Federal do Rio de Janeiro), Andre Ferreira (UFF - Universidade Federal Fluminense), Márcio Moutinho Abadlla (UFF - Universidade Federal Fluminense), Pítias Teodoro (UFF - Universidade Federal Fluminense)

Purpose:
The Government and the private sector in various regions of the world have sought to stimulate the development of innovative organizations, with a view to the potential of your support for the economic development (Costa, 2007). Startups, defined as temporary organizations used to pursue a repeatable and scalable business model (Blank, 2010a), are strategic in this process. They are being designed to create new products and services in conditions of extreme uncertainty (Ries, 2011). Startups do not have a well-defined process or procedure, which differs them from other business organizations (Blank & Dorf, 2012). In addition, startups are not smaller versions of large companies with specific master plans because they often find success and failure quickly (Blank 2010b). In Brazil, the federal government implemented public policies with the aim of boosting innovative companies, aiming to stimulate the creation of startups. As an example, the FINEP Startup Program, which supports innovation in start-up companies in the knowledge economy, can be highlighted, subsidizing these activities through programs of growth through financial resources (FINEP, 2017). This research has as object of study the Rio Sul Valley Movement, located in the southern state of Rio de Janeiro, Brazil. It is important to note that the region has traditional heavy industry as the base of its economy, being the headquarters of the largest steel company in Latin America (Companhia Siderúrgica Nacional), as well as five automakers: MAN Latin America, Groupe PSA, Jaguar Land Rover, Hyundai Heavy and Nissan. However, in an environment of capital mobility, where productive units move easily through the territories, the diversification of economic activity is a constant concern for the maintenance of the economic dynamism of any region (Ferreira, 2012; Capello, Caragliu & Nijkamp, 2011; Marrocu, Paci & Usai, 2013). In this context, influenced by the stimuli of public power, by the social and economic valorization of undertaking innovative activities, by the companies’ demand for technological solutions and by the new business opportunities that became viable by the dissemination of the use of smartphones, Rio Sul Valley (RSV). The RSV movement, whose purpose is to stimulate innovative companies in the region, has been gaining ground since mid-2016. RSV currently has about three hundred members and works on the mapping, education and connection pillars: (i) The idea of RSV mapping is to create a catalog of innovation and technology in the region with companies, products, services, events, courses, among others; (ii) education aims to disseminate the knowledge needed in a new business model, full of unknown concepts. (iii) In the connection digital means already created for this purpose are used: Facebook, WhatsApp, Slack, Meetup platform. In this context, this research proposes to analyze how the emergence, spontaneously, of an innovation community in a developing country, with little participation of the Government and still timid performance of the private initiative, can benefit from theoretical and practical experience existing in the field to analyze the sustainability of this movement.
Design/Methodology/Approach:

This research was supported by a deep and exhaustive case study on RSV movement, divided in two moments: 1. Participation in Meetups promoted by the RSV community and in Meetups promoted by startups communities in San Francisco and in the Silicon Valley, California, as a benchmark; 2. Data collection through: (i) preliminary questionnaire, made available to RSV community participants; and (ii) semi-structured interviews with leaders of the RSV community and with experts in the innovation field. The purpose of the preliminary questionnaire was to map the profile of participants, professional experience (more specifically in technology and innovation companies) and identify the level of knowledge regarding the movements of startups. Subsequently, individual semi-structured interviews were carried out, in person, with actors involved in startups and in the RSV community. They were chosen to participate in the interviews: (i) entrepreneurs who act as main collaborators and disseminators of the RSV community in the region; (ii) participants in events promoted by the RSV community, entrepreneurs or not; and (iii) people with experience in management (public or private), or researchers in the field of innovation or in startup environments. The interpretation of the data of this research occurred in two stages: preliminary analysis of data obtained in a questionnaire made available to participants of the RSV community and analysis of the information collected after literal transcription of semi-structured interviews, through content analysis.

Findings:

During the participation in the community-sponsored Meetups and conferences, a meeting of enthusiasts about technology and entrepreneurship was witnessed. They are people who are willing to break away from traditional business and the regional culture of industry-oriented training because they are motivated by the wave of startups and innovative business that is growing around the world. The methodology adopted in the Meetups resumes a relaxed atmosphere, encouraging networking and is different from the classic business meetings in companies. The members of the RSV community, realizing the need to spread the movement among the participants, in all Meetups invite a specialist on a certain subject, theme of the event. It should be remembered that no financial resources are received by these members. The goal is to attract new ideas, new entrepreneurs and to win over potential investors and developers of startup environments. As for the entrepreneur profile of startups, the community aggregates the majority of young, tech-passionate, high-level participants who are always looking for change, creating their own job opportunities and not fitting into a traditional employability. Some have had opportunities to study abroad, where they have had contact with startups and entrepreneurs in innovation environments, and try to replicate in the region the lessons learned from experience in other countries. The first instrument of data collection revealed a low number of innovation deals in the region. One respondent wondered if the movement would be ahead of its time, leading it to believe there was no market in the region enough to absorb the momentum of investing in startups. One barrier encountered by the movement in the region is the local culture focused on the metallurgical and assembly industries. Universities, public and private, and other institutions of technical and vocational education direct the creation of their courses according to the needs of manpower dictated by the mentioned industrial segments. During the events promoted by the RSV community, there are good ideas for problem solving or software development, followed by the validation of the business model, but they do not materialize for a variety of reasons, such as lack of adequate business management to startups. Due to the lack of accelerators registered in the region, some entrepreneurs have been registering their projects in acceleration announcements in metropolis closer to the RMP, such as Rio de Janeiro and São Paulo. The financing of the projects relies on entrepreneurs’ own capital or with the so-called seed capital, in view of the absence of venture capital investment in startups. Some entrepreneurs believe that the appearance of investors for this type of business is linked to the existence of more consistent financial results. The data allow us to conclude that the community has not yet been able to create consistent actions that attract the necessary elements that, according to Motoyama and Knowlton (2017), form an ecosystem support network: between entrepreneurs, between support organizations, between entrepreneurs and organizations and between the various other existing media. In view of the above, it was verified that the
isolated actions by the RSV community have presented innocuous results, revealing a demand for greater participation of the actors in the triple (or quintuple) helix, necessary for the existence of an ecosystem of innovation. The uncertainties, linked to scarce support for the operation of the business, increase the risks of undertaking such startups.

References:
The Strategic Component in the Negotiation of Technologies from the Defense Sector

Category: 3. Post-Industrial Industrial Policy: Convergence and Fusion of Arts, Creative and Service Industries, Big Data, Artificial Intelligence and Genetic Technologies
Presentation: Oral

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The objective of this work is to analyze the organizational innovation carried out in the Defense Sector of Brazil, through the analysis of the strategic component in the negotiation of technologies from the Sector, generated and managed under the Triple Helix model. The negotiation of these technologies must observe the strategic aspects, since innovations in the defense sector have a role in national security and supplant economic interests. It is applied research with a descriptive and exploratory focus. Initially, documentary research was carried out to reconstruct the defense industry's trajectory in Brazil. In a second stage, examples of technology negotiations from defense sectors were studied. It also analyzed the legal system with a focus on scientific and technological development. Besides, characteristics of innovations of the sector were presented, with emphasis on the strategic component that guides it. The technical procedures used were bibliographic and documentary research.

For the analysis, the deductive methodological approach was used. The Brazilian defense industry reached its peak in the early 1980s. However, by the end of this decade, the industry's expansion trajectory came to an end and a period of great difficulties began, with massive loss of technological capacity in the sector. Retraction of internal and external markets, the absence of long-term defense policy and deficiencies in the productive structure resulted in a crisis that affected virtually all the companies in this industry. After more than a decade of ostracism and stagnation, the theme returned to the national agenda with the creation of the Ministry of Defense. This process culminated in the elaboration of several documents in the political and strategic spheres, such as the National Defense Policy (PND), the National Defense Strategy (END), the National Defense White Book (LBDN) and the Intellectual Property Policy. Besides, the Armed Forces of Brazil began a process of transformation in which science and technology are now in a more prominent position. The work identified that the Army, in particular, acknowledged that its capacity for innovation was exhausted and proceeded to undertake the open innovation model in order to boost the sector and master sensitive technologies for the development of its military land capabilities. As well as seek cooperation with the various actors in the Triple Helix spheres (university, business, and government) to develop, in particular, dual technologies. These initiatives reinforce the importance of innovation in the area of defense with a view to the best positioning of the country regarding technologies for military or dual use. Initially launched in 1996, the PND is in its fourth version, and unlike the previous ones, it inserts the political issue inherent in the Defense sector, establishing twenty-eight political positions for the sector. This policy contemplates eleven National Defense Objectives, and number IX aims to "develop the national defense industry, oriented towards obtaining autonomy in indispensable technologies" (BRAZIL, 2012a). The END has as one of its structuring axes the reorganization of the Industrial Defense Base (IDB), to ensure that the supply of
products for the Armed Forces is based on national domain technologies, preferably dual-use. Also, it highlights several strategic points, among which: "Promotion of the sustainability of the defense industrial base product chain" and "Strengthening of the area of defense science and technology" (BRAZIL, 2012a). The LBDN, published in 2012 and updated in 2018, proposes the integration between the governmental, academic and industrial sectors, aiming at saving resources and efforts and promoting synergy between different types of actors of the national innovation system. Greater involvement of the civilian scientific community in military projects may enable the conduct of projects of interest to the defense sector. Also, the interaction between civil and military research institutions, universities, and companies is fundamental to integrate business efforts in the creation of high technology poles in the country. As an example of the success of this type of interaction, there is the Technological Park of São José dos Campos, in the space area, an example of synergy in the scientific-technological sector (BRAZIL, 2012b). The studied environment shows the expectation of resuming growth in the defense area and, as a consequence, intensifying the innovations, both those emerged in the old model of closed innovation, within the military scientific and technological institutions (ICT) and the companies of the IDB of Brazil. As well as those that come from collaborative research between the military ICT and the other actors of the Triple Helix, in an open innovation model, particularly, dual use. Regardless of the situation, the intangible assets owned or co-owned by the Armed Forces, arising from these surveys, must be negotiated and transferred to the private sector, particularly to the national IDB, since the Armed Forces do not have enough manufacturing facilities or the objective to manufacture. The advantage for the Armed Forces should not be attached to the economic aspect, and strategic aspects should be observed so that Brazil is independent in sensitive technologies. They recall that technologies in this area involve national security issues and that countries tend to curtail information. For Brazil to have independence in the field of sensitive technologies, it is not enough that universities or civil and military research centers advance in technological readiness and develop proofs of concept, demonstrators of technologies and even prototypes, it is necessary that this knowledge be transferred to the national productive sector, thus generating innovation in a sustainable way. It is fundamental to deepen such initiatives and investments in the sector, to observe strategic factors, such as the need for technological independence, to reduce the impact of technological restriction and to strengthen the national industry. Thus, it is possible that the licenses or assignments will occur even at no cost to the licensed companies, prioritizing the strategic aspects to the detriment of the economic ones. For such licensing to occur, consideration must be given to the characteristics of the technologies; to the existence of technological barriers; to the intellectual property instruments used; to the possibility of substitution of technology for similar in the national or international market; to the importance of technology for military artifact, among other characteristics that may affect the real dominance of the industrial production of technology through the IDB. It should be emphasized that the strategic aspects, especially those contained in the END, should be observed so that Brazil becomes independent in sensitive technologies, with a reorganized and strengthened IDB. The work is based on literature review and documentary research and in this sense is limited to the secondary data available. It is understood that there are possibilities for international comparisons and case studies with successful experiences.

The results of the research carried out at the request of the defense sector, carried out internally, through partnerships or technological orders, can overflow to other sectors of society, thus contributing to national development. Both the technologies, developed for exclusively military use and those of dual-use, are produced by the public or private industrial sector. Moreover, respecting the Intellectual Property Rights, the industries can realize the production of this type of technology, it is necessary that the assignment or the licensing to occur, when it is possible to receive pecuniary remuneration from these transactions. In short, the work has several possible implications. For military agencies, it can serve as an assessment of their strategies and identify actions that can be incorporated, in addition to allowing bridges with academia and the private sector. For the academy, the work can identify new topics for research. No similar study was performed in the Brazilian academic literature. Thus, it is an innovative work that can contribute both to the Brazilian Armed Forces and public policy managers. There are similar works in international academic literature.
Applying the Triple Helix Framework to the Creative Industries: Learnings and Comparisons from Shenzhen and Brisbane

Category: 3. Post-Industrial Industrial Policy: Convergence and Fusion of Arts, Creative and Service Industries, Big Data, Artificial Intelligence and Genetic Technologies
Presentation: Oral

Yi Wang (Queensland University of Technology), Greg Hearn (Queensland University of Technology)

Interactions between universities, industries and governments – the Triple Helix approach - is widely acknowledged in developed nations (Etzkowitz & Leydesdorff, 1997) as a method to promote open innovation and regional development. To date, research based on the Triple Helix framework has focused primarily on science and technology collaborations. Implementing the Triple Helix model in arts and humanities is more complex and it seems to require more attention. In this study, we apply this framework in the field of creative industries. In the context of technological development and rapid globalization, it is generally recognized that developed economies have shifted economic focus from tangible assets to intangible assets (for example, technology, design, human capital, knowledge production, intellectual property, research and development, brand, social media, and software applications). While traditional sectors of the creative industries such as media, arts, and culture have experienced economic declines, the combination of digital technology and cultural creativity; creative technology which is a broad, transdisciplinary field including the art and humanities, digital media, software and computing, digital product design, and advertising specifically in digital entertainment fields such as gaming, online literature, video editing, software engineering, virtual reality, and augmented reality. Digital creative technology has become an increasingly important sector in its own right as well as an input to other economic sectors through creative services. These creative sectors are of increasing relevance for improving emerging markets, particularly in developed countries, and for prosperous competitiveness in city-based innovation (Flew, 2012; Hartley, Wen, & Li, 2015; Hearn, Bridgstock, Goldsmith, & Rodgers, 2014). The digital economy is characterized by multi-layer networks and cross-sectoral connections through higher education, companies, government agencies, and civil societies. Moreover, the synergy between start-ups, governments, and universities is argued to be significant to such innovation (Comunian, Taylor, & Smith, 2014; Hearn, Cunningham, & Ordonze, 2004; Moreton, 2016). Thus, the stimulation of creative digital industries is becoming a more systemic, complex policy and management process. Here we propose that knowledge exchange – both formal and informal – is critical in the operation of the triple helix in these sectors.

Furthermore, in order to understand and develop a knowledge exchange strategy in the creative industries, this study explores two major types of knowledge from the exchange process through Triple-Helix networking. 'Tacit' (know- how) and 'explicit knowledge' (know-what) are embedded during the knowledge creation and diffusion through the businesses process (Nonaka & Takeuchi, 1995). Compared to tacit knowledge, explicit knowledge is easily identified, evaluated, articulated, and shared. Tacit knowledge is generated by experience and learning in the minds of humans, and difficult to express, code, and extract for uses such as insights, aesthetics and creativity. Both tacit knowledge and explicit knowledge all play a significant role in the real-world practice of university-industry-government (UIG) interactions. However, since its intangible feature of creative industries within digital technology, the potential forms and strategies
of inclusive UIG interactions will be articulated. Moreover, this paper offers a critical analysis of how tacit and explicit knowledge in creative industries are effectively shared and transformed. It provides a further contribution by analyzing the relationship between open innovation and knowledge transfer from digital media and creative spaces. This paper attempts to indicate the overlapping linkages between involved Triple Helix components and the role of media and culture (civil society) as the fourth helix between civic engagement and creative sectors. The function of civil society, particularly with media and communication, has become an important factor in the digital society. Colapinto and Porlezza (2012) and Comunian et al (2014) suggested the Triple Helix to be used as a framework for analyzing the creative industries. However, excluding the recent work of a few authors, research of the creative industries applied the Triple Helix framework to the creative sectors needs more attention.

This study addresses this research gap by fulfilling the following research objectives. This is achieved by applying the Triple Helix framework to examine innovation through knowledge exchange in the creative industries and investigating how such UIG relationships are implemented in city creative spaces. This issue cannot be addressed without considering a broader range of related research questions: 1. What kinds of knowledge exchange occur in the digital creative industries? 2. How does Triple Helix network of creative industries foster innovation? 3. What is the role of creative spaces in facilitating this knowledge exchange? First, factors and dynamics influencing knowledge exchange in the creative industries within UIG networks will be identified from already collected data. More specifically, it will identify how tacit knowledge and explicit knowledge in creative industries are exchanged during the process. In addition, key operational knowledge-exchange mechanisms that support UIG partnerships in the creative industries will be examined. Secondly, we will investigate how UIG relationships contribute to innovation within the digital economy. Finally, employing the use of the creative city concept adds equal emphasis to innovation through creative sectors and cultural activities in combination with advanced technologies. Creative industries involve various commercial engagement within the creative economy, which, together, dynamically reshapes the city into an innovative space (Borén & Young, 2013; Felton & Collis, 2012; Harvey, Hawkins, & Thomas, 2012). Therefore, we will explore the mechanisms and dynamics of creative spaces within city-based UIG partnerships that aim to develop the creative digital industries. To achieve these aims two case-study cities in China and Australia have been conducted: Shenzhen and Brisbane. The choice of particular case-study cities is significant due to their location in the Asia-Pacific region. China is displaying growth as one of the largest markets in the global economy. The creative industries in China and Australia transact billions of dollars annually and are becoming a major economic growth sector in Australia-China trade relations (Holmes, 2011; Australian Government, 2017). At the city level, cooperation between Shenzhen and Brisbane has been strongly increased in recent years within the International Sister Cities, especially in cultural and creative sectors. Thus, this study’s investigation of the comparison of creative industries between these two cities might suggest meaningful partnerships in the future. In addition, we make a preliminary assessment of what these two cities could learn from each other to promote innovation within their creative industries. Analysis of how Shenzhen and Brisbane implement the Triple Helix framework will inform the comparison, as well as strengths and weaknesses, of UIG networks within their own supporting mechanisms and innovation ecosystems for creative industries. This paper employs a qualitative research methodology based on initial secondary data analysis, face-to-face semi-structured interviews, and site visits. The framework of tacit and explicit knowledge enables understanding relational and transferable forms of knowledge sharing in a network of a Triple Helix relationship. Data are collected for analysis in Shenzhen and Brisbane, through stakeholder interviews (including experts, professors, managers, government officers, organization senior staffs and relevant participants) regarding engagement during UIG exchange processes. The fieldwork took place between August 2018 to November 2018 in Shenzhen and February 2019 to the current date in Brisbane. The information collected from fieldwork in Shenzhen was supplemented by 22 semi-structured interviews with a variety of stakeholders of creative industries within the Triple Helix network.

In Shenzhen, the study examined several relevant entities including the case of a higher education institution of Shenzhen University (SZU) with the Institution of Culture Industries, Design College, University
Entrepreneurship Park. The companies and spaces included relevant creative technology sectors in Shenzhen, such as the technology giant Tencent, state-owned companies, design and game firms, video editing start-ups, and music studios. Creative spaces such as incubators, accelerators, and co-working places were also examined. In Brisbane, the study conducted interviews such as the Queensland University of Technology (QUT) which included the Creative Industries Faculty, university incubator Creative Enterprise Australia, co-working space like The Capital and The Precinct, government agencies such as Digital Brisbane and Arts Queensland, game companies such as Half Brick, digital content start-ups, design companies, and other relevant firms. Due to the differing ideologies of political parties and cultural environments, we compare the knowledge-exchange actors, operations, collaborations, and mechanisms within digital creative industries in Brisbane and Shenzhen as case studies. We found that both the Triple Helix framework in Shenzhen and Brisbane are implemented in the creative industries. The engagement of UIG entities is more balanced in Brisbane than Shenzhen because of the sustainable interactions and activities and that the academy in Brisbane (QUT) plays a more supportive role to promote inclusive innovation and collaboration opportunities through research projects, real-world practice, and relevant events. Compared to Brisbane, the integration of cross-sectors and convergence of industries between culture and technology, and entrepreneurship culture has been crucial to Shenzhen’s success. Triple Helix framework in Shenzhen could be more balanced because the higher education institution (SZU) has not been regarded as a vital role to engage participation and advance innovation within creative industries. However, the open innovation of industry in Shenzhen has been the driving force to lead the regional inclusive innovation. Overall, the Triple Helix framework is implemented in creative industries within a continuous process of knowledge exchange that deserves more attention for inclusive innovation within digital technologies in the city context.
Entrepreneurship as a Catalyst for Enterprise Development in South Africa: Towards the Development of an Institutional Framework for Intervention and Support

Category: 3. Post-Industrial Industrial Policy: Convergence and Fusion of Arts, Creative and Service Industries, Big Data, Artificial Intelligence and Genetic Technologies
Presentation: Oral

Dr Tirhani Ezekiel Mabunda (Tirhani Group Holdings and Da Vinci Institute PhD alumnus)

While small and medium enterprises (SMEs) are heralded as engines of economic growth and job creation in both developed and developing countries across the world. Empirical evidence from the extant literature indicates that SMEs make up more than 95% of enterprises and contribute between 60 and 70% of employment opportunities in Organisation for Economic Co-operation and Development (OECD) economies. However, this is not the case to a large extent in South Africa where although SMEs make up 90 percent of formal business enterprises, they only contribute roughly 34 percent towards Gross Domestic Product (GDP) and provide employment to about 40 percent of the labour force. Entrepreneurship is not thriving in South Africa, and enterprise development is not sustainable, although the South African government has invested a lot of money in the development of SMEs and job creation since the dawn of democracy in 1994. Apart from low entrepreneurial activity, the challenges of unsustainable enterprise development in South Africa include a high start-up failure rate and a low transition rate from small-to-medium and from medium-to-large enterprises. South Africa’s rate of entrepreneurial activity is very low – a mere quarter of that seen in other African countries. South Africa has a dismal Total Early-Stage Entrepreneurial Activity (TEA). Only 7% of the adult population in South Africa are engaged in entrepreneurial activity, and a mere 2.7% already own or manage an established business. Evidence show that less than 50% of start-ups survive beyond their first five years and only a fraction become high-growth firms that create jobs. In South Africa, it is noted that SMEs do not survive beyond their nascent stages of 3,5 years and their attrition poses an economic growth challenge because most of them are too small to create jobs, hence the expanded definition of the sector as Small, Medium and Micro Enterprises (SMMEs). The impact of a less vibrant SME sector in South Africa is exacerbated by a decline of employment by large firms. It is hardly contestable that governmental support is vital for the development and promotion of a thriving SME sector. Furthermore, the South African government’s commitment to stimulate entrepreneurship and to develop the SME sector is evident from numerous interventions – legislation, policy, programs, incentive schemes and the huge investment in institutional infrastructure. However, given the massive resources which the South African government commits towards the SME sector, it is evident that the apparent lack of impact is happening despite government’s efforts and initiatives. Despite extensively documented government interventions where vast amounts of resources have been channelled towards creating and growing SMEs, the formal business sector in South Africa has hardly changed since 1994. Also, government interventions appear to be aimed at improving the start-up rate rather than strengthening existing SMEs. It seems to be a trend world-wide that governments employ measures that support the development of entrepreneurial activities, particularly for start-ups, as part of their national economic development strategies, but inadvertently neglect the sustainability challenges SMEs face thereafter. There is too much emphasis on providing finance to new businesses as compared to the attention
given to solving sustainability challenges faced by newly established SMEs. The poor performance of start-ups in South Africa indicates that there is a need for alternative policies aimed at supporting and promoting SMEs – not only during their difficult birthing stage, but also about the management skills that are necessary to overcome failure and promote their sustainability. In view of the poor performance of start-ups in South Africa the researcher explored the need for alternative policies necessary to stimulate enterprise development – not only during the difficult birthing stage of SMEs, but also with the management skills they require to overcome failure and promote their sustainability during their transition from small-to-medium and from medium-to-large enterprises.

The research sought to investigate the basis upon which entrepreneurs, entrepreneurship or entrepreneurial business activities could be separated and isolated from non-entrepreneurial business owners and non-entrepreneurial business activity. In addition to that, the research explored alternative methods of stimulating and promoting SME development in South Africa, considering that current government interventions and initiatives do not seem to be producing desired results – particularly SME development policies and programs focused largely on stimulating entrepreneurship and entrepreneurial, with new venture creation and start-up activity as the barometer. In particular, the research asks whether all SME business owners are entrepreneurs and always engage in entrepreneurship and entrepreneurial business activity, with a view to explore and recommend ways through which non-entrepreneurial business activity could be isolated, understood, better promoted and supported in order to counter the current high failure rate of start-ups by becoming more effective catalysts for job creation, poverty alleviation, reduction of inequality and inclusive economic development in South Africa. The researcher also questioned whether some of the business owners and managers who are currently regarded as entrepreneurs are really entrepreneurs in the truest sense of the word. The researcher posits that entrepreneurial and non-entrepreneurial business activity could be so distinct that their requirements in terms of support differ vastly, such that treating non-entrepreneurial business owners and managers as entrepreneurs could be the reason why the impact of SME development interventions and initiatives is dismal, despite the vast amount of resources being poured into SME development.

A theme that has occurred throughout the research is that current SME development models are geared towards supporting start-ups, and do not prioritise existing SMEs which are already sustainable but require assistance to scale-up and replicate themselves. This perspective is consistent with the high failure rate of new SMEs in South Africa. The researcher concludes that there is a need for a new ecosystem of entrepreneurship – hereby coined ‘enterpriseneurship’. The thrust of the ‘enterpriseneurship model’ is to strengthen existing high-impact SMEs by documenting and standardising their systems and processes with a view to scale them up and replicate their already successful businesses. It is posited that the implementation of ‘enterpriseneurship’ is likely to counter the current high failure rate of start-ups by fostering the creation of sustainable business enterprises, thus facilitating the creation of sustainable jobs, reduction of poverty and reduction of inequality through inclusive economic growth – among others. The findings and recommendations of the study have implications for - and make contributions to - policy makers, SME development agencies, academics and society. As such, it is postulated that in order to ensure social impact it is important to change course, and “invest in those who have the highest chances of success”. The unanimous recommendations of the participants that ‘existing SMEs who have already proven themselves in business’ should be targeted for support to scale-up and replicate their businesses confirms this key finding. This suggests that adopting the enterpriseneurial approach would help to reduce the failure rate of SMEs in South Africa. The successful ‘tool’ is already there, and that ‘tool’ is existing SMEs which have been running for 10 or more years. What is needed is ‘to use the tool and execute the function rather than develop the tool’. This is also interpreted to mean that there is need to support ventures that have already been tried and tested and replicate these ventures through collaborative business models using enterpriseneurship.

The main limitation is that the research was exploratory and based on a limited number of SME case studies selected from only two of the many economic sectors. Therefore, the results cannot be statistically
extrapolated and generalised to the rest of the SME sector in South Africa. However, the findings still enable theoretical generalisation and the requirement for statistical extrapolation and validation can be overcome through future follow up quantitative research that is based on sufficiently robust and representative samples.
Theme 4:

Spacial and Temporal Axes of Innovation: Innovation Spaces; Smart Cities and Knowledge-based Rural Development

Category: 4. Spacial and Temporal Axes of Innovation: Innovation Spaces; Smart Cities and Knowledge-based Rural Development
Presentation: Oral

Il-haam Petersen (Human Sciences Research Council), Xolisa Magawana (Human Sciences Research Council)

Introduction:
Innovation hubs are gaining popularity as enablers of entrepreneurship and innovation. This is evident in the proliferation of innovation hubs in major cities around the world, including South Africa (Tuukka Toivonen & Nicolas Friederici, 2015; World Bank, 2016). The hub model boosts creativity and facilitates collaboration among a range of actors including both formal and informal businesses and other organisations. The potential for innovation hubs to facilitate co-creation, participation and thus the development of ‘innovative and locally relevant solutions’ has been highlighted (Kraemer-Mbula and Konté, 2016). Innovation hubs have thus begun to spring up in informal settings such as township areas. The South African government, for example, intends to invest in setting-up such hubs in four township areas to promote entrepreneurship, small business development and opportunities for youth development (State of the Nation Address 2019). The impetus is local economic development and social impact. It is thus timely that we assess the strengths and limitations of these hubs, and their roles in township areas. The body of literature on innovation hubs is growing, with few researchers focusing on linking the informal sector (see for example, Comins & Kraemer-Mbula, 2016). The present research draws on a participatory research approach in analysing the role of an innovation hub in Philippi, one of the largest township areas in one of South Africa’s major cities, Cape Town. The advantage of a participatory approach is that it draws attention to how the values, norms and identities of people – including the surrounding communities, the people who use the Hub and Hub management and employees – and the interaction between them shape its role in the area. Rather than seeing the Hub as simply an infrastructure development, we view it as a relational space.

Case Study Research Design:
The analysis presented in this paper forms part of a larger study on community engagement and the interactive capabilities of formal knowledge producers – i.e. universities, science councils/institutes and NGOs that offer formal training and knowledge services – and informal sector actors – community-based organisations and informal businesses. This paper focuses on one case study, the Philippi Innovation Hub. The Hub is located in an area of Philippi that has been demarcated for industrial development, and is surrounded by informal settlements and bustling informal business activity. Philippi is located close to the airport, and is surrounded by four other large township areas. It is a typical township area in that a large proportion of the working age population is unemployed and the majority of households report a monthly income of R3 200 or less, making them eligible for subsidised housing (Census 2011; HHO Africa, 2015). Because of its location potential and development needs, Philippi has received considerable attention from local and national government. The Hub has an innovative design, and rents out formal ‘business
space’ made out of shipping containers that are integrated into a very modern design. The containers are rented out at a cheaper rate than other formal business premises. Informal businesses renting the containers also receive free training in business skills and mentorship offered at the Hub. Several organisations offering a range of services, with most related to small business development, are based at the Hub. This includes a set of well-established NGOs. The business school of a well-established university has also set up a facility at the Hub and offers programmes supporting innovation for social impact, such as incubation programmes for start-ups. A library that is run by the municipality is based on the ground floor and attracts children and youth from the area. There is thus potential for the Hub to facilitate collaboration between the university, local government, NGOs, and formal and informal businesses.

**Participatory Visual Methods and Interviews:**
The analysis is based on the discussions and outputs of two workshops conducted using two types of participatory visual methods that are gaining popularity in research, digital storytelling and Photovoice. We argue that participatory visual methods, which are traditionally used for community development and in public health research, hold promise for linking with hard-to-reach social groups and studying complex topics. Such arts-based methods are thus becoming popular as participatory research tools for producing in-depth, rich data on under-explored topics. The methods also provide tools for capturing alternative views and understandings based on the lived realities of social groups that tend to be marginalised from formal processes and decision-making. In September and December 2018, we conducted two workshops, one digital storytelling and one photovoice workshop, with informal businesses and community-based actors from Philippi. The digital storytelling workshop was held over five days and focused on understanding the innovation and learning activities of informal businesses in Philippi. The guiding topic was: “tell me a true story of a time when you have done something differently in your business and what happened”. Through a facilitated process and in-depth discussions, the participants were encouraged to elaborate on a specific experience / decision / moment and the processes that led to that moment and what happened after. The result was thus a set of stories that included a detailed description of an innovation and related processes (such as learning). The photovoice workshop focused on exploring knowledge flows between formal and informal actors, and key mechanisms and strategies for learning. The main guiding question was: ‘if you want to grow livelihoods in Philippi, how does the Innovation Hub help you (or not)?’ Again, the participants were encouraged to reflect on their own personal experiences, whether they were positive or more critical of the Hub. We wanted to understand how they engage with the Hub as a relational space. The workshops, which included seven to 10 participants, are similar to focus groups but involve a more lengthy and intensive process, allowing for in-depth and participatory discussion. Through intense engagement over several days, participants, guided by the facilitators, scripted and recorded their own stories on how they learn and innovate and the role of the Hub. The outputs of the workshops are thus co-produced. For the digital storytelling workshop, each participant produced a script and short (three to five minute) video recording of his/her story. The photovoice process involved participants taking photographs, at the Hub and in their community that related to the topic. The participants, guided by the researchers, produced a set of individual photo-stories and a collective story including a series of photographs with captions. We used participant observation, and conducted a set of semi-structured in-depth interviews with the participants, and staff at key organisations based at the Hub, including the NGOs that provided training and support services, and the university. In addition, we interviewed other informal business owners who were renting containers and participated in the incubation programmes, and representatives from local government in order to gain better insight into the policy environment and political structures.

**Findings and Discussion:**
The stories produced show how the Philippi Innovation Hub represents a space for informal business owners, NGO workers and development practitioners, university students and staff, researchers, and (sometimes) representatives from government to interact and share knowledge and resources. As one participant stated: “The space is safe. The resources are available. It’s a space for engaging, coming up with possible solutions, networking, (and accessing) online resources to apply for employment”. The one
narrative that was conveyed through the stories and discussions was that the Innovation Hub was as a space for accessing knowledge and material resources, for collaborating and networking and promoting creativity and innovation. This is consistent with the literature and the objectives of the Hub communicated by formal actors and publicly available sources (e.g. the Hub’s website and news coverage on the Hub). The stories and discussions also revealed ‘hidden’ narratives about spaces of exclusion. For example, the findings show how certain symbols and facilities created distance between the Hub and community members. Interestingly, these were originally intended to promote inclusion and a sense of belonging. Another example is the participants’ descriptions of how they managed to work around restrictions to make the space useful to them. Certain practices also served to ‘exclude’ informal business from opportunities to grow and access knowledge resources. Another interesting narrative that emerged related to power, agency and norms in the community. The paper provides recommendations for supporting and enabling the agency of informal business owners and other community members. Drawing on a participatory approach and novel visual research methods, the paper thus provides useful insights into the role of an Innovation Hub in a township area, based on the narratives and lived realities of informal businesses and other community-based actors. It proposes recommendations for improving knowledge services offered by innovation hubs and making such Hubs more accessible to improve social and economic impact in the local setting.
Unintended Flows of Knowledge Unveiled: A Policy Framework for Propagating Knowledge and Innovation to Regions

Category: 4. Spacial and Temporal Axes of Innovation: Innovation Spaces; Smart Cities and Knowledge-based Rural Development
Presentation: Oral

Sergio Botelho Junior (Waterford Institute of Technology), Valerie Brett (Waterford Institute of Technology), Bill O’Gorman (Waterford Institute of Technology)

Knowledge flows are a crucial regional aspect for firms (Rupietta and Backes-Gellner, 2019; Snider and Nissen, 2003) and policies on innovation (Yigitcanlar and Inkinen, 2019, Meagher, Lyall and Nutley, 2008) because, according to the OECD (2018), they can facilitate knowledge-based interactions between firms and other organisations, such as universities and government agencies involved in the regional innovation process. The more these interactions happen the more likely they are going to evolve into a knowledge network, which enables firms to acquire knowledge that can be used for innovation. Knowledge flows need to be understood and considered by policy-makers because innovation is a distributed process based on managed knowledge flows across organisational boundaries (OECD, 2018). Thus, due to the importance of managing knowledge flows in a region, the OECD (2018) proposes a framework that explains how two types of knowledge flows, intentional and unintentional, can facilitate firms to acquire knowledge that is available in a region and important for innovation. This paper addresses and complements the framework proposed by the OECD (2018) by proposing a framework of its own that explains how Unintended Knowledge Flows (UKF) happen regionally and have the potential to benefit multiple firms in a region. The authors posit that such a policy framework can facilitate industrial knowledge and innovation for firms that neither have predisposition to innovate nor the resources to conduct R&D activities and create innovation themselves. Thus, this study argues that propagating UKF is more beneficial to regional innovation performance than propagating Intended Knowledge Flows (IKF) because of the reach potential. UKF diffuse knowledge to multiple firms and, because it is unintended, spread and have an effect in firms not involved in the process of knowledge creation. IKF, on the other hand, is directed to the firms and organisations that were involved in the knowledge linkages that created the knowledge and are much more restricted in numbers. Therefore, UKF is a positive phenomenon for regional innovation that should be considered by policy-makers in order to benefit all types of firms in a region, and not only those who are already conducting innovative activities and are more likely to have access to industrial knowledge anyways, which is also the case for IKF.

In order to conceive a framework for explaining how UKF happens regionally, this study undertakes a mixed methods research. Initially, quantitative techniques identify what are the effective mechanisms for knowledge linkages and the existing interrelationships between them. Following the quantitative approach, interviews with key informants explain the role of these mechanisms for UKF and regional innovation. An analysis of both quantitative and qualitative approaches enables this research to build on findings and culminate with an explanation on how UKF happens in regions through a framework that can assist policy makers to propagate UKF. In order to conceive this framework, this research was based on the mechanisms that can facilitate knowledge linkages between different regional actors (firms, universities and government
These mechanisms for knowledge linkages are assumed in this study to start the process by which UKF spreads knowledge between regional actors. These mechanisms are not widely addressed in previous research literature, thus this research looked for previous studies that promoted channels of Knowledge Spillover as conduits for regional innovation. This is because knowledge spillover, i.e. unintended transmissions of knowledge (Fallah and Ibrahim (2004) is the result of successful UKF. Based on extensive literature review, the process by which UKF happens at the regional level has not been fully explained by previous research. However, literature does provide the mechanisms for knowledge linkages by which UKF can happen, which partially explain how it happens. As a result, a desk research was conducted and identified 15 such mechanisms. The importance of these mechanisms was tested by administering a survey in four regions, namely South East Ireland, Bucharest-Ilfov Romania, Castilla-La Mancha Spain and North East Brazil. In total there were 7,292 questionnaires administered yielding 439 valid responses (a response rate of 6.02%). The questionnaire consisted of five-point scale questions requesting respondents to rate the importance of these mechanisms for knowledge linkages (from 1- not important to 5- very important). Descriptive statistics identified consistent similarities in the way UKF can happen as the top five most important mechanisms for knowledge linkages were basically the same across regions, categories of technology intensity (from low- to high-tech-industry sectors) (OECD, 2011) and firm sizes. The top five most important mechanisms for knowledge linkages are, namely (i) Specialisation; (ii) Networking; (iii) Hiring skilled labour; (iv) Competition; and (v) Diversification. Moreover, Exploratory Factor Analysis (EFA) explored the interrelationship of mechanisms for knowledge linkages and revealed five dimensions of UKF, which serve as key inputs for propagating knowledge flows. The dimensions of UKF revealed are, namely (i) Industrial setting; (ii) Workforce; (iii) Competition; (iv) Technological innovation environment; and (v) Industrial secrecy. The qualitative approach consisted of conducting two sets of interviews. One set of interviews was with regional stakeholders and the other with Experts on UKF and Innovation (UKFexperts). These key informants explained the regional role of the top five most important mechanisms for knowledge linkages in UKF and innovation. Regional stakeholders interviewed were individuals from the four regions surveyed who are involved with knowledge spillover (KS) propagation in their regions, including representatives from HEIs, government and industry. UKFexperts were (i) relevant scholars that have their research on UKF and innovation, (ii) managers of clusters that serve as international references for developed regions, and (iii) policy-makers that are members of international institutions that promote programmes geared towards regional development of participating countries. An important characteristic of UKFexperts is their position as decision-makers in academia, industry or government. In total, 15 regional stakeholders and 9 UKFexperts were interviewed.

The framework for explaining how UKF happens regionally is the result of an analysis based on the interview findings that follows the trail of knowledge flows that starts from geographical proximity of firms and other organisations and culminates with regional innovation. This framework explains how this trail of knowledge flows, much like a snowball effect, leads the way towards regional innovation by creating many opportunities for firms to create knowledge linkages and benefit from the knowledge flows that are available in regions. The framework for explaining how UKF happens regionally can be summarised as follows. Geographical proximity between different organisations that are involved with innovation in the region is the main requirement for knowledge flows to reach firms within a region. The interactions that derive from this proximity leads firms from the same and different industry sectors to concentrate in the region. When firms are close to each other, knowledge interactions lead to competition and networking. Two results of competition are (i) copy of innovative products through reverse engineering and also (ii) imitation of organisational innovation, which are practices that have a positive impact on business. Networking, in turn, enables firms to be more effective as regards what is positive for innovation, thus, it leads firms to conduct R&D. When firms conduct R&D, they are ready to engage in research cooperation with other firms and also with universities. Once they have this kind of practice, they get noticed by the government, and start receiving relevant supports for innovation. Moreover, the concentration of firms also facilitates them to hire skilled labour, since these individuals are already working in other firms they can easily move from firm to firm. Also, these firms hire university graduates because they have learnt up-to-date skills that can be
applied to their businesses. The major contribution of this study to the existing body of research on innovation, knowledge flows and knowledge spillover, is explaining how UKF happens regionally, which complements at an in-depth level the framework proposed by the OECD (2018) that explores how two types of knowledge flows, intentional and unintentional, can facilitate firms to acquire knowledge for innovation. The authors posit that, when policy-making targets UKS, it has the potential to promote innovation in all firms in the region, including non-innovative firms and firms with restricted resources. The major contribution of this research to practice is that when policymakers target IKS, it is more likely to induce innovation only in firms that are already involved with innovation processes. However, if policymakers take UKS into consideration, they can diminish the imbalances of innovation between firms that are concentrated in a region and therefore increase the innovation capacities and capabilities within their region, which in turn leads to sustained regional competitiveness.
The Rio Sul Valley Movement through the Prism of the Triple Helix

**Category:** 4. Spacial and Temporal Axes of Innovation: Innovation Spaces; Smart Cities and Knowledge-based Rural Development

**Presentation:** Oral

Jéssica Souza Maia (Universidade Federal Fluminense), Marcelo Gonçalves do Amaral (Universidade Federal Fluminense)

**Purpose:**
It is known that entrepreneurship is a local phenomenon (Feldman, 2001) and plays crucial roles in economic development (Schumpeter, 1982). Its importance to the field of social and economic development has also been demonstrated through the generation of jobs and income (Haltiwanger, Jarmin, & Miranda, 2009). Innovation in countries development centers have been created in an agglomerated way, through partnerships, not necessarily of the same organization, but which work as an interrelationship that, in the end, results in mutual advantages, resulting in innovation ecosystems (Kon, 2016). Businesses should be considered as part of an ecosystem, which involves several companies, rather than as units of a single industry. In this ecosystem, firms would evolve together, around an innovation, producing competitively and cooperatively, with a single goal of elaborating new products to satisfy the consumer market (Moore, 1996). In this context, the innovation communities have occupied a prominent place in world literature. Saxenian (1996) and Ries (2011) argue that the movement has a strong potential to stimulate the economic development of regions in various parts of the world. Located in the region of Vale do Paraíba Fluminense (RVP), in the southern state of Rio de Janeiro, Brazil, the Rio Sul Valley (RSV) community is self-styled as an innovation movement that occurs in the region and not just a startups movement. It is common for several companies to be involved in this movement, moving from traditional to innovative organizations, participating in meetings and using ideas discussed for application in their businesses (Silva, 2018). The objective of this research is to make a description of the Rio Sul Valley movement and analyze the relationship among the actors based on the Triple Helix approach (3H). In order to achieve these objectives, existing information (secondary data) regarding the RSV (or community) movement will be gathered, and the analysis of the innovation environment will be done from the perspective of 3H.

**Design/Methodology/Approach:**
The work is based on bibliographical research, based on the literature review and general sources, such as books, scientific articles and web pages (Fonseca, 2002) highlighting the analysis of the regional ecosystem conducted by the Brazilian Association of Startups (ABS). As for the approach, research is qualitative and the collection of primary data, performed in the year 2018, qualifies work as a case study, which is often used in organizational studies (Yin, 2001). This case study was carried out through participant observation of the authors attending the RSV meetings. For the analysis of the case will be used a framework produced by UP Global in partnership with Google for Entrepreneurs and Brad Feld (2014), which indicate the five elements considered key to the creation and development of a thriving startup and innovation ecosystem (Talent, Density, Culture, Capital and Regulatory Environment). In Brazil, ABS also created its own "pillars," adding to the five factors, the item Market Access. It is through these factors that the analysis of the various
Brazilian communities, including RSV, takes place based on a report made by the Brazilian Startups Association (ABS Startups). Findings: Based on the framework used the following points were identified: 1. Capital - The absence of the capital offers, where angel investors and networks or investment funds are accounted for. One of the six pillars described by ABS does not have the ecosystem actors involved, which hinders the evolution and sustainability of the startups in the region. These businesses become hostages of their investments, diminishing the chance of success and rapid growth, or being forced to look for other possibilities of investments in the capitals. 2. Culture - There is a higher volume of actions, where the community participates and organizes various events in several cities in the region, bringing together different audiences, stimulating networking between networks, and fostering innovation. Even with the most significant volume of events, Silva (2018) points out that there is a need to carry out training on entrepreneurial and technological education, as well as the creation of a network of entrepreneurs, since only a few of them have network or partnership interaction with other companies and movements in the area of local innovation. 3. Regulatory environment - A critical point identified concerns the lack of a minimum amount of governmental actions to promote the sustainability of these organizations (tax incentives or regulation). Silva (2018) points out that most of the actors that make up the community do not have at least formalization as a legal company. 4. Talent and density - The participation of universities and other educational institutions should be the central focus of the 3H and, consequently, the ecosystem. This can mean a barrier encountered by the movement, in the region, where the strong local culture is focused on the metallurgical and assembly industries. These actors of the Academic Helix guide the creation of their courses according to the needs of workforce dictated by the industrial segments. Siegel & Wright (2015) argue that academic entrepreneurship must be rethought, stressing its increasing importance in recent years and that this should be a strategic theme for universities. 5. Market Access – Too limited due to the absence of funding and the distance and concurrence with big centers like Rio de Janeiro and São Paulo.

Research limitations/implications:
This research was developed primarily with secondary data and observant participation without major theoretical rigors. It is a first approach to the ecosystem that is still under development and can be useful to support maturation and guide future studies. Practical and/or Social Implications: At first, the interaction between the themes that cover developmental ecosystems and the 3H is observed, mainly concerning the role played by each one of the actors involved. The ecosystem found in the RVP is conducive to development, sustainability, and innovation, due to the large number of industries in the south of the state of Rio de Janeiro. There are some absences (investment and regulation) that become conversion factors for lack of an active ecosystem to guide, enable and accelerate the process of viable business ideas. The work identifies possible bottlenecks that, in their absence and lack of regional, indicate where future efforts should be used for community development to impact innovation and economic development. Originality/Value: The work studies the region from a distinct prism. There is a long industrial tradition, and that this should be a strategic theme for universities. 5. Market Access – Too limited due to the absence of funding and the distance and concurrence with big centers like Rio de Janeiro and São Paulo.

References:
Governance on Technology Parks in Brazil: A Triple Helix Practice

Category: 4. Spacial and Temporal Axes of Innovation: Innovation Spaces; Smart Cities and Knowledge-based Rural Development
Presentation: Oral

Adriana Ferreira de Faria (Federal University of Viçosa (UFV)), Jaqueline Akemi Suzuki Sdyama (Federal University of Viçosa (UFV)), Danielle Silveira Leonel (Federal University of Viçosa (UFV)), Marcelo Gonçalves do Amaral (Federal University Fluminense (UFF)), Juliane de Almeida Ribeiro (Federal Institute of Education, Science and Technology of Minas Gerais), Ana Cristina de Alvarenga Lage (Rede Mineira de Inovação), Jose Antonio Silvério (Ministry of Science, Technology, Innovation and Communications)

In an increasingly knowledge-based economy, technology parks have emerged as promising mechanisms to promote sustainable development through innovation. Based on the Triple Helix model of university-industry-government interaction, as an intermediate organization, these ventures act as regional economic development catalysts, facilitating the creation and development of new technology-based companies and knowledge transfer between universities and businesses. Over the past few years, however, issues concerning technology parks’ governance, such as the alignment and integration of actors and organizations, and the evaluation of performance and accountability, including the proper identification of improvement opportunities, have been discussed more intensively. There is a lack of studies that address questions concerning technology parks’ governance as success key factor. There is no consensus on what is a successful technology park, and it is particularly difficult to compare these ventures accurately. Thereby, to advance the research on technology parks, it is crucial to understand their role in the value chain of their different stakeholders. In order to contribute to fulfilling this gap, this paper has as general objective to develop an analysis of the governance and management systems of technology parks in operation in Brazil, in light of the model of the triple helix model, in order to identify the factors of success. It was analyzed the relationships of cause and effect, which can help to promote the technology-based resident companies and to reduce fragility and organizational risks, as well as the financial sustainability of these innovation environments. This research can be characterized as exploratory and qualitative. Initially, this work presents the theoretical and conceptual framework that addresses issues related to technology parks, as their critical success factors and the primary forms of results’ assessment used for these ventures. After this step, the multiple cases study, with ten Brazilian’s technology parks, was used as a research strategy for the understanding of the context and the identification of causal variables that contribute most to explain their performance. To carry out this research, primary and secondary data were collected along 2017 and 2018 as a part of a project led by University of Viçosa and funded by the Ministry of Science, Technology, Innovation, and Communication.

The proposed research design was sufficient, enabling the development of the research model and the identification of issues for further studies. The parks chosen represent ventures in different stages of maturity and regional contexts, allowing a broader spectrum of analysis of management practices, essential for the construction of reference models. A conceptual formulation for technology parks is challenging to be
entirely consensual. There are several typologies proposed in the literature, and all can be useful depending on the object of analysis. Thus Science Park is usually adopted in the United Kingdom; Tecnopolis, in France; Technology Centre and Technology Park, in Germany; Research Park in the United States; and Technology Parks or Science and Technology Parks in Brazil. Despite this terminological variety, it can be established a common denominator for all the parks: a place where high-technology products and services are developed and institutional cooperation opportunities for university-industry-government collaboration are generated. Technology parks have spread throughout the world as mechanisms to promote innovation, technology transfer, knowledge exchange, generation of skilled employment and socioeconomic development. That way it is observed that a technology park is a planned and cooperative space, in which occurs the interaction between technology-based companies and those with research, development and innovation institutions (R&D&I). It is up to the park to offer value-added services that promote the culture of innovation, competitiveness and increase business training, seeking to stimulate the creation of wealth in the region. The interest in these innovative environments, based on the Triple Helix model, has increased as government, academic and business actors had realized its potential as a catalyst of innovative entrepreneurship and technological and socioeconomic development. In Brazil, the movement of technology parks is recent and had its most significant boost just from the 2000s. Data from the Brazilian government, 2013, indicated the existence of 94 technology parks initiatives in all five regions of the country, in different stages of development (planning, implementation, and operation). As a whole, within the 28 projects in operation, 939 companies are installed, generating more than 32,000 skilled jobs and significant impacts in terms of revenues and taxes. The robust dissemination of technology parks in Brazil has found challenges such as the lack of resources for expansion and improvement of infrastructure, the difficulty of attracting companies and promote alignment between institutional partners and the establishment of best management practices. It is observed over the past few years the absence of more robust performance management and evaluation systems able to further verify the achieved results, indicate opportunities for improvement and support the effectiveness of parks as a public policy instrument. In recent years, several Brazilian cities have expressed interest in installing technology parks to develop skills of universities and local companies, stimulating the development of their regions. However, as these ventures demand high public investment and the available resources are limited, it is essential to establish parameters to assess their feasibility. Many parks and their managers are resistant to performance evaluation, in part because they are concerned about the consequences of a bad evaluation by its stakeholders and on the other hand because they consider that the assessment can be a costly and time-consuming process that adds extra demands on their responsibilities and can distract them from their main management objectives. However, science parks have been traditionally financed with public funds, and, therefore, despite all the difficulties and implications, performance needs to be evaluated, even as a way to check the directions and conduct new public policies. The critical success factors can be defined as the characteristics, conditions or variables that can have a significant impact on the success of a project when properly supported, maintained or managed. The study of these indicators is related to the identification of the most critical areas in order to reduce the complexity of decision making and management. For the present study, concerning technology parks, the analysis of critical success factors will be listed as preconditions or parameters for the viability of these environments, as organizations that help the promotion of innovation, according to the Triple Helix model.

As shown in this study, the sustainable development perspective goes beyond the traditional measures of financial and innovation performance expected by most ventures. It reflects a dimension of the park value to the stakeholders and society or the fulfilment of the park mission as a local and regional development vector. The presence of a strong scientific and technological base is seen as a sine qua non condition for the establishment of a technology park. Nevertheless, only the geographical proximity does not guarantee a strong relationship of university-company type. Therefore, it is essential that the park establishes strategic objectives in order to strongly influence this performance perspective, considering the context of scientific and technological development and the promotion of the entrepreneurial university. Thus, the technical-scientific perspective has four areas: university-business relationship, the creation of spin-offs, R,
&D&I projects and intellectual property. Considering the context presented, it is possible to conclude that the proposal of a study on governance and management systems of technology parks in Brazil, considering the Triple Helix model, is a complex task. Due to the variety of actors and expectations involved, as well as the influence of the boundary conditions that involve geographic location, level of local development, scientific and technological basis present, public policies and cultural context for entrepreneurship and innovation. In this sense, the analysis of the main critical success factors of these ventures, according to the literature, becomes necessary to understand the most critical aspects for the development of a performance management model based on the Triple Helix Model. It is expected with this study to propose practices and models, as well as new public policies in Brazil, that if properly applied, will allow technological parks to expand the number of resident companies, attract anchor companies, improve management and governance mechanisms, increase the satisfaction of resident companies and improve partnership mechanisms with universities. This study helps in understanding the strategic goals and performance indicators common to these ventures. Despite the limitations of the research, it is believed that this work can support the establishment of strategic management systems that will contribute to technology parks’ development. There is a vast literature about technology parks. However, there is a lack of studies that address questions concerning governance. Also, it is a new discussion to the Brazilian innovation system and the data collected to enable an original analysis and significative contribution to the managers and policymakers.
“PHYSICS FOR FOOD” Interdisciplinary Agro Science for Soil Protection and Food Safety. A Participatory Governance Model in Regional Innovation

Category: 4. Spacial and Temporal Axes of Innovation: Innovation Spaces; Smart Cities and Knowledge-based Rural Development
Presentation: Oral

Dr. Christiane GEBHARDT (representative of physics for food consortia), Prof. Klaus-Dieter WELTMANN (Leibniz Institute for Plasma Science and Technology (INP Greifswald) INP), Prof. Leif Alexander GARBE (Hochschule Neubrandenburg Fachbereich Agrarwirtschaft und Lebensmittelwissenschaften)

Strategy:
The German Ministry of Education and Research, BMBF will fund the projects of the initiative “Physics for Food” in the framework of the WIR! Programme (Transformation of Regions) in the period from 2019 to 2022. In 2018 the consortia developed a joint and highly integrated project strategy. Members of the consortia are the research institute INP (Leibniz Institute for Plasma Science and Technology), University of Applied Sciences Hochschule Neubrandenburg, local firms, and experts in physical process technologies, agro science and food science. The consortia players work in a triple helix setting of science, industry, policy makers and citizen and farmers. Strategy development and implementation follows a systematic strategy process suitable for regional innovation systems.

Objectives:
The research consortia “Physics for Food” is situated in the agrarian region Mecklenburg-Vorpommern in the North of Germany. Together consortia members will address the interdisciplinary research field of Physics, Plant Biology, Agro Sciences and Engineering Science, enhanced by other experts, local farmers and seed producers. In a joint attempt, “Physics for Food” will develop and test innovative process technology to reduce chemical plant protection products that are harmful to bees, and to improve the durability of seeds in an environmentally safe manner without yield decrease. At the same time and in collaboration with local universities the consortia intends to support the emergence of start-up firms and to provide innovation input for the mature agro industry in the lagging region. Not only will the innovation cluster facilitate new firm formation in incubators, it also aims at the development of citizen and farmer driven business models and engages in social innovation such as corporative local food production. Therefore participatory governance models for the agro and food industry are integrated elements of the strategic initiative. These models offer a new professional perspective and provide incentives for students to stay in the region.

Background:
There is a high demand for profitable and effective farming on the premises of pesticide free production in order to meet SDG and new EU law as well as consumer preferences. The Bundesland Mecklenburg-Vorpommern tested approximately 120.000 ha farmable land applying the new pesticide-free technology in a small-scale pilot. The consortia needs to upscale the production in order to meet target costing objectives
in a very competitive European and global market. Apart from soil protection cold plasma and other physical methods show first promising results in lab trials in that way that the treatment increases plant fertility and enhances plant resilience against viral, bacterial and fungal diseases.
Smartilience: Participatory Governance and Transformations at the City Level: The Crucial Role of Public Administration for Smart City Governance: Comparative Study of Climate Policy Implementation in Cities

**Category:** 4. Spacial and Temporal Axes of Innovation: Innovation Spaces; Smart Cities and Knowledge-based Rural Development

**Presentation:** Oral

Dr. Christiane GEBHARDT (representative of SMARTILIENCE consortia), Prof. Jörg KNIELING (HafenCity University Hamburg Institute of Urban Planning and Regional Development)

German cities experience increased flooding, heatwaves, droughts and severe storms. The consequences of climate change are diverse and cannot be forecasted. The flexible anticipation of climate change and the implementation of counteraction is difficult because city management lacks a date based strategic process to address unknown problems. At the same time, innovation policies have long neglected the role and the high potential of Social Entrepreneurial Individuals for urban innovation organization due to an institutionalized bias that is built into the fabric of bureaucracy, city polity and also innovation policy. Even so, cities have more and more encouraged and employed participatory and systemic approaches to comply with innovation programs and to address new challenges with democratic principles and new solutions. The implementation of policies however, is sluggish and outcomes are diverse. In this line of reasoning, Isabel Dedring, the Deputy Mayor of London in her speech at the urban age conference at London School of Economics in 2012 claimed that long term mobilizing of citizens remains a problem because of the complexity deriving from a multitude of interests, the dissipative tendency, and the institutional blockage participation of citizen is constantly facing (Sassen 2003, Sennet 2012, Fadaee and Schindler 2014). We argue that Public Administration lacks the organizational readiness, and the absorptive capacity for innovation as well as the capacity to manage participation processes with transformative character - even though Administration is the unbiased player in the city with the most stable situation and a long term interest for the wellbeing of citizens (Florida et al. 2013). Although citizen engagement and the employment of mobilization techniques became a precondition for funding, the new role of the administrative apparatus was rarely addressed in these process. It remains unclear how the selection process for individual citizen players and long term commitment of citizens could be organized in a sustainable, transparent, interconnected process of institutional interaction and decision making directed to policy implementation. We hypothesize that policy implementation is facilitated by polity and possible, if there is room for self- reflection and systematic intake of system knowledge on the individual level. Governance of sustainability relies on adequate rules, political values and daily routines and the organization of decision making - in line with administrative law. There must be a renewed discussion of the Weberian bureaucratic model in the transformation mode and a renewed attention to administration sciences in the educational and academic sector (Seibel 2018). In an interdisciplinary approach we discuss the role of system sciences Vester (2001, 2012); Schwanninger (2006), Göllinger (2012, Gebhardt (2015) Mieg and Töpfer (2011), Umpleby (2012) for the renewal of public administration in the socio-political context of smart cities.

Our study is based on the theoretical ground work of Francis Fuyukama (2012) for the discussion of the
political science perspective and on the influence of rigid institutions for democracy. We consider the contributions of Renate Mayntz (1997) and her attempt to define the critical interface of policy and administration when managing new tasks. Further, we rely on Stefan Kulmann (2001) who initiated a debate on policy impact in the light of evolutionary and neo-institutionalist economics. In a comparative analysis based on empirical evidence of European cities we discuss why smart and systemic actions and innovative policies go astray in traditional institutional frameworks and what polity, rules, routines and knowledge support participation in a sustainable way.

Our analysis exemplifies that cities cannot cope with the complexity of multi-level governance in a prevailing Weberian bureaucratic model and on the grounds of Public Administration Law. We resume that it is the rigid structure of administration and the dramatic shortage of qualified and talented personnel in the public sector that hampers citizen driven, grassroots development and systemic intervention rather than to facilitate it. We offer an alternative governance model that employs system sciences to discuss a renewed role of public administration and public management education (especially in terms of data management). Consortia is funded by BMBF, FONA 2019 - 2022 Consortia Members: Science and Academia: Institute of Human Factors and Technology Management IAT at the University of Stuttgart HafenCity University Hamburg City Partners: City Administration and Climate Control Centers in German Cities Halle (Saale) and Mannheim Practice Partners: Drees & Sommer, Malik Institute.
Theme 5:

Gender and Indigenous Equity and Equality in Science, Technology and Innovation
Technology, Racial Inequality and Innovation Debate in the United States

Category: 5.Gender and Indigenous Equity and Equality in Science; Technology and Innovation
Presentation: Oral

Cheryl Leggon (Georgia Tech), Willie Pearson, Jr. (Georgia Tech)

A number of scholars, especially economists, assert that productivity growth depends largely on the knowledge-intensive sectors of the economy. Typically, the argument is that success will increasingly require skilled workers to invent and use the new technologies. Additionally, expertise will be required in innovation, management and marketing. However, some scholars warn that the United States (U.S.) does not have the skilled workers necessary to capitalize on the shift to non-production activities. Several governmental and corporate reports pointed to the fact that American students’ mathematics and science achievement lag behind their peers in other industrialized countries (Chatterji, 2018). While there is a growing body of scholarly literature on inequality, technology and innovation, there is limited attention to vulnerable populations, especially low-income populations and racial and ethnic minorities in urban centers. These populations are overrepresented in high-poverty, underperforming primary and secondary schools with limited access to high-quality mathematics and science courses. These conditions significantly limit these students’ readiness to pursue mathematics, science and engineering majors in college. The confluence of the educational disadvantages and discriminatory practices does not bode well for changing the demographic composition of U. S. future inventors.

This paper focuses on the neglect of these vulnerable populations in the conversations on the intersection of technology and innovation in the U.S. The primary methodology involves creating a meta-analysis of relevant literatures covering the period from 2000 to the present. The goal is to identify conceptual boundaries of the issue, the types of available evidence, and to identify any research gaps. While most of the review involves published studies, some reports from the government, non-governmental organizations (NGOs) and various private sector organizations will be examined.

Theme 6:

Topics Related to the Triple Helix
Collaborations to Develop and Deliver Frugal Innovations Addressing Critical Health Challenges: Case Studies from Medical Devices Sector in South Africa

Category: 6. Topics Related to the Triple Helix
Presentation: Oral

Sanghamitra Chakravarty (International Institute of Social Studies, Erasmus University)

Frugal innovation understood as affordable products and solutions for value conscious consumers in resource constraint setting, has drawn enormous attention from various quarters in the last decade. The idea of “doing more with less for more people” as one road towards realizing the Sustainable Development Goals has created much excitement in policy circles. Multinational Corporations have raced to offer stripped down versions of their products to the large untapped African market, many times under the umbrella of “creative capitalism” and “inclusive business”. There is a growing interest from all kinds of firms to offer frugal innovations to the African market. On one hand this interest is motivated by the perception of an untapped market potential and on the other hand there are unmet basic needs essential to development which frugal innovation promises to satisfy. The overall objective of this study is to understand how this interest can translate into long term social and economic development. To do so we must have a clear picture of the innovations they offer, characteristics of firms engaged, their organizational dynamics, and their interactions with key local actors. The process/mechanism by which these innovations are developed and brought to the consumer greatly determines whether, how and who will truly benefit, or in other words the mechanisms by which local economies will appropriate value. The impact will depend on the role that African firms and consumers play in the creation, production, adaptation and distribution of frugal innovations. This participation is related to the capability of local African firms or MNC subsidiaries and interlinkages between key actors of the national innovation system – mainly the industry, academia and government. The article is guided by the following research question: To what extent do firms in South Africa participate in the conceptualisation, development, manufacturing and delivery of innovations to the local market?

Using data from the medical devices sector in South Africa, my methodological approach involves a case study analysis of three firms, products and solutions they offer and the environment in which they operate. The research design rests on the argument that, if frugal innovation is to be positioned as an enabler of development, it needs to converge these two dimensions of development: the humanistic side of capability development by serving essential needs to the price conscious consumer thereby enhancing capability at the individual level; as well as the production side of development by building capability in local firms. The approach is guided by a conceptual framework informed by extant literature and theories on firm capability (technological, organizational and embeddedness) and; innovation and technology systems. Essentially, the local firm (subsidiary in the case of MNC) is assumed to be at the core of the analysis. The local firm is embedded in the host environment with various kinds of domestic and international relationships. In the case of a subsidiary it has a close relationship with the MNC headquarters in another (advanced or emerging) country. Data collection techniques include document analysis, semi structured interviews and an innovation survey. The Innovation survey is developed by adapting the CIS of Oslo Manual to the research context. Additional questions which the research addresses include: who are the key players...
providing innovations critical to development in South Africa – is it MNCs as commonly understood, or local firms who are embedded deeply into the local system? Or rather, is it a collaboration of actors? How does the innovation process and local engagement differ based on the characteristics of actors? And in what ways are policies and programmes enabling or hindering local engagement and overall developmental impact? Fieldwork was carried out in South Africa 2018 and 2019 over several weeks in two phases.

Preliminary findings from the fieldwork reveal that while there are several South African firms in the medical devices sector with advanced innovation capabilities and state of the art technologies, they do not yet have strong market presence or carry out local manufacturing. Many firms are start-ups, with strong linkages with universities, however, scaling up and reaching a mature enough stage to contribute to local economic growth may take time. The research contributes to a micro level understanding of innovation at firm level in the medical devices sector in South Africa, the relationships between the various actors of the innovation system and how they influence the development of the sector and its contribution to economic growth. The main limitation of the study is the extrapolation of the case studies to represent trends at the sector level or that to other African countries.
Triple Helix, Multiple Helix and Triple Helix Twins

Category: 6. Topics Related to the Triple Helix
Presentation: Oral

Chunyan Zhou (International Triple Helix Institute)

Purpose:
Economic growth must be balance with sustainable development. In other words, sustainability is becoming more important. The Yang Triple Helix for Economic Growth has been explored, since it was initiated by Henry Etzkowitz and Loet Leydesdorff. In the tradition of the triple helix study, there has been Quadruple Helix, idea proposed and also a Triple Helix Twins idea (Etzkowitz and Zhou, 2005). Is there a four helix? Can the triple helix twins explain the conception of the Quadruple Helix? Why and how? This project clarifies the confusion between the two opinions.

Design/Methodology/Approach:
We will start from understand the existing research on multiple helix such as “quadruple helix” (Carayannis and Campbell, 2009) and “quintuple helix” (Carayannis et al., 2012), as well as "triple helix twins"(Etzkowitz and Zhou, 2006; Zhou and Etzkowitz, 2006); then compare them with the triple helix conception to get findings; in the end focus on the dynamic making of innovation and entrepreneurship to clarify these studies’ meanings and impacts in practice. The contents may include: The Quadruple Helix The Quintuple Helix The Triple Helix Twins Yang Triple Helix for Economic Growth Yin Triple Helix for Sustainability Coupling the triple Helix Economic Growth and Sustainability.

Findings:
The triple helix doesn’t emphasize “system of innovation”, but rather “dynamic of innovation”. European researches refer to innovation system since Freeman (1986), which influences and limits the coming exploration. In the multiple helix, actors such as the Public are added to make a better innovation system. This obviously confuses the concept of the triple helix and the innovation system. The triple helix twins can help explain the phenomenon that both goals for economic growth and sustainability of the development co-exist in the social system. It is likened to two wheels of the development: growth and sustainability. In practice, the triple helix can contribute to the both wheels. Put differently, it is not necessary to have multiple helix in the triple helix. References Elias G. Carayannis and David F.J. Campbell (2009) in "Mode 3’ and ‘Quadruple Helix’: toward a 21st century fractal innovation ecosystem. Carayannis et al., The Quintuple Helix innovation model: global warming as a challenge and driver for innovation, Journal of Innovation and Entrepreneurship, 2012, 1-2. Etzkowitz, H. and C. Zhou (2006), Triple Helix Twins: Innovation and Sustainability, Science and Public Policy. Vol.33, No.1, pp.77-83 Zhou, C. and H. Etzkowitz (2006), Triple Helix Twins: Innovation and Sustainability (Expanded Version in Chinese), Journal of North-eastern University, 2006 (3)
Developing an Inter-regional Innovation Collaboration, the Role and ‘Anti-Role’ Of Proximity: The eDIGIREGION Story

Category: 6. Topics Related to the Triple Helix
Presentation: Oral

Mandy Lalrindiki (Centre for Enterprise Development and Regional Economy (CEDRE), Waterford Institute of Technology), Dr. Valerie Brett (Centre for Enterprise Development and Regional Economy (CEDRE), Waterford Institute of Technology), Prof. Bill O'Gorman (Centre for Enterprise Development and Regional Economy (CEDRE), Waterford Institute of Technology)

While most innovation collaboration projects consist of partners who are located at close proximity and within organisational and cognitive boundaries (Dettmann, von Proff and Brenner, 2015), recent literature has explored the development of an innovation collaboration without spatial proximity. Although the systematic interaction between knowledge producer and knowledge exploitation sub-systems in regional innovation systems stresses the advantage of geographical proximity, the perception of spatial proximity as a competitive advantage raises the question of the possibility of creating inter-regional innovation collaboration with regions and institutions that are at a distance.

To address this question, this research studies collaboration among 15 triple helix institutions from four European regions with non-contiguous borders. Hence, this paper presents a practical approach to developing inter-regional innovation collaboration by exploring a research in action ‘eDIGIREGION’ project and establishes how institutions in regional institutional frameworks interact with each other at inter-regional level. In an inter-regional collaboration, the advantages that cross-border regions have regarding geographical proximity are non-existent when it comes to collaborating from a distance. Geographical proximity has been regarded as advantageous for inter-organisational collaboration and innovation (Storper, 1997; Lawson and Lorenz, 1999; Howells, 2002) as the possibilities of face-to-face interactions decreases coordination costs and facilitates the transfer of tacit knowledge. However, in inter-regional collaboration, transfer of tacit knowledge is often considered not to be possible from a distance. The local character and the perception of region as a locus of innovation has been emphasised in the innovation processes perceiving spatial proximity as a competitive advantage. Accordingly, certain studies (Katz, 1994; Gertler, 2003; Storper and Venables, 2004; Pan, Kaski and Fortunato, 2012) have provided evidence of the advantages of being close to one another and that geographical distance can be an impediment to collaboration. However, these studies raise the question of the possibility of collaborating at a distance. Nevertheless, collaboration across borders is often confined to a limited number of issues and it differs greatly in size, competences, finance and commitment (Klatt and Herrmann, 2011). While cross-border areas are believed to bring together firms, people and knowledge generation institutions that are in geographic proximity, albeit with an international border in between (OECD, 2013), Van den Broek and Smulders (2014) stated that the nation state border itself can act as a barrier to cross-border learning by hindering interaction between actors on both sides of the border. These barriers to cross-border collaboration can also be expected on an inter-regional collaboration, especially with the absence of geographical proximity. In order to tackle this, the current research also looked at substituting geographical
proximity to that of a non-spatial one. The institutional aspect is prominent in defining a regional innovation system as these institutional infrastructures support innovation within the region (Asheim and Gertler, 2005); therefore, the current research investigates the actors, specifically in triple helix institutions (government, academia and industry). The different institutional settings of academia versus industry versus government actors can be a hurdle for interactions (Etzkowitz and Leydesdorff, 2000), especially when regions collaborate with different institutions across borders. The relevant norms and beliefs alter as well as the rules and regulations under which they interact. Therefore, this research explored different forms of proximity that could hinder the inter-regional collaboration. Accordingly, Four (4) European regions that collaborated at an inter-regional level were chosen as a medium to answer explore the inter-regional innovation collaboration. The regions are, Bucharest-Ilfov, Romania, Castilla-La Mancha, Spain, Central Hungary, Hungary and South East Ireland, Ireland. These four regions collaborated on a European Commission funded project called eDIGIREGION.

The research employed a multiphase mixed methods research design which entailed desk research (analysis of the four regions), a three time-point longitudinal survey (n=83), interviews with the collaborative group (CG) (n=17), and a detailed review of 573 emails. The regional profiles of the four regions highlighted each region’s settings and their capabilities in order to better understand how their frameworks influence collaboration at an inter-regional level. The longitudinal data was collected at three (3) time-points using the Wilders Collaboration Factors Inventory (WCFI) tool. This tool was developed and validated by the Wilder Research Centre which identified 20 factors that influence successful collaborations. All factors have been tested in multiple studies and are deemed generalisable by the researchers (Mattessich, Murray-Close and Monsey, 2001). Accordingly, the Wilder Research Centre created a questionnaire designed to address the 20 factors with 40 Likert-scale style questions that investigate the details of organisations’ actions related to collaboration and partnership.

Overall, the findings from WCFI suggest that the institutions in different regions identify different favourable conditions at different points in time. At the start of their collaboration process, the members of the consortium believed that they had general public support regarding their collaborative group in their respective regions. However, it was shown that there are differences in perception between regions and indicate that there was statistically significant difference between South East Ireland and Castilla-La Mancha. This suggests that even though the CG as a group believed that they had the support for their CG objectives from policy makers and general public, there was a difference in this perception among the collaborating regions. Furthermore, the findings indicate that the inter-regional CG was working from the beginning and continued to collaborate effectively, despite their differences, throughout the collaborative process. Additionally, interviews were conducted with seventeen eDIGIREGION partners which included the coordinator (n=1), the regional leads (n=4) in each region and the triple helix (TH) representatives were chosen at random from the represented institutions in the consortium (n=12). All the informants participated in the longitudinal survey (WCFI) which was conducted throughout the inter-regional collaboration process. The interview process allowed for greater understanding of the workings of the collaborative group (CG) at the inter-regional level and the identification of what makes the inter-regional collaboration (IRC) work from a distance. The findings uncovered that distance did not have a negative impact on the collaboration and that it is common among European projects to collaborate with regions that are not necessarily close to each other and are non-contiguous in nature. It was also found that distance did not impact the collaboration because of the type of collaboration the CG was in. The soft (policy) research involved in the collaboration did not require constant face-to-face interaction while other types of collaboration that need constant face-to-face interaction and transfer of tacit knowledge could be impacted by the distance between the regions. The analysis uncovered differences such as culture, both organisational and work culture. However, these differences did not hinder the collaboration as the informants felt it was a good opportunity to learn from each other and share knowledge not only regarding the project but the workings of each other’s region. Even though the interview questions addressed the frequency of the communication among the partners, from the coordinator and the regional lead partners, additional analysis was conducted through Network
Sociogram by using the email data (n=573), which was collected throughout the collaborative process. The findings are consistent with the interview data, which suggests that there was open and frequent communication among the CG. Additionally, the differences in the systems of government was highlighted which impacts their policy making for the region. Most informants stated that engaging their regional government was challenging. Even though the triple helix collaboration in the four regions is not ideal, it is developing and by collaborating at an inter-regional level allowed them to learn from the other regions.

Overall, the research suggested that even though there were many challenges and regional institutional frameworks are not ideal, the inter-regional collaboration worked because of the three critical dimensions, namely, leadership and good management (organisational proximity), the relationships (social proximity) which existed among the CG partners, especially the informal relationships and their openness to learn and share knowledge with each other (cognitive proximity). Based on the findings, the current research has major contributions to both theory and practice. Firstly, the notion that geographical proximity is advantageous for research and innovation activities and could be an impediment for interactions if it does not exist is addressed. The findings of this research suggest that the inter-regional CG established an interaction and collaboration that works effectively over a distance and across non-contiguous borders. Secondly, the research identified the three non-spatial forms of proximity (social, cognitive and organisational) that are key determinants for developing successful inter-regional innovation collaboration. Thereby, the research suggests that the substitution mechanism of geographical proximity is not with only one non-spatial form of proximity but with all three non-spatial forms of proximities. Another major contribution of this research is the uniqueness of the study’s method, especially the longitudinal aspect, employed to determine changes in perceptions of CG members over time. And finally, this study presents a novel and unique framework for inter-regional innovation collaboration, which can be applied to regions and institutions that want to collaborate from a distance and across non-contiguous borders.
Innovation Collaboration Mechanisms Enabling Innovation Performance in a Triple Helix Regional Innovation Ecosystem: Evidence from South Africa

Category: 6. Topics Related to the Triple Helix
Presentation: Oral

Yasser Buchana (Human Sciences Research Council)

Geographic proximity and knowledge spillovers have been identified in the innovation literature as key factors that facilitate knowledge diffusion between academia and industry. When local knowledge producers (e.g. universities) collaborate with local business firms for innovation, their interactions have often been known to improve economic growth of the region, promote resilient innovative capabilities through knowledge spillovers, which ultimately feeds back to foster stronger regional systems of innovations. Previous studies have shown how collaboration between academia, government and industry support and promote innovation. In particular, regional ecosystems of innovations have been identified over the last few years as important locations of innovation and competitiveness. However, in a developing countries context, collaboration between academia and industry still lag behind in terms of knowledge diffusion, synergies and innovation performance compared to developed countries.

Therefore, using the Triple Helix model as an analytical framework, this paper explores the significant features of Triple Helix interactions termed in this study as "innovation collaboration mechanisms", which are defined based on the systems theory as a set of individual entities or actors, relationships and functions that enable or accelerate innovation performance (specifically) in regional innovation ecosystems. The study develops an econometric model that relates sources of information and co-operation for innovation activities as well as absorptive capacity to innovation performance while taking into consideration appropriate control variables. The developed model is tested using a data set of innovation performing firms in South Africa to identify the significant innovation collaboration mechanisms that accelerate innovation in a regional ecosystem of innovation. The study contributes to literature on the Triple Helix system model of innovation and regional systems of innovations.
Status Quo of the South African Clothing Industry’s University-Industry-Government Research and Development Collaborations

Category: 6. Topics Related to the Triple Helix
Presentation: Oral

Sipho Mbatha (University of Pretoria), Anne Mastame-Mason (Tshwane University of Technology),
Owen Seda (Tshwane University of Technology)

Purpose:
The South African clothing industry is among industries viewed as strategic for socio-economic development by the South African government. The South African government’s industrial policies incorporated University-Industry-Government (UIG) Research and Development (R&D) collaborations in efforts to achieve among others, the United Nation’s Sustainable Development Goals (SDGs) 2030 and African Union’s Agenda (AU) 2063. Literature on UIG R&D collaborations from the context of developing economies and the clothing industry is limited and requires attention in order to support the achievement of the above goals. This manuscript emerges out of a larger doctoral study registered at Tshwane University of Technology, South Africa. This manuscript presents the status quo of the South African clothing industry using qualitative and quantitative data.

Methodology:
Triangulated methodology was employed in the manuscript to gain experiences from institutional sphere practitioners at executive management, Heads of Departments and lead researcher levels. The manuscript population included universities with fashion design education programmes, clothing related research institutions, consulting firms in the clothing industry, clothing firms, and government divisions responsible for the clothing industry, R&D policy as well as innovation and technology. The purposive sample was utilised to select three university fashion design education programmes, one clothing firm, one clothing association, two clothing consulting firms, two clothing related research institutions, and three clothing related government divisions. The manuscript received valid surveys from twenty two clothing firms out of thirty four clothing firms that responded to the survey. Thematic analysis was employed for qualitative data in order to unearth experiences of participants about UIG R&D collaborations in the clothing industry. The themes used to analyse the data were sourced from the literature on the role of institutional spheres and the characteristics of the etatistic, laissez-faire, and integrated models. Due to the low response rate on quantitative data, descriptive statistics were employed to analyse the data into graphs.

Findings:
The findings shows that the South African government plays a dominant though distant role in these collaborations through R&D grants and incentives due to the lack of R&D funding in the South African clothing industry. Other institutional sphere perform their R&D activities in isolation while pockets of R&D bilateral collaborations take place at arm’s length. In light of this, the results indicate that the South African clothing industry is currently at the laissez-faire stage. The findings show that the UIG R&D collaborations in the South African clothing industry has the following challenges; lack of transformation, black economic
policy, strong boundaries between institutional sphere, and conflicting R&D priorities between institutional spheres. The findings indicate the following opportunities for UIG R&D collaborations in the South African clothing industry; increase in industry relevant research findings, consolidation of R&D funding between institutional spheres, increasing competitive advantage for the clothing industry, development of spin-off industries and inclusion of all institutional spheres in existing clothing related clusters.

Research Limitations:
The manuscript did not interview academic staff in sampled university fashion design education programmes and only relied on the departmental heads for data. Other clothing related educational programmes like consumer sciences, and stand-alone clothing production education programmes were not sampled in the study. Quantitative data achieved only twenty two valid respondents resulting in data analysis limitations in using advance statistical analysis methods. Other government related departments dealing with science and technology were not included in the sample. Sampled research institutions were firmly linked to universities as a result could not be viewed as stand-alone research institutions thus limiting possibilities of Quadruple Helix emerging from the findings. Despite these limitations, the quality of the data is viewed as credible and valid to present the status quo of South African clothing industry UIG R&D collaborations given the fact that the data was sourced from executive directors, heads of departments and lead researchers within the institutional spheres of the South African clothing industry.

Practical and/or Socio-Economic Implications:
The manuscripts provides practitioners within institutional spheres with the state of South African clothing industry UIG R&D collaborations in order each institutional sphere to constructively assess their role and make the necessary changes as per the recommendations presented in the manuscript. The manuscript demonstrates how the South African clothing industry UIG R&D collaborations could better aid the achievement of SDGs and AU agenda 2063 goals. Lastly, the manuscript’s findings presents gaps that could be filled by other clothing related disciplines thus increasing the multiple effect of this study.

Originality:
This manuscript add to the limited body of knowledge about UIG R&D collaborations in the clothing industry from the South African context. As part of a larger study, this manuscripts contributes to the body of knowledge around strategies to improve the competitiveness of the South African clothing industry. Lastly, this manuscript presented new knowledge regarding possible platforms that the South African government can use to improve its chances to achieve the SDGs and the AU Agenda 2063 goals using the clothing industry.
Research and Policy Agenda for Transformative Change in Africa

Category: 6. Topics Related to the Triple Helix
Presentation: Oral

Dr Chux Daniels (SPRU, University of Sussex)

Innovation, including science and technology (S&T), is for transformation. The emphasis for transformations in Africa across sectors, systems and societies continue to be expressed in various continental policies, strategies, and frameworks. These frameworks include the Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024), the Continental Education Strategy for Africa (CESA), and Africa’s Agenda 2063 (the Africa we want), which has transformation as the central theme. This desire for transformation is in line with the UN’s SDGs, which focus on transforming our world. Across Africa’s Regional Economic Commissions (RECs) and national contexts, we observe similar aspirations for transformative change. These aspirations, as articulated by RECs and national governments, aim to deploy the power of innovation, S&T, and public policies in bringing socio-economic development that is both inclusive and sustainable, and does not exacerbate, for example, inequality and exclusion. In the era of, for example, the Fourth Industrial Revolution (4IR), SDGs, growing inequality and exclusion, and pressing energy and environmental challenges; the need for transformation has never been greater. Yet, designing research and innovation programmes and projects to support transformation; or the formulation, implementation, evaluation and governance of policies, continue to pose major challenges in Africa.

In this paper, I outline the research and policy agenda to underpin transformative change in Africa. I argue that in order to achieve the objectives articulated in the SDGs in Africa, as reflected in the continents’ regional national development plans and policies, priority areas of research and innovation will need to identified and operationalised. In operationalising these key research and innovation areas, the approaches, for instance, to capabilities development and capacity-building, research design and management, and actor configurations, will have be to be reimagined. Relatedly, in the policy ecosystem, the formulation, implementation, evaluation and governance of science, technology, and innovation (STI) policies in Africa will need to be significantly strengthened, in order to support the transformative change agenda. For these, new governance structures and configurations may be necessary to reflect the new demands, challenges, evolving stakeholder landscape, and the need to address the issues around the directionality of research, innovation and STI policy.
Towards Promoting Private R&D Investment in Kuwait

Category: 6. Topics Related to the Triple Helix
Presentation: Oral

May Asfour (Kuwait Institute for Scientific Research), Husam Arman (Kuwait Institute for Scientific Research), Neil Lee (London School of Economics and Political Science), Simona Iammarino (London School of Economics and Political Science), Sulayman Al-Qudsi (Kuwait Institute for Scientific Research)

Innovation does not just rely on the firms, other critical factors and actors, as part of the wider ecosystem, are crucial for knowledge generation and innovation (Nelson, 1993; Lundvall, 2007). The presence of active actors (i.e. relevant organizations and institutions) in the national innovation system (NIS) is important, but not enough for innovation. A dynamic and progressive interaction among these actors is critical success factor (Etzkowitz, 2007). The demand side in Kuwait which is represented by the firms proved to be innovative (large firms in particular), but the innovation activities in general, as per Oslo Manual (Mortensen and Bloch, 2005), are modest and incremental (KISR, 2017a). This can be explained by the weak R&D activities among the firms that were interviewed as part of the recent Community Innovation Survey (CIS) which showed that only 37 out of 400 firms are engaged in R&D activities. The large firms, which are the powerhouse in terms of investment in Kuwait, are not engaged and integrated effectively in the ecosystem due to the lack of a national science, technology, and innovation (STI) policy and the limited incentives for industry to innovate (KISR, 2017b). It seems they are comfortable with current system where they contribute to Kuwait Foundation for Advancement of Science (KFAS) to support R&D activities without active involvement in the innovation process itself. Therefore, incentivizing the collaboration is urgently needed, and not just among industries themselves but with the research and academic institutes. The supply side on the other hand, represented by few research institutes and universities led mainly by Kuwait Institute for Scientific Research (KISR) and Kuwait University, continue to create the knowledge generation base for the national innovation system. However, these institutes are still focusing on the research on the expense of development activities and commercialization, although both organizations have made some progress in the last few years in this aspect. In the absence of a national body to facilitate, and possibly direct, innovation similar to other countries (e.g. National Innovation Council), KFAS has been trying to improve collaboration and to facilitate industry-driven R&D programs. However, the major initiatives are still directed towards sponsoring research activities that are driven by the interest of research institutes and hence the result is usually science/technology-push which struggle to find applications in the industry that is already skeptical of the research outputs of these organizations. The Government showed interest to leap frog through innovation-driven development strategy, but this has not been reflected in the rolling Kuwait national development plans. Hence, there is a lack of explicit and aligned innovation policy which clarifies the role of innovation in the economic diversification vision of Kuwait. The Government’s intervention regarding to innovation has been through supporting the supply side by providing generous budgets to public research and academic organizations in addition to engaging large firms to fund KFAS. With the absence of national technology programs with clear incentives, the mega projects and SMEs development have not been geared towards innovation and there is a lack of cluster programs and strategic partnerships. Although, education is being reformed, but it will take time to show the fruits of providing the right skills that the industry require, especially if the reform does not include the higher education, and if it is education for innovation. Important
positive interventions by the government include the plan to establish joint innovation infrastructures through science and technology parks and smart cities. Moreover, ongoing effort to improve the business environment and support services has showed encouraging progress according to Ease of Doing Business (EDB) index of the World Bank, and such a progress gives impetus to continue implementing economic reform program in this endeavor.

The principal objective of this paper is to identify the enabling factors and barriers to private R&D investment in Kuwait and develop policy recommendations to help increase investment. The methodology consists of three linked phases. Firstly, a thorough literature review has been conducted, with the aim of establishing the framework conditions behind successful R&D activity and situating the Kuwaiti economy in this utilizing an early stakeholder engagement. Secondly, investigate the main helpers and barriers to R&D, innovation and growth amongst Kuwaiti firms using focused survey targeting large firms in addition to the available secondary firm-level data from the recent CIS. In these two phases, the identified issues will be considered in phase three, which would consist of a series of semi-structured interviews with key stakeholders in Kuwait including major firms. These activities will help developing evidence-based policy recommendations that are aligned with Kuwait’s vision and aspiration. The initial stakeholder engagement showed that the Government has not been able to promote private sector to engage in R&D activities, and its intervention has only been through supporting the supply side with limited industry-driven R&D activities. The focused survey on large firms is being conducted at the time of writing this abstract is to investigate the obstacles facing private sector to innovate in Kuwait.

Exploring University- Industry- Government (UIG) Research and Development (R&D) Collaborations in Heis Design Programmes of South Africa

Category: 6. Topics Related to the Triple Helix
Presentation: Oral

Sipho Mbatha (University of Pretoria), Sinqobile Sihlobo (University of Pretoria)

Purpose:
The Triple Helix (TH) on University-Industry-Government (UIG) indicates that relevant new knowledge is produced through Research and Development (R&D) collaborations improving socio-economic development a country. In these UIG collaborations, R&D activities are largely performed by the academia in universities. In line with the third mission of universities (economic development), Academia in universities are expected to form part of various UIG R&D collaborations in pursuit of their traditional and new mission. Literature on UIG R&D collaborations that is focusing on academia is predominately from the global north context then the global South. This starves Africa of relevant new knowledge to apply as Africa attempts to achieve the United Nation’s Sustainable Development Goals (SDGs) 2030 and African Union’s Agenda (AU) 2063. As part of a larger honours degree study project, the manuscript seeks to explore and describe UIG R&D collaborations that academia in South African HEIs with clothing related programmes engage in through the Triple Helix (TH) framework. In this manuscript, South African HEIs with clothing related programmes are defined as HEIs with the following degree and diploma programmes; Fashion, Consumer Science, Textiles and Clothing Management. Kruss & Visser (2017) advise that industry and government need to understand university collaboration in order to improve their UIG collaborations, generation of new knowledge and transfer of new knowledge to industry.

Methodology:
The study employed explorative study using quantitative methods to explore and describe UIG R&D collaborations that academia in South African HEIs with clothing related programmes engage in. The population of the study included Traditional Universities, Comprehensive Universities, and Universities of Technology clothing related programmes. Participants of the study were purposively sampled using the total sampling methods due to the small number of the population (around 150) found in the above mentioned South African HEIs with clothing related programmes. Ethical approval was sourced from the research ethics committee of the hosting HEI. Further ethical clearances sourced from the participating HEIs’ research ethics related committees as per the recommendation of the research ethics committee of the hosting HEI. Data collection was conducted through an online questionnaire developed using Qualtrics. The questionnaire development was adapted from Kruss and Visser (2017) scale in line with the TH framework. The online questionnaire was designed to explore forms of UIG R&D collaborations, collaborations with government levels, collaborations between academia and clothing related organisations as well as collaborations with clothing related firms from the perspective of academia. To explore and describe forms of UIG R&D collaborations, the manuscript looked at whether the following collaborations exist; • Contract research • Joint research and publication • Joint supervision • Incubation • Research park / Technology transfer centers • Studying Masters / M-Tech within a research collaboration project • Studying PhD / D-Tech within
a research collaboration project. To explore if academia has R&D collaborations with government, the manuscript looked at the existence of R&D collaborations with government focusing on the following levels; local, provincial and national. The manuscript further explored R&D collaborations between academia and the following clothing related organisations; • Council for Scientific and Industrial Research (CSIR), • Department of Trade and Industry (DTI), • Cape Clothing and Textiles Cluster (CCTC), • KwaZulu-Natal Textiles and Clothing Cluster (KZNCTC), • Exotic Leather Cluster • Other Lastly, the manuscript looked at collaborations between academia and clothing related firms which were grouped as followed; • Full clothing manufacturing firm • Cut-Make-Trim (CMT) manufacturing firm • Small Micro Medium Enterprises (SMMEs) clothing manufacturing firm • Retail Groups • Textiles Industry • Exotic Leather industry Respondents were given the following answer options to select from; Never, In the last 3 years and More than 3 years ago. After permission was granted by the HEIs research ethics committees and the heads of departments, the online questionnaire link was emailed to all academic staff in the South African HEIs with clothing related programmes. Descriptive statistics were employed to analyse data and present results in tables and graphs.

Findings:
The manuscript found that 79% of academia from South African HEIs with clothing related programmes have never been involved in the above mentioned forms of UIG R&D collaborations. Over two thirds (76%) of academia from South African HEIs with clothing related programmes have never been involved in UIG R&D collaborations with the stated government levels. Findings of the study indicated that 83% of academia from South African HEIs with clothing related programmes have never been involved in UIG R&D collaborations with other clothing related organisations. Lastly, the manuscript found that 77% of academia from South African HEIs with clothing related programmes have never been involved in UIG R&D collaborations with clothing related firms. In view of the above, one can conclude that the surveyed academia from South African HEIs with clothing related programmes have less interest in UIG R&D collaborations. The manuscript concludes that the ability of academia from South African HEIs with clothing related programmes to produce “relevant” new knowledge may be limited due to low levels of UIG R&D collaborations. The likelihood of academia from South African HEIs with clothing related programmes producing graduates with “relevant skills” for a changing world may also be negatively impacted. Research Limitations - While the study sampled the entire population due to its size, the response rate was at 16% of the population. Due to the questionnaire being designed in a closed ended manner, respondents could not explain why they are not involved in all the explored UIG R&D collaborations. The study relied on the experiences of academia in South African HEIs with clothing related programmes. As a result, the research directorates of concerned HEIs and clothing related government departments were not sampled for this study. Other clothing related organisations were not sampled for this study. In light of the above limitations, the researchers argue that the study yielded valid empirical findings for the study to draw conclusions on UIG R&D collaborations from the perspective of academia in South African HEIs with clothing related programmes.

Practical and/or socio-economic implications:
The findings of the study should sound a warning call for HEIs with clothing related programmes if academia in South African HEIs with clothing related programmes are to contribute to the achievement of the United Nation’s Sustainable Development Goals (SDGs) 2030 and African Union’s Agenda (AU) 2063. It is recommended that HEIs with clothing related programmes should educated academia in clothing related programmes about the benefits of UIG R&D collaborations and their roles in this regards in order to realise the SDGs and AU agenda. The manuscript presents inter-university R&D collaborations between Traditional Universities, Comprehensive Universities and Universities of Technology to collaborate in strengthening UIG collaborations within academia in South African HEIs with clothing related programmes. Originality - This manuscript contributes new knowledge to the limited global south literature about UIG R&D collaborations from the perspective of academia in clothing related programmes. As part of the larger honours study project, the manuscript add new knowledge to the limited South African literature on UIG R&D collaborations as South Africa strives to be a knowledge economy.
The University-Industry-Government Relations for Economic Revitalization: The Case of Mobicaxias (Brazil)

Category: 6. Topics Related to the Triple Helix
Presentation: Oral

PEDRO GILBERTO ALOISE (University of Caxias do Sul and MobiCaxias), Rogerio Rodrigues (University of Caxias do Sul and MobiCaxias)

This paper aims to present the efforts made by the business, academic and governmental institutions of the city of Caxias do Sul (Brazil) for the recovery of the economic activities of the city, after a period of deep recession and loss of investments and competitiveness. As a case study, the information was systematized based on documentary analysis and interviews. The study aims to present a practical situation of using the concepts of Leydesdorff and Etzkowitz’ Triple Helix (TH) in southern Brazil. TH's participants are representatives of companies and business class entities (industry), the University of Caxias do Sul (academia) and Municipal Secretariat of Economic Development, Job and Employment.

In practical terms, a strategic action plan for 2040 established a focus on three priority areas or Thematic Chambers: Infrastructure and Logistics, Attractiveness of Investments and Tourism. This case study also describes the performance of each component of the local TH, as well as the steps that are being developed in each Thematic Chamber. MobiCaxias has been an important initiative of social actors in favor of economic growth in Caxias do Sul. The movement was an initiative of local leaders committed to the community, acting in a cooperative and voluntary way, without party ideologies, individual beliefs and isolated interests. The model has proved successful and has attracted interest from other cities and regions, to be applied in their local realities.

This case presents a practical application of Triple Helix demonstrating its applicability in different contexts and positive practical results when institutions are involved and committed to local development.
Innovation and policy learning: Insights from the Agriculture Innovation System in Rwanda

Category: 6. Topics Related to the Triple Helix
Presentation: Oral

Parfait YONGABO (University of Rwanda & Lund University), Devrim Göktepe-Hultén (Lund University)

Agriculture development in response to the societal demand has been one of the core priorities for most developing countries that consider agriculture as a potential socio-economic sector. Development actors prioritize the application of skills and technologies for agriculture development as an important pragmatic action. This has attracted the attention to research and innovation in the agriculture sector. More systemic and strategic approaches were realized as important for ensuring the success and impact of research and innovation in the agriculture sector. This builds on public policies, actors’ behavior and engagement, resources allocation and institutional setting. To understand the construction of such system in a specific context needs to scrutinize the planning and policy-making process as a point of departure in positioning research and innovation in the system, considering both normative and operational perspectives.

This paper does the same for the Rwandan agriculture innovation system. It explores how the agriculture policies and development plan prioritize research and innovation and ensure the matching with the real societal problems as a mean for constructing the Rwandan agriculture Innovation System that can enhance the performance of the Rwandan agriculture sector. Stakeholders’ interviews and policy/plan documents were used as sources of data for exploring different patterns in the Rwandan agriculture system. Empirical evidence show that policies and plans explicitly express the will for promoting research and innovation in the Rwandan agriculture sector and efforts to develop innovations are being invested. This is observed through the institutional setting, policy frameworks, capacity building and resources allocation. However, future plans need to consider the enhancement of stakeholders’ engagement and the matching between expectations and resources allocation.
Understanding How Innovation Is Defined In The Informal Sector Using A Participatory Research Methodology.

**Category:** 6. Topics Related to the Triple Helix  
**Presentation:** Poster

Xolisa Tania Magawana (Human Sciences Research Council), Dr. Il-haam Peterson (Human Sciences Research Council)

**Introduction:**  
Interest in innovation informal settings such as township and rural areas is growing. This is evident in the increasing volume of studies conducted, particularly in Africa and the global South (e.g. Arza and van Zwanenberg, 2014; Cozzens and Sutz, 2014). However, much more empirical research is needed to understand exactly how innovation in informal settings differs from formal settings. An important question that arises is, are our definitions suitable for both formal and informal settings? We argue that, an important first step to addressing this question is to understand how people in these settings define innovation. This paper discusses research undertaken in the Western Cape region of South Africa, where participatory methods were used to understand how people in a township setting defines and understands innovation. The informal sector in South Africa is a significant source of employment and provides more secure livelihoods, and poverty reduction for those poor neighborhoods households. In terms of GDP, it’s estimated to contribute 6% and about 17% of employment that informal sector provides to those unemployed households in poor communities. In the National Development Plan, this sector is projected to generate almost 2 million jobs by 2030. Therefore, it is important to understand how informal businesses grow. Innovation is crucial in this regard.

**Methodology:**  
This research undertook a participatory methodology that included an interactive stakeholder workshop with a range of actors, a Digital Storytelling workshop, and a Photovoice workshop with informal traders around Philippi in the Western Cape, South Africa. We first held an interactive stakeholder workshop that brought together 40 people representing local universities, national and local government, NGOs and community-based organisations. The digital storytelling workshop involved 7 informal traders in Philippi. Digital storytelling is a qualitative that was developed in the mid-90s at the Centre for Digital Storytelling in San Francisco. This methodology involves a process of intensive workshops that usually last for a week, during which participants develop a personal narrative that is about three minutes long. This narrative is then recorded and the final product is a short film, which has been produced and edited by the narrator. The guiding question for the digital storytelling workshop was: Tell me a true story of time that you did something different in your business and what happened. The second workshop was a Photovoice workshop that involved 10 participants, some were informal business owners, other NGO founders, community activists and community members. This participatory methodology first formally articulated by Caroline Wang and Mary Anne Burris (1997), provides a process by which people can “identify, represent, and enhance their community through a specific photographic technique” (p.369). With this methodology, the research participants use a camera and associated physical and theoretical infrastructure to individual community
members. These individuals were prompted to capture visual representations of their everyday lives and their interpretation of innovation in their community. These individual images helped the participants to better engage in critical dialogue around the research topic. The guiding topics focused on how the participants viewed innovation in their setting, drawing on one of the digital stories produced through the digital storytelling workshop, and on how they learn.

**Results:**
The outputs of the workshops included a set of video clips and photographs that provide insight into the participants’ own definitions and experiences. At the start of the workshops, the participants showed a limited understanding of innovation and most did not think that they were innovative or that much innovation took place in township areas. Through the workshop discussions, the researchers and participants came to a shared understanding of innovation as a collective process that is locally driven with the benefits accruing to the community or social network of local (and external actors) rather than an individual or individual business. As one participant stated, “two heads are better than one”, that is working together yields better results and innovation than working in silos. The participants highlighted the importance of local procurement and supporting other informal businesses and organizations to participate in local value chains that typically included formal and informal actors. They defined local procurement as buying from each other, as well as sharing resources and information with each other. They link one local company with another, thus creating a local value-chain within the local system.

**Significance:**
This research draws on a novel methodology for researching innovation informal settings that is not typically used in innovation studies. It presents a narrative on innovation in a township setting that was derived through a participatory, bottom-up process, as well as insights in different forms innovation and learning taking place and how informal businesses facilitate the development of local value chains. Key words: Innovation, informal settings, participatory research methodology, value chains.
The Effect of Online Travel Agencies (OTA) On Brand Relationships in Low and High-End Hotel Groups

**Category:** 6. Topics Related to the Triple Helix  
**Presentation:** Poster

Abigail Chivandi (University of the Witwatersrand), Caelyn Alessandra Widnes Stegmann (University of the Witwatersrand), Olorunjuwon Samuel (University of the Witwatersrand), Mammo Muchie (Tshwane University of Technology)

The purported study explored Online Travel Agencies (OTA) influence on consumers brand relationships towards hotels and provided convenient and easy purchase decisions for South African Millennial consumers who travel or intend to travel. Empirical and theoretical investigation in low and high-end hotel groups was executed, explored the research problem aimed at filling the gap. The internet has changed the tourism industry and the behavior of travellers by providing a source of distribution and communication that bridged the gap among consumers and suppliers. Prior to the internet the hotel industry was reliant on travel intermediates, such as travel agents, to circulate marketing material and to ensure purchases were made by consumers. The internet allows travel suppliers to reach customers directly without having to rely on intermediaries (Amaro & Duarte, 2015). In the 10 years millennials (Generation Y) will be a significant customer segments for hotels worldwide, thus, it is important for marketers to create relationships (Bilgihan, 2016) Online and mobile booking can be completed through an intermediary such as Online Travel Agencies (OTA). OTA’s are convenient and easy by providing an array of transactions, including flights and hotel bookings. Allowing consumers to asses’ functional benefits and psychological benefits and that may drive brand loyalty (Ozturk, et al., 2016; Yeh, et al., 2016). An online intermediaries’ role such as an OTA is to find suppliers and potential consumers. Furthermore, to determine the prices of the product or service, establishing the terms of transactions, keep record of payments and transactions as well as provide lists of availability of goods and services (Yang, et al., 2015). However, the developments in information and communication technology that allowed for the development of OTA’s has changed consumer behaviour, impacting customer’s brand loyalty (Cantallops & Salvi, 2014). With the emergence of online and mobile booking, e-loyalty is increasingly important for hotel brands (Ozturk, et al., 2016). Millennials use e-commerce and m-commerce and have a growing spending power. This generation are more aware and inquisitive than previous generations, (San & Yazdanifard, 2014). Customer value theory states that value perception is the fundamental to brand loyalty as consumers remain loyal if they notice more value from a brand (Yeh, et al., 2016). Yeh, et al (2016) stated that the factors of brand loyalty are functional value, emotional value, and social value as grounded on consumer value theory. However, value can elicit brand loyalty this can be understood in terms of functional value, emotional value and social value (Yeh, et al., 2016). Whereby, functional value creates consumers’ preference and loyalty to the brand (Yeh, et al., 2016). Emotional value when perceived higher, consumers have brand loyalty evidently seen in repurchase intentions, will to pay, and positive word-of-mouth (Yeh, et al., 2016). Social value when perceived as higher, consumers show greater brand loyalty behaviours of disseminating positive information and accepting premium prices (Yeh, et al., 2016). Furthermore, Yeh, et al (2016) found that value motivates consumers to purchase repeatedly where consumer purchase decisions are made on product evaluations. Whereby perceived value is the customer’s valuations on quality and price of products and services post-purchase.
as well as the advantage gained from the product and brand (Ercis, et al., 2012). Pre-purchase information is whether the product or service meets customer’s functional needs and is affected by product factors, customer’s factors as well as situational factors (Kotler & Keller, 2012; Schiffman & L.Wisenblit, 2015 in Chivandi, 2018). Hospitality enterprises are using numerous online distribution channels to foster online purchasing and for visibility in increasing awareness and interest (Stangl, et al., 2016). Stangl, et al, (2016) found that how those traditional channels (i.e., telephone, fax, letters and walk-ins) still play a dominant role in terms of distributing hotel room; however, OTAs who have a strong position as a booking channel. OTAs have a global reach that can build on economies of scope and scale, aggregate products, offer deals in multiple languages and provide a convenient shopping for all travel one site. On average hoteliers use 3.61 OTAs Interestingly (Stangl, et al., 2016). Internet has transformed the way of business (Stangl, et al., 2016). Whereby tourists are more demanding, more informed and educated as well as more aware of the diversity of choices available to them (Stangl, et al., 2016). Crnojevac, et al (2010) found that due to online booking consumers are more sophisticated as online booking have made consumers increasingly powerful and more so able determine the elements of tourist products. Study established that customers of tourism have become increasingly difficult to satisfy (Crnojevac, et al., 2010) and has led to the growth of online distribution (Stangl, et al., 2016). Key reasons for internet’s advancement as a reservations channel is the internet’s dependability channel for intangible goods, customers presume items online to be sold and less expensive, allowing for fast price assessments and reduced search charges and customers can get in direct communication with the seller (Stangl, et al., 2016). (OTAs) came about in the 1990’s. OTAs are third-party companies that sell products from multiple suppliers. OTAs place a disadvantage on hotels by compelling hotels to sell a great number of their inventory using intermediaries, sold frequently at discounted prices (Stangl, et al., 2016). OTAs create economies of scope, gather products and reduce costs for cost effective solutions in providing deals that are superior to the deals on hotels own websites (Stangl, et al., 2016). OTAs use data mining to adapt direct mail and loyalty programmes. There are many difficulties for hoteliers as OTAs can generate customer value and provide ease in information search and booking (Stangl, et al., 2016). Hoteliers are losing control over their products and brands because of their reliance on OTAs (Stangl, et al., 2016). OTAs hinder a hotel from nurturing a relationship with a customer by making price, location, photos and reviews as of greater significance than the hotel brand for potential guests. The online price transparency of OTAs has caused price competition and reduced guest loyalty. However, Independent hotels are more so dependent on an OTA for brand awareness to attract guests (Logt, 2017). Thus, it is important that hoteliers assess their relationships in distribution networks to ensure that they get exposure to the market and exploit the share of the total value obtained from being part of a network (Stangl, et al., 2016). The booking process varied according to the type of travel, where guests did not book on the internet for a business trip or group tour. Whereas guests booked on the internet when staying for a conference or for holiday (Caruana, 2002).Generational cohorts share life experiences which cause them to develop similar attitudes and beliefs. Shared life experiences and social context trigger each generational cohort to develop different beliefs, expectations and views regarding their lives and consequently different behaviours which results in cohorts developing their own distinct characteristics (Bilgihan, 2016).

Materials and Methods:
This study made use of a quantitative research technique that generally involved the collection of primary data from a target population in Gauteng. This was done for the purpose of capturing the wider population of millennials. Quantitative research was conducted using a self-administered questionnaire to collect data. The questionnaire design allowed the determination of the Confirmatory Factor Analysis indices, Chi-Square/degree of freedom, Comparative Fit Analysis and the Incremental Index of Fit. A cross-sectional study was conducted due to time limitations which restricted the use of longitudinal studies. In this study the sample frame are persons in CBD- Braamfontein Johannesburg who are seeking to travel or who are active travellers, who own a smart mobile devise or own a PC to conduct online and mobile bookings through an OTA and have a focus on the millennial population. Results The overall finding implies a positive relationship between hotel brand loyalty and repurchase intentions. However, consumer may be attitudinal loyal and may need marketing incentives to ensure that the consumer become behaviorally loyal to ensure visitation

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to the hotel brand. However BI does not stand alone since it was the moderating variable SB&BT were the most variable with higher relationship on BI implying that brand satisfaction AND Brand trust in low and high-end hotel groups sector plays a crucial role and there is need for them to have strategies that are in tandem with the prevailing technological economic situations. This indicates that elements of customer value, brand satisfaction, customer trust are precursor of brand loyalty that can be determined through brand reuse intentions. Marketing Contributions - provide valuable practical implications for marketers to develop better customer retention strategies and provides a contribution to the marketing environment on hotelier’s behaviors by determining that most persons that books accommodation at hotels use OTAs with many respondents using Air BnB. Allowing marketers to understand the consumer behavior of consumer and competition to the hotel segment.
Promotion of Carbon Footprint Development Mechanism; a Case Study of the Osu Night Market.

Category: 6. Topics Related to the Triple Helix
Presentation: Poster

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Energy, one of the fundamentals for economic growth is also one of the fundamental sources of pollutions, through its by-products, as gases emissions; namely particulate matter (PM 2.5 and 10). The General Assembly, in September 2015, adopted the 2030 Agenda for Sustainable Development that includes 17 Sustainable Development Goals (SDGs), building on the principle of “leaving no one behind”. The new Agenda emphasizes a holistic approach to achieving sustainable development for all the 17 sustainable development goals (SDGs) to transform our world. In addition, the United Nations Framework for Convention on Climate Change encourages in the reduction of Green House gases (GHG) emissions by 5.2% below 1990 of which Kyoto protocol is linked. In the Paris Climate Change Conference of November 2015 in the 21st session of the Conference of the Parties (COP 21) reached a historic agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future. Essential elements of the agreements include long-term temperature goal, global peaking of greenhouse gas emissions, mitigation through nationally determined contributions (NDC), creating sinks and reservoirs etc.

OSU night market on Lokko Street, is an old popular market at Klottey Korle constitution of Accra. OSU is a suburb of Accra in which the market is situated. In this market activities normally starts at 3pm and climax around 9pm and ends completely around 2am. During this period mainly, foods are sold to people from all corner of Ghana. Most travellers, mostly drivers and official from government establishment troop there to buy food for the evening. The delicacy or tasty nature of the attract people to the market. Food cooked and sold in the market are mainly, kenkey, rice, kelewele, fried yam, fufu, porridge. Fish and meat like pork are also smoked and sold in the market to go with some of the food sold. It is the cooking and smoking with inefficient cookstove and smoking ovens in the market that causes the air pollution during trading activities. First a survey cookstoves and smoking oven and positions for taking air pollution samples. Air pollution levels were measured before and after interventions, and levels of carbon footprint recorded. New cookstoves and fish smoking oven were installed and huge chimneys to direct the smoke away into the atmosphere. After the intervention the average PM2.5 reduced from 1821.625 ug/m3 to 494.75ug/m3 and that of Carbon monoxide reduced from 12.96ppm to 2.575ppm. Keywords: Carbon footprint, Osu night market, particulate matter, clean cook-stoves, biomass fuel, Clean Development Mechanism (CDM).
Theme 7:

Education as an Evolutionary Practice

Category 7: Education as an Evolutionary Practice
Presentation: Oral

Mario Landman (Da Vinci Institute)

In 1994, a team of researchers led by Michael Gibbons published The New Production of Knowledge – a manifesto on a revolutionary and evolutionary approach to knowledge production and dissemination during the third industrial revolution. This approach was simply referred to as Mode 2. It has been 25 years since the principles espoused in the above publication were accepted and widely applied. However, it is now the appropriate time to question whether the Mode 2 approach can still adequately address the needs of contemporary society for new knowledge and technologically-driven innovation.

This paper seeks to critically review and evaluate the relevance of Mode 2 as a modality to drive knowledge production and innovation in contemporary society, through interrogation of competing modalities that promote collaboration between academia, government, industry and civil society, who are the primary contributors to and beneficiaries of, education, research and innovation. Through the convergence of academia and industry at the dawn of the information age, the multi-dimensional knowledge production and innovation system of Mode 2 represented a ground-breaking departure from the restrictions of the then prevalent modality. The homogenous discipline-based approach to knowledge production classified as Mode 1, contrasted sharply from the Mode 2 approach, which is founded on the principles of contextual application, transdisciplinarity, heterogeneity, social accountability and enhanced quality control. In addition, Mode 2 operates within the context of real-world application, in that knowledge and innovation are not positioned within the parameters of a particular discipline-based theoretical framework, but situated within the broader context of a meta-disciplinary application. It should be understood, however, that Mode 2 was not created in response to a changing world in which technological advancements such as increased access to the internet, enabled a cross-pollination, convergence, melting, intersecting and repositioning of academic disciplines. It was rather observed as a naturally occurring phenomenon exhibiting a series of traits or characteristics which was collectively identified as Mode 2. This is a critical distinction, as it implies that Mode 2 was not purposefully created, it was an observed organic response to the climate of the early 1990s. With this in mind, we need to ask whether Mode 2 is still the most appropriate response to knowledge generation and innovation in the present climate. In attempting to answer the above question, we begin by looking at changes that have occurred in the global economy over the last 25 years. While resource scarcity and competitiveness have always been prevalent, their severity has increased exponentially in recent years. Where sustained access to natural resources once provided companies with a competitive advantage, a strong investment in science and technology is now considered as the only means through which companies can remain relevant. However, this paper will argue that the aforementioned strategy in itself cannot secure sustainable solutions to present-day challenges, since the commercialization of technologies does not occur in an environment that enables entrepreneurship, public-private partnerships (particularly between governments, universities, and industries), education evolution, policy reform, civic involvement and broader societal impact. At face value, it may seem that Mode 2 may no longer be able to optimally respond to a
climate that not only looks outside academic disciplines for answers, but also outside the restrictions of conventional relationships between established and emerging stakeholders. While a Mode 3 approach has been observed and identified, this paper will argue that developing economies, such as that of South Africa, has not cultivated an economic climate that would allow for this modality to flourish. It will also be argued that the full potential of the Mode 2 modality has not yet been (fully) realised and that it may still be the ideal means through which knowledge may be generated and disseminated, given the current socio-economic climate and present state of education evolution.

The primary research methodology applied in the preparation of this paper is desktop or secondary research, during which the prevailing literature and documents related to the themes and constructs alluded to in this paper will be analysed for purposes of presenting a critical review of knowledge generation and innovation systems in the 21st Century.
Agile Teaching for the 21st Century: Developing Collaboration, Creativity and Critical Thinking Competencies in Higher Education

Category 7: Education as an Evolutionary Practice
Presentation: Oral

Heather Goode (Da Vinci Institute)

The current business and education environment is shaped by the currents of the fourth industrial revolution, and characterised by volatility, uncertainty, complexity and ambiguity. Within this context, employees that are advanced to management or seek to develop their personal leadership often explore formal learning through higher education institutions as a means of attaining the requisite qualifications. These students come to a business school with prior expertise, success and competencies. Higher education teachers, therefore, employ the principles of Adult Learning (Knowles, Holton and Swanson 2005; Knowles, 1970) in order to engage students who come from such unique professional contexts and who have various learning objectives. A staggered profile of prior knowledge of business management and related competencies are often evident in such students. In addressing their learning requirements within the current and future working environments, several frameworks propose competencies or skills needed by graduates, employees, and especially leaders, for the current and future working environments. These frameworks repeatedly include collaboration, creativity and critical thinking as well as the ability to continue learning in a dynamic workplace context. Similarly, the World Economic Forum’s Future of Jobs Report (2016) finds that both critical thinking, creative thinking, and interpersonal skills are integral to future employability and emerging jobs. Assuming the purpose of higher education is to enable learning, develop competencies and contribute to theory and knowledge creation, how should we approach teaching to engage and empower our students and their educators? Laura Freberg (Top Hat, 2019) comments that learning and mastery are iterative and require feedback. In the context of a business school, teaching cannot simply rely on one-way lecturing but needs to draw on student-centred collaborative and co-operative approaches. This positions learning within an applied competency approach as a means of developing higher cognitive competencies through utilising experience linked with theoretical underpinnings, and encouraging critical reflection for metacognition and feedback. The recent National Framework for Enhancing Academics as University Teachers (DHET, 2018) described ‘good teaching’ as “respond(ing) to its context; builds on students’ knowledge and experience; respects, actively engages and is accessible to and appropriate for the students enrolled; and helps them to develop their understanding of the discipline and their discipline-related skills and ways of thinking”. ‘Good teaching’ is thus integral to students’ learning and success.

This paper explores Agile Teaching as an approach to improve learning within higher education for adults as a contribution to the field of the Scholarship of Teaching and Learning (SoTL). This approach can personalise learning and draw on the staggered profile of students, as an asset-based approach (Du Toit, 2009), where students’ experience and prior knowledge are resources for collaboration in cooperating with the learning process. Furthermore, the paper argues that a student-centred, active learning process to achieve graduate attributes, programme outcomes and student objectives requires higher education teachers to adopt a responsive agile approach.
The growth in project activity and a rise in project failures emphasises project management as a discipline in which employee perceptions, knowledge, decision-making and communication play a central role in the execution of projects (Azzopardi, 2015; Davis, 2016 & Kerzner, 2013). Although the management quality of projects is critical to the success of an organisation, many projects are still troubled by the risk of failure (Jonas, Kock & Gemünden, 2013). A significant factor contributing to the failure of projects is that project environments have rapidly become more complex and uncertain. The discussion above highlights the probability that there is a relationship between complexity, competency and project failure, including uncertainty and risk within the context of projects. This is even more apparent when these projects affect not only one facet of society but have far reaching consequences for government, industry and those that are developing the skills base in the country.

The motivation for this research was derived from the researcher’s experiences working in project risk management at Eskom. Eskom is a South African parastatal that is the dominant electricity generator and supplier in Africa. It was found at Eskom that the conventional project management processes aggravate the risk of incompetence when dealing with complex projects where uncertainty and risk are perceived to be higher. Eskom has failed to meet many of its electricity supply objectives, due to various reasons including, the departure of managers with technical and professional competency, the loss and slow transfer of skills, and difficulty in filling job vacancies to strengthen Eskom. Eskom was established with the goal to supply energy to meet national demand. Massive expansions caused Eskom to confront the reality of persistent challenges in delivering on their mandate. Fundamental to the challenges were a shortage of skills, the lack of expertise in project management, constant interference by government in pushing political agendas, and flawed contracting policies between Eskom and its suppliers (Koopman, 2011). Research has shown that the competency and maturity levels in Eskom are still low (Meny-Gilbert, 2013; Khalema, Van Waveren & Chan, 2015) including risk management in the project environment (Ernst & Young, 2013). Eskom management’s ‘one-size-fits-all’ approach to competency development does not consider the fact that projects have different complexities when competencies for project risk management are developed (Archibald, 2004). During the late 1960s to the early 1990s, Eskom was considered world class in power station construction and contract management as skills and resources were abundantly available in the country (Etzinger, 2013a). The oversupply of electricity in this period (Heun, et al., 2010) led to an underinvestment in the energy sector (Flanagan, 2012). The discrepancy in investment affected Eskom between the early 1990s to 2005 during which time this government entity lost most of the skills and resources to other companies and industrial sectors, both nationally and internationally, thus causing a tension between two of the pillars of the triple helix model namely government and industry. It became apparent that there was a national scarcity of required specialist skills, including vital skills in project
management to support Eskom’s mega projects (Flannagan, 2012), which are large-scale, complex ventures. To this end, the Da Vinci Institute for Technology Management (a private higher education institution) partnered with Eskom and industry as a synergy between academia, government and industry to conduct this research. This was done to probe the skills based issues, conducting research that could be practically applied by Eskom to service various industries effectively. This work is a strong example of the Triple Helix model being applied - given that the research is currently being implemented within the Eskom project management environment. Eskom, like all major electricity utilities, has a vital role to play in the welfare of the country (Karanfil & Li, 2014). Industries require full, uninterrupted access to electricity to grow, thereby leading to the creation of jobs, poverty alleviation and social upliftment (Calldo, 2008). By ensuring a stable energy infrastructure proficient of meeting the demand, Eskom plays a critical and strategic role in providing the conditions to encourage positive direct foreign investment into the South African economy. Eskom’s undertaking of a huge build programme required them to rapidly escalate skills development and this presented the ideal environment within which to conduct research on project risk management. Therefore, the focus of this research is on competency development in the project management environment. The research problem was to investigate whether there is an existence of a relationship between complexity, maturity and competency in project risk management, and determine whether such a relationship affects the performance of projects. The research culminated in a competency framework specific to project risk management as a precursor to project risk management career pathing. Out of this research, practical direction is being provided to Eskom on competency development within the project management space.

An interpretive and subjective research philosophy was adopted for this research, using inductive reasoning and a qualitative research approach to probe the literature. The researcher applied field research with participative action research for the interviews and a qualitative survey to collect data and verify the findings of the literature review. A semi-structured questionnaire was used for in-depth interviews with Eskom senior managers. Stratified sampling was used for the collection of data from 207 Eskom project risk management practitioners. They were invited to respond to the web-based survey comprising a questionnaire with multiple-choice questions on project and project risk management. Further, a checklist of possible project risk management incompetencies was emailed to project management experts in Eskom and national and international project management associations for their input. Thematic content analysis was applied as the qualitative method of analysis to create an analytical narrative about the present project and project risk management situation in Eskom. Some research and practical limitations included the maturation and obsolescence of data as time elapsed since the initiation of the research and the slow or lack of response from the participants. The researcher had to depend on the goodwill of the participants who were spread across the country making accessibility and response rate challenging. However, the limitations are overridden by the value of the research.

The research findings indicated that project complexity is driven by the interaction of management, systems and the product delivered. All projects have some level of complexity and Eskom should acknowledge differing complexities. Competency development includes the development of technical, contextual and behavioural competencies. Most importantly, there is a notable relationship between complexity, maturity and competency in the project environment. These findings led to the creation of a sense-making framework in which the relationships between the research elements, their sub-elements and project risk management were combined to indicate how such relationships could lead to the successful execution of projects. The practical and social implications that the research outcome holds for Eskom is more mature risk management functions. The knowledge contained in this research could ensure better skilled risk management practitioners. The increased ability to execute complex projects by Eskom staff would ensure higher levels of project success. The result will be more efficient use of project funding, an enhanced project execution reputation and an increased access to funding for Eskom. A more structured career pathing process through the application of the competency framework could encourage higher levels of staff motivation and retention.
The significance of the research to society could result in a more reliable and stable electricity supply that not only serves industry but also attracts investments into the economy. There would be more efficient use of the fiscus through better managed projects and less wastage of resources. However, the major social innovation is that this pioneers a competency framework that applies specifically to the practical application of competencies needed for supporting the development of risk management practitioners in the low-complex and high-complex project environments. The low-complex project environments must be used as an incubation area to develop the required competencies because it is a less stressful area with lower uncertainties. Eskom should instil a project risk management culture to ensure maturity of the organisation and sensitivity to the varying levels of complexity in projects. Eskom, has subsequently initiated the development of a competency framework for project managers in the organisation. The researcher is a fundamental part of this initiative and provides guidance on how the framework should be developed and implemented. Although the research concentrated specifically on the development of project risk practitioners, the innovative principles ensconced in the research are being applied to a much wider project management environment. The return on investment for this research impacts not only the Triple Helix role players, such as, the impact on industry and those education institutions developing skills as discussed above but is also recognised for its applied contribution to Eskom. Further, the return on investment is a global contribution to the risk management body of knowledge, nationally the delivery of a more reliable and stable electricity supply whilst at the same time encouraging higher investment into the country. For project risk practitioners, there is now a defined career path which encourages elevated levels of competency.
TIPS™ Managerial Leadership Framework: A Conceptual and Practical Implementation Framework to Work-Based Challenges

Category 7: Education as an Evolutionary Practice
Presentation: Oral

Marla Koonin (The Da Vinci Institute), Prof Benjamin Anderson (The Da Vinci Institute)

There has been a shift globally to move from an industrial market economy to a creative network economy, which according to Jarche (2013 & 2015) requires, amongst others, more independent workers with initiative, creativity, and passion. It is against this context that the researchers identified the need to revisit existing management and leadership frameworks. These frameworks were predominantly formalised from a rational (Northern hemisphere) and/or pragmatic (Western hemisphere) perspective and have not always sufficiently considered contextual aspects related to a holistic (Eastern hemisphere) and humane (Southern hemisphere) interpretation of reality (Lessem & Schaeffer, 2014). This theoretical engagement with both local and global trends, coupled with engagements with workplaces over a period of 25 years within predominantly the Southern African context, solidified the need to reflect on existing management and leadership frameworks and develop a framework that could assist leaders and managers in co-creating relevant performance solutions. The intent of the TIPS™ Managerial Leadership Framework is to provide a systemic awareness of the multiple sub-systems at play within the workplace; evoking an awareness of existing mental models and the ability to re-think and dissect assumptions about work performance. In applying this complex systemic lens, individuals are afforded an opportunity to make sense (sense making) of their own reality in relation to the conceptual frame. In doing so, the emergence of additional and/or similar managerial leadership competencies and practices affords individuals the opportunity to co-create alternative interpretations, perspectives, and/or conceptual frameworks to cooperatively navigate change and add new knowledge to the domain.

The TIPS™ Managerial Leadership Framework aims to contribute towards the overarching field of Business Leadership. The framework was developed out of a longitudinal study conducted utilising self-administered questionnaires based on 150 related metrics and semi-structured interviews. This involved a large number of organisations including emerging, small, medium and large enterprises over two Decades. It is recognised that a limitation to the study is little extant research on the topic and a lack of articulation and broad understanding of the key constructs of the management of technology, innovation and people in a systemic context. Thus, there is often a misinterpretation of what these terms mean systemically and the management of them is often related to, for example, a physical product. Moreover, there is limited literature on the management of technology, innovation and people in a systemic context, the literature available speaks instead to management without the context and in the case of this framework the context is the crux.

The findings illustrated that the management of technology, innovation and people allows for the emergence of three processes, namely, engagement, alignment and agility, as a consequence of these processes, nine Managerial Leadership competencies may emerge. A blend of these competencies are utilised to ensure engagement, alignment and agility are mobilised. Resulting from the mobilisation of the processes and related competencies, six practices should come to the fore, and as a result, there could be three...
overarching workplace realities that transpired, being either a coordinated, collaborative and/or cooperative workplace reality. These workplace realities are underpinned by the exchange of energy flow and social interaction. These practices impact the workplace realities in a layered sense, where these practices ‘appear’ in either a coordinated, collaborative or cooperative way, or a combination of them. For example, the practice of promoting experimentation could happen as part of a coordinated, collaborative and/or cooperative reality, depending on the levels of energy flow and social interaction that occur. However, if a practice is predominantly coordinating in structure, the reliance on the creator (whomever the leader is) is much more onerous from a sustainability point of view as opposed to that same role in a collaborative environment, and vastly different in a cooperative environment where all the stakeholders are involved as networked knowledge workers/artisans.

The value of, the TIPS™ Managerial Leadership Framework is the intention to facilitate and influence the crafting of agile, aligned and engaged leaders, passionate about co-creating innovative ecosystems, contributing towards socioeconomic and transformational agendas. In view of the afore mentioned framework, the institute further developed a practical implementation framework to not only operationalise the TIPS™ Managerial Leadership Framework, but also to ensure the linkages to real world situations/work-based challenges.
Statistics Education for a Developmental Economy: The Development of a Coherent Reasoning and Thinking Intervention

**Category 7: Education as an Evolutionary Practice**

**Presentation:** Oral

Dr Sophie Thandiwe Joana Mparutsa (St Johns College and Da Vinci Institute PhD Alumnus)

South Africa implemented a new curriculum in secondary schools known as Curriculum and Assessment Policy Statement (CAPS) which was examined for the first time in November 2014 (DoBE, 2011). This curriculum includes new topics in statistics and probability. The emerging importance of statistical knowledge has led to statistics being introduced into school curricula internationally. South Africa, recognising this importance, has also introduced statistics into the secondary school system. The aim of this research is to examine areas of concern in the development of statistical knowledge as students move through the secondary school education system, concentrating on grades 10 to 12. The introduction of new and unfamiliar topics in a curriculum is often accompanied by a variety of challenges. The challenges that most schools face, in South Africa and internationally, is providing teachers who can effectively teach for the development of statistical understanding, rather than merely doing some calculations. The purpose of this paper is to identify the cognitive levels of statistical knowledge that students attain as they progress through the secondary school system, and then develop a teaching framework to help teachers approach the teaching of statistics in a manner that would enhance statistical reasoning and thinking.

A mixed methods methodology was used in this research. Data was collected in two stages. The first stage involved quantitative data collection. Three written assessment instruments (one each for Grades 10, 11 and 12) were developed, checked for reliability and administered to about 400 learners. The objectives of these instruments were to establish concepts and skills that learners had successfully mastered, concepts that they had been unsuccessful in and concepts that they had failed to apply successfully. Data analysis was done and 13 students were selected for interviews, representing the second stage of data collection. The interviews provided qualitative data for the study. Deeper insight into students’ understanding and misconceptions was obtained during the interviews.

The overall findings from Grade 10 to 12 reveal that most students managed to achieve statistical knowledge at the basic level of statistical literacy. This cognitive level does not equip learners with tools to reason and think statistically. The results also revealed that learners used formulae to learn statistics, without understanding their foundation. In most cases students have achieved at this level by simply demonstrating their ability to use calculators and/or some given formula to determine statistical values. Most students have not yet successfully achieved at the level of statistical reasoning and statistical thinking. The results also indicate that students do not have a coherent and connected knowledge of statistical concepts. Students lack knowledge of the relationship between statistical concepts. The statistical skills and concepts learned are all isolated from one another. Modern technology makes calculations instant and more accurate, minimising the importance of the ability to perform manual calculations. This implies that the focus on statistical knowledge should be on reasoning and thinking. From these results, it is recommended that
statistics teaching that enhances development of reasoning and thinking needs to include the importance of context, computing, comparing, contrasting and connection between statistical concepts.

The limitations of the study were that the findings of the study could have been influenced by the cross-sectional studies approach that was applied to the study rather than longitudinal studies. A further limitation was that the choice of the participating schools could have had an influence on the results of the study. Schools were selected due to their proximity to the researcher in order to make access to the students during the school day possible for both the researcher and the students. The schools were limited to schools in the Johannesburg area. The proximity to Johannesburg could also have influenced the level of teachers’ statistical content and pedagogical knowledge. This would then have had an impact on the level of statistical knowledge attained by students. The value of this study is multi-faceted theoretically, this research can therefore contribute to theories of teaching and learning statistics. The results of the study can pinpoint the particular areas that need more attention in teaching and learning statistics. Of special note in the findings of this research is that the concepts of standard deviation, graph interpretations and grouped data are a cause for concern. The findings also indicate that students have acquired statistical concepts in isolation to each other. These results can be used to structure alternative and appropriate interventions in statistics pedagogy that would be more effective in enhancing the learning statistics to the expected cognitive levels. The value from a methodological perspective is that methodology and the research instrument of this research study could also be used by many educational institutions to assess teachers’ statistical content as well as pedagogical knowledge as they progress through the training process. Knowledge of teachers’ level of cognition can assist the specialist training personnel plan effective intervention programmes for the trainees, so that after training they are better equipped for effective teaching of statistics in their classrooms.

The practical significance is that the study provided the necessary information about the concepts that students struggle with in understanding as well as in application. The study also provided deeper insights into why students have difficulties in understanding and applying the particular concepts. Another immediate practical result of the research findings is the formulation of a teaching framework that can be used by teachers to help them plan lessons that develop understanding of statistical concepts and the required statistical cognitive levels. The findings of this study were used to design a framework consisting of five components. The 5C-PST framework was created to move statistics learning from statistics literacy to statistics reasoning and statistics thinking. The 5C-PST framework is founded on the basis that the use of these five components will provide teachers with a focus on teaching strategies that will promote understanding of statistical concepts. The framework is designed to also help inexperienced teachers understand statistics deeply and flexibly so that they, in turn, can help their students relate ideas in statistics and form cognitive maps of statistics. Moreover, the research has a further link to the Triple Helix model in that the importance of statistics education is a result of the needs in industry as recognised by the industry itself. The introduction of the new curriculum shows how government is prepared to accommodate these needs or the demands of industry and the job markets, such preparation will lead to economic growth. Adequate training of local people in the scarce areas increases marketability of local people and thus could reduce poverty.
Personal Leadership through a Framework of Holistic and Sustainable Development

**Category 7: Education as an Evolutionary Practice**

**Presentation:** Oral

**Dr Sharon King Gabrielides (Key Steps Corporate Training and Da Vinci Institute PhD Alumnus)**

This research investigated the challenge facing organisations that are sceptical about investing in the development of their human capital when they are not sure whether sustainable personal leadership development can actually be achieved. Moreover, if it can be achieved, they question what the principles of a successful intervention are, and what return on investment the individual and organisation receive. Very few South African studies have tackled this problem, and the research on holistic and sustainable personal leadership development has not been formalised. Therefore, the aim of the study was to conceptualise and create such a framework, showing the underpinning principles and describing the impact of personal leadership development on the individual and the organisation.

The qualitative inductive approach to the research was based on the phenomenological, constructivist, interpretive research philosophy. A hybrid research methodology using grounded theory and hermeneutic phenomenology was designed and used to distil the essence of the phenomenon, tell the story of the lived experience of the research participants and build the theory of holistic and sustainable personal leadership development. The study adopted a multi-step design that collected multiple forms of research data from 29 participants employed at two organisations in Gauteng, including solicited data (EQ-i2.0 and BeQ™), in-depth interviews, personal reflections, focus groups, questionnaires, field notes and literature. Data was also collected (through in-depth interviews) from six organisational and leadership development experts.

The findings revealed five meta-insights into the process of holistic and sustainable leadership development. The first was that the facilitator was at the heart of the development process, interwoven through each theme and key aspect contributing to holistic and sustainable personal leadership development. The second insight was the importance of cohort learning; the safe, supportive, sacred environment created by the group was paramount in facilitating the individual’s and group’s development. Thirdly, learners becoming vulnerable to challenge and shifting their limiting paradigms was a key part of the programme’s success and its sustainable results. Additionally, the vulnerability of the facilitator was a catalyst to the learners opening up and becoming vulnerable. The fourth meta-insight was that for development to be sustainable, the learning must be experiential, personally meaningful and transferred and integrated to the learner’s context and reality. Lastly, overwhelming evidence points to the fact that learning is a journey that takes time if it is to be holistic and sustainable, and therefore quick fix programmes will not yield the desired results. As a result of the meta-insights, a framework for holistic and sustainable leadership development was constructed. In practice, the findings provide insights, models and practical tools for organisational development (OD) practitioners, facilitators, coaches, managers and organisations responsible for developing leaders to ensure that the development is holistic and the results are sustainable. The study also offers the principles of a successful intervention and illustrates the return on investment individuals and organisations are likely to receive from interventions designed according to these principles. This insight and understanding can contribute to increased success in the field of OD, leadership development and management. In addition,
this insight can also support government academia to design interventions in ways that will develop personal leadership capacity holistically and sustainably to support increased economic and social development.