'The Role of Government / Academia / Industry in Building Innovation-Based Cities and Nations'

TRIPLE HELIX
BEST PRACTICE
SERIES

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Triple Helix Best Practice Series is an annual publication by the Triple Helix Association demonstrating evidence of successful implementation of university-industry-government programs that mobilise multistakeholder coalitions, driving alliances and cooperation agreements across the public and private sector. While different volumes may differ in content and structure, the thrust of individual articles is to capture the voice of Triple Helix practitioners building successful and goal-oriented relationships among Industry-Academia-Government, thus facilitating the transfer and exploitation of knowledge for societal and economic growth. Individual publications in this series are reporting evidence from the "best in class", who have developed and operationalized effective interaction models and mechanisms bridging across the Triple Helix actors and able to produce concrete results with impact in terms of knowledge transfer and exploitation. Among the target audience and contributors to this series are Triple Helix Practitioners, technology transfer officers, liaison officers, science parks managers and CEOs, techno poles administration, incubators, regional innovation agencies and public or semi-public innovation intermediaries, private consulting firms and innovation actors and intermediaries involved in managing Triple Helix dynamics for knowledge generation and exploitation.

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Triple helix best practices series [Online]

Volume I: The Role of Government / Academia / Industry in Building Innovation-Based Cities and Nations

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The first volume of this Series is on **The Role of Government / Academia / Industry in Building Innovation-Based Cities and Nations** and aims to present a group of cases of successful Triple Helix engagement which demonstrate the benefits and the costs of multi-stakeholder management at regional, national and international level. Articles present different sectoral and regional triple helix constellations in different country context – comparing actors, their strategic aims, and how these co-align, how they act together, and what is the tangible and intangible impact of such a triple helix mobilisation. We also present models to scale up the impact. The cases in the first volume were sourced from the applications for the **Triple Helix International Medal Award 2018**, A triple Helix Association Award, launched at the II International Triple Helix Summit, 10-13 November 2018 Dubai.

Table of Content

The Challenges of Mobilising Triple Helix Stakeholders: Introduction by the Editors

Prof. Emanuela **Todeva**, *St. Mary's University, UK, Vice-President Triple Helix Association*

The post-industrial society and economy are emerging as complex, dynamic and fragmented entity – characterized by smart specialization and fragmentation of global production, narrow core capabilities of firms, global value chains and blurred firm boundaries of cooperation and competition. Traditional commercial activities become entangled into complex networks of public and private services, public and private innovation actors, national and international stakeholders with everchanging power and influence.

Internationalisation and coordination of supply chains across national boundaries are no longer a simple firm decision, but requires complex interactions with governments, local authorities, education providers and local business institutions. These complex multi-stakeholder arrangements are unique both as historical and commercial coalitions. Their management and orchestration are charting unique trajectories of negotiations and agreements, stretching across geographic boundaries, or policy domains, such as innovation, economic growth, regional development, industrial modernisation, or community engagement and societal impact.

The complex relationships between technologies, products and services make business decisions dependent much more on government innovation policies, university engagement and multiple layers of domestic and foreign intermediation by public and private sector actors. Building Triple Helix constellations and multi-stakeholder coalitions becomes a major risk sharing mechanism for large and small firms. Triple Helix constellations at regional level become a lead mechanism to simplify business and social interactions across knowledge and technology fields that encompass stakeholders such as service providers, users and investors, decision makers and community members.

In order to understand better how to engage with stakeholders and to activate triple helix actors, there are two challenges that need to be addressed. The first is to expand our knowledge on multiple stakeholders. The stakeholder theory is almost stuck on mapping and measuring stakeholder power and influence. On the other hand, the practice of stakeholder engagement is flourishing harnessed by networks, blogs, focus groups and action groups, intermediaries, facilitators, brokers and a variety of community level communication platforms.

This volume is aiming **to present a group of cases of successful Triple Helix engagement which demonstrate the benefits and the costs of multi-stakeholder management at regional, national and international level**. We present different sectoral and regional triple helix constellations in different country context – comparing actors, their strategic aims, and how these co-align, how they act together, and what is the tangible and intangible impact of such a triple helix mobilisation. We also present models to scale up the impact.

The cases presented in this publication were sourced from the applications for the **Triple Helix International Medal Award 2018**, A triple Helix Association Award, launched at the II International Triple Helix Summit, 10-13 November 2018 Dubai.

The award invites public or private organizations who are actively involved in Triple Helix interactions and engaged in **building successful and goal-oriented relationships among Industry-Academia-Government**, thus facilitating the transfer and exploitation of knowledge for societal and economic

growth. The scope of the award is to give relevance to the "best in class", who have developed and operationalized effective interaction models and mechanisms able to produce concrete results and impact in terms of knowledge transfer and exploitation, and that could inspire the next generation of Triple Helix Practitioners. Among the applicants are Technology transfer offices, Liaison offices, Science Parks, Techno poles, Incubators, Regional innovation agencies and pubic or semi-public innovation intermediaries, Private consulting firms and innovation actors and intermediaries involved in managing Triple Helix dynamics for knowledge generation and exploitation[1]. The winner of the award was Lombardy region, represented at the award ceremony by Mr Ermanno Boccalari, and Ms Paola Peduzzi for the case "Lombardy Region Open Innovation Platform" authored by Roberto Albonetti, Paola Peduzzi, Maurizio De Bartolo and Marina Colombo [https://bit.ly/2Goim9M].

In the first section of this volume we look at four cases of scaling up impact. The first case explores Powering Synergies between Innovation Policy and Regional Development frameworks. In this case Dimitri Corpakis looks at how smart specialisation as a policy framework provides this horizontal perspective on co-alignment of Research and Innovation and Cohesion (Regional development) policies. Governments across the entire territory of the European Union are increasingly looking at how to generate synergies across policy domains through co-financing, strategic integration and intelligent choices on research, technology and innovation. Research and Innovation Strategies for Smart Specialisation (RIS3) and the accompanying action and implementation plans, emerge as key enablers for an effective coordination between government, industry and academia.

The RIS3 policy framework has enabled both bottom up and top-down strategic choices that grow into investment decisions shaping the future landscape of sectoral strengths and economic growth across the Single Market. Although the instruments of policy intervention seem to be the same – investment projects – the mechanisms of shaping the strategic focus of these projects is fundamentally changed –

[1] The **International selection committee** supporting the Award [https://bit.ly/32HfkHg] is composed of leading figures from the academia, business and investor communities as follows: Prof. Panayiotis Ketikidis, University of Sheffield, Greece; Prof. Josep Miquel Pique Huerta, La Salle Innovation Park- Ramon Llull University, Spain; Prof. Riccardo Viale, Bicocca University, Italy; Prof. Bassam Abdel-Karim Abu-Hijleh, British University in Dubai, UEA; Prof. Bilal A. Akash, American University of Ras Al Khaimah, UEA; and Prof. Geoffrey Gachino, British University in Dubai, UEA. The **selection criteria** for the Award were as follows:

- **Relevance** of the case in relation to the Triple Helix actors and the themes of the Summit.
- **Reach**: Number of stakeholders/actors that benefited from the practice/case.
- Impact (intangible): What has changed/improved for actors and the wider community as a result of the adoption of the concerned practice?
- **Impact (tangible):** What's the financial impact on the involved organizations, resulting from the adoption of the concerned practice?
- **Transferability**: Is the concerned practice transferable in other/different contexts or is it dependent and enabled by specific local/framework conditions?
- **Innovativeness**: To what extent is the proposed case/solution innovative as compared to existing efforts?

embracing the Triple Helix constituencies through an early engagement under the Entrepreneurial Discovery Process (EDP). The case provides details of the theoretical foundations for the RIS3 policy framework – by a reference to the strategic aim for developing an interregional comparative advantage and to generate scaling up, broadening the scope and accelerating the spill-overs in knowledge production and use across the European Union member states.

The expected impact is envisaged at regional level – to stimulate local stakeholders, increasing innovation capacity, trade and jobs. The envisaged intangible impact is around enabling stakeholders, the maximisation / optimisation of the regional impact of structural and investment funds and supporting the competitive selection process across the single market. In addition, the implementation of the RIS3 policy framework has already generated new administrative capacity for exercising scrutiny, evaluation, monitoring and provision of constructive feedback across stages of the strategy design and implementation process with enhanced possibility for re-adaptation of goals and means to achieve them. Corpakis acknowledges that the Triple Helix concept represents a 'triumph' of policy integration through the Smart Specialisation Strategy in action – empowering universities, government and business in their open dialogue.

The second case of the National Research Council of Italy (CNR) demonstrates how bilateralism and Multilateralism can co-exist – empowered by Triple Helix actors (Fiore, Cormio and Di Marzo). The leading actor in this case is the Université Laval, who established a Joint International Research Unit (JIRU) as a Triple Helix endeavour – co-financed by the Italian government (through CNR), strategically managed by the Université Laval in Quebec, Canada, and actively working with international innovation networks in the fields of biomolecular chemistry, micro-biome, nutrition and cardiometabolic health. This case demonstrates how Bilateralism can enhance the ability of individual actors to produce knowledge and to quickly transform such knowledge into an economic value. This case demonstrates the use of a precompetitive Network model with an open system and industry participation.

Among the tangible impact is the synergy that emerged between the partnering institutions and the innovation dynamics that this created in the open innovation ecosystem that grew around the Joint International Research Unit. Among the intangible impact of this case is cited the co-alignment of foreign policy and innovation policy, and the emerging practice of international technology transfer and the transformation of knowledge into productive capacity. Among the transferability of this practice can be cited the Instrumentarium of contracts and procedures for managing international technology transfer operations.

The third case describes the successful implementation of a national initiative in Pakistan designed to boost innovation and triple helix interactions – the Invention to Innovation Summit. This is a jointly planned initiative between the government in four provinces in Pakistan, local universities and education providers and national and international firms. The case summarises the experience from 18 Innovation Summits with over 100 participating organisations. The lead institution - Institute of Research Promotion (IRP) – has adopted the Triple Helix model as a foundation principle in designing the events and organising the activities. In addition, as an off-spring of educational entrepreneurship the IRP hosts multiple initiatives – from pure academic activities (research paper series), to knowledge transfer activities (such as the Invention to Innovation Summit since 2012), commercial activities (data management and research commercialisation), and institution building for R&D.

The IRP is quasi-independent entity that is employing the Triple helix concept to promote transformation of culture embracing innovation and entrepreneurship. The international team of authors describe details of the triple helix model adopted for this initiative. First, the organiser represent a Triple helix, which constitutes of government (Pakistan Council for Science and Technology, Pakistan Science Foundation (PSF), Ministry of Science and Technology, and Government of Pakistan), a

coalition of Universities (University of the Punjab and University of Management and Technology, Lahore – among others), sponsors and participants from industry. Second the activities during the two-day event encompass technology demonstrations, university-industry interactions, policy sessions, technology awards and other technology promotion activities bringing the helices together. Third, in specific sectors, such as gems and jewellery, participated in policy development sessions, demonstrating a synchronise triple helix approach to industry development.

The sequence of 18 consecutive events across the country have facilitated a simultaneous horizontal and vertical connectivity across the Triple Helices at a provincial and at national level. It has also generated mobility – described as 'technology tourism' – where participants from previous forums follow the event as it unfolds in new locations. The open engagement between university researchers and industry has generated a new form of a dialogue and feedback from business on future technology diffusion and upgrade opportunities.

The transferability of this initiative is achieved across all provinces in Pakistan and can easily be replicated across other developing countries. The portfolio of Summit awards has already achieved a wider national recognition, which actively promotes the Triple Helix model of engagement.

The fourth case by Kobzeva, Malakhovskaya, Pavlova and Gribov highlights the importance of the intrinsic knowledge of the Triple Helix model, enabling universities in Russia to participate in the self-assessment exercise about the role of universities in regional development. The self-assessment exercise aims to develop a workable university model with operational mechanisms how to scale up practices.

One of the key transferable outcomes from this national implementation project is the development of indicators that can measure the operational performance across different Russian regions. As a consequence, these indicators enabled the adoption of a new financing mechanism for Russian universities that includes non-budgetary sources and research funding. These were piloted with universities, highlighting the inertia in academia and the lack of proper methodology for the assessment of the third mission of the universities.

The volume contains three regional cases of Triple Helix best practice. The case on the open innovation platform in Lombardy Region contains good description of creating an open system that empowers citizen innovation bringing in the triple helix actors in a horizontal space of searching and match-making. From measuring innovation needs to measuring competences and impact – the platform serves as an open instrument – introducing actors one to another. The authors Albonetti, Peduzzi and De Bartolo describe that all three types of actors have Champions that lead the process. These Champions exhibit both committed individuals and committed institutional roles associated with resource allocation and decision-making powers. The novelty for the Triple helix constitution in Lombardy is the strong cluster on Advanced Manufacturing Systems, with the commitment of the cluster manager.

The main tangible impact evidenced with this case is the free collaborative work environment and the comprehensive repository of R&I competences in the region, developed for several critical regional actors, enabling free flow of information among innovators. The main intangible outcome is a technology enabled sharing platform integrating the competences repository with related activities, business and innovation networks, international relationships and interests in different technical and economic topics. This 'one-stop-shop' for the regional research and innovation ecosystem is seen as a milestone in the building of a culture of open innovation and university-industry collaboration.

The second territorial case describes the efforts of the Regional Government in Tomsk Oblast, Russia to develop a Triple Helix system for the support of the regional transformation into an innovation hub. Kobzeva, Gribov and Raevskaya outline an ambitious initiative of a regional authority to develop a new

coordination platform for the generation of resources to accelerate regional economic growth, for the practical implementation of the cluster approach, and for the delivery of organisational support (methods, mechanisms and new practices) for the adoption and implementation of economic decisions at regional level.

Table 1: Triple Helix Best Practice Cases

CASES	WHO LEADS THE TRIPLE HELIX	OUTCOMES FROM ENGAGEMENT
Smart Specialization - *Corpakis*	European Commission	Synergies across policy frameworks
Laval University, Joint International Research Unit (JIRU) – *Fiore, Cormio, Di Marzo*	National Research Council, Italy	International technology transfer practices and instruments
Invention to Innovation Summit – *Ullah, Shirwani, Zohra, Todeva, Altaf*	Consortium of hosting Triple Helix actors	Branded portfolio of innovation awards, improved national innovation culture, research & technology mobility
University Self-Assessment for their Role in Regions – *Kobzeva, Malakhovskaya, Pavlova, Gribov*	Ministry of Science and Education of Russia	Indicators measuring universities as drives of innovation & development and ranking
Open Innovation in Lombardy – *Albonetti, Peduzzi, De Bartolo*	Lombardy Region General Directorate for research, Innovation, university, export & internationalization supports, Italy	Technology enabled sharing platform - containing tools for knowledge sharing; integrating a comprehensive competences repository with related innovation activities, business and innovation networks, international relationships and interests in different technical and economic topics
Triple Helix system for the support of the regional transformation in Tomsk Oblast, Russia - *Kobzeva, Gribov and Raevskaya*	Tomsk Oblast regional authority in the Russian Federation and creation of a special project office 'INO Tomsk'	A new coordination project/office - based on the Triple Helix model - for the generation of resources to accelerate regional economic growth, for the practical implementation of the cluster approach, and for the delivery of organizational support (methods, mechanisms and new practices) for the adoption and implementation of economic decisions at regional level
Institute of Research Promotion (IRP), Pakistan - project comparing national and international entrepreneurial scientists - *Ullah, Zohra, Mirza, ul Haq and Altaf*	Institute of Research Promotion (IRP) as an Independent knowledge transfer organization	Entrepreneurial research strengthens both the visibility of entrepreneurial scientists themselves, and the triple helix response of industry, academia and state recognition, transforming the culture of university-industry cooperation and enhancing knowledge exploitation and wealth creation
Harvesting Rewards from Open Innovation Collaborations – *Cochrane, Mancini*	A company AgroVegetal, established by the Andalusian Federation of Agricultural Cooperatives and with support from the Andalusian Government and the European Union	Advanced portfolio of new technologies designed in implemented within the maize supply chain with major economic and societal impact on crop production
Crowdsourcing for Refining a Product Concept and Raising Awareness - *Albats, Mancini*	A small startup company driving in a crowdsourcing and mobilizing stakeholders in a crowd-science project – with the support of the European Commission, Horizon 2020 and number of incubators and accelerators	
Industry-research collaboration transforming public procurement assignments to a mutual knowledge exchange project	Archimede Solar Energy, a small start-up company spun out from an Italian industrial group	Startup Learning how to establish long-standing collaboration with large public research organizations and multinational companies to bring a complex solution to market

Source: own edition

The essence of this initiative is the creation of a mechanism for inter-departmental and inter-agency cooperation of federal ministries for the implementation of Triple Helix based initiatives. Among the intangible impact the authors refer to the link between the Triple helix model and the implementation of the cluster policies in the region. The transferability of this Triple Helix best practice is achieved as the model is spread to two other Russian legal entities - the Republic of Tatarstan and the Novosibirsk region. The authors identify three prerequisites that would guarantee the successful transferability: high concentration of PhD researchers, high concentration of innovative companies, and the existence of a consensus between the regional triple helix actors.

The regional case on entrepreneurial science in Pakistan describes well that the academic entrepreneurship knowledge is essential to all innovation actors, including scientists, project managers, university teaching and research staff. According to the authors Ullah, Zohra, Mirza, ul Haq and Altaf, entrepreneurial research undertaken as part of studying entrepreneurial scientists provides valuable insights for all triple helix actors and stakeholders, including donors and entrepreneurial scientists themselves – how successful entrepreneurship enhances knowledge exploitation and wealth creation.

The Institute of Research Promotion (IRP) in Lahore is a proud host for this research initiative and operates entirely on the principles of Triple Helix engagement. The IRP conducts research, seminars, symposiums, exhibitions of indigenous technologies, and acts as a broker in university-industry collaborations. Their project studying national and international entrepreneurial scientists has revealed that the diversity of cases delivered a stylised framework for the comparative analysis (PESE framework) and served to strengthen both the visibility of the scientists themselves, and the triple helix response of industry, academia and state recognition.

The three sectoral cases by Maria Mancini and colleagues identify the variety of stakeholders engaged in each technology field. The case of AgroVegetal - Harvesting Rewards from Open Innovation Collaborations refers to a collaborative project between the Andalusian Federation of Agricultural Cooperatives and their company AgroVegetal, the International Maize and Wheat Improvement Center (CIMMYT) in Mexico, and a grant by the European Union's Horizon 2020. Other partners and stakeholders in this project included industry for quality testing, scientists on disease resistance for crops from the Spanish National Research Council (CSIC) and public universities, and companies within the supply chain for wheat varieties.

The second sectoral case on Platoscience, from Lab to Market presents a crowd-science project which runs a community of neuroscientists, engineers, developers and creative people and exploits the expertise and resources of business incubators – aiming at Refining of Product Concepts and Raising Awareness. The project has adopted crowdsourcing for its crowd-science endeavours, combining high level technical skills and knowledge with entrepreneurial spirit, in a supportive innovation ecosystem in order to bring its disruptive solutions to market.

The third sectoral case is also a case of a business-lead Triple helix, where Archimede Solar Energy has formed an Industry-Research Collaboration and has transformed its activities from Public Procurement Assignments to a Mutual Knowledge Exchange project. The most essential learning is that the SME needed a Triple Helix umbrella – to obtain financing and to deliver its value proposition.

Activating Triple Helix Constellations – Models and Practices

This first volume of Triple Helix Best Practices has revealed that although Government-funded institutions continue to play a dominant role shaping Triple Helix constellations, there are emergent practices where universities and private sector organisations take this leadership role. The complexity of

triple helix interactions requires substantial intermediation – both in terms of financing, but also in terms of coordination (Todeva, 2013). The new model for governance of innovation and intermediation in Triple Helix interactions explains why non-governmental actors actively stir relationships between innovation actors. It is through the factors of production and the factors of innovation that knowledge actors and private sector organisations engage – to actively shape future location-driven or technology-driven coalitions. The literature on intermediation activities and practices points at five types - regulation, innovation policies, knowledge transfer channels, contract management, and relationship management - and in our first volume the assembled cases provide details for all of these. Among the most visible intermediation channels described in the cases are: strategic partnerships, events, contract research, collaborative research, collaborative platforms, coordination agencies, or specialised organisational resources supporting triple helix relationships.

The cases that focus on the triple helix in the regions provide good empirical evidence of the role of regional authorities in supporting triple helix coalitions and exercising a leadership role for value creation and value capture within the particular locations (Danson and Todeva, 2016). In addition, all cases confirm that regional triple helices need substantial inputs from the so called enablers – skills and human capital, public sector finance and private sector investment of some kind (Todeva and Danson, 2016). In terms of leadership and who should drive the Triple Helix, the cases demonstrate that all actors are capable of building coalitions and implementing collaborative strategies across the triple helix space. The stakeholder engagement for the purpose of triple helix mobilisation designs and implements innovative business models and captures skills and capabilities previously untapped (Todeva and Ketikidis, 2017b).

Finally, the tangible and intangible impact and outcomes reported in the cases, demonstrate a very rich range of value added from triple helix interactions. Among these are: Synergies across policy frameworks, International technology transfer, improved national innovation culture, research and technology mobility, co-alignment of incentives between university ranking and regional development, technology enabled sharing platform that supports business and innovation networks and international relationships, or the visibility of entrepreneurial science and technology start-up companies. All these examples of impact demonstrate effective triple helix coalitions that are able to overcome challenges such as: building regional research and innovation systems, implementation of smart specialisation strategies, diffusion of key enabling technologies, SME support, building of knowledge internationalisation partnerships, or building intra- and inter-regional cooperation networks (Todeva and Ketikidis, 2017a). The editorial team and the Triple Helix Award Committee, are looking forward to the next editions of the Triple Helix Best Practice Series.

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SCALING UP THE TRIPLE HELIX

Powering Synergies between Innovation Policy and Regional Development Frameworks: The Case of Smart Specialisation[2]

Dr. Dimitri **Corpakis**, *former European Commission senior official*

Abstract:

The case study refers to the whole territory of the European Union, addressing the question of increasing synergies between two of its critical policies with strong potential for Triple Helix interactions, namely Research and Innovation and Cohesion (Regional development) policies It is argued that through the novel approach of Smart Specialisation, introduced in the beginning of the current programming period (2014-2020), these interactions would be more focused and facilitated. Smart Specialisation, an ex-ante conditionality for the deployment of regional innovation plans to be funded through Cohesion Policy, provides the breeding ground for intelligent choices on research, technology and innovation related investments that can guide Europe's regions and countries to the path of economic growth in a more assertive way, by creating appropriate conditions for successfully connecting local business communities to Global Value Chains. Research and Innovation Strategies for Smart Specialisation, (RIS3) emerge as key enablers for an effective coordination between the two policy frameworks. To make this process a success, national and regional governments, universities and businesses (Smart Triple Helix) engage at national and local level through the so-called Entrepreneurial Discovery Process (EDP), a key step for mobilising local stakeholders towards prioritisation of knowledge-based investments and ultimately coordinating better with the top-down actions of the R&D Framework Programme. The case study addresses these issues and identifies the critical determinants for success through specific real-world examples located primarily in the European Union.

Keywords: Knowledge-Based Economies; Smart Triple Helix; Innovation and entrepreneurship; Funding strategies and priority identifications, knowledge institutions, entrepreneurial discovery process

Geographic Coverage: The entire territory of the European Union

Strategic Aims:

The problem the case study addresses is straightforward, and its resolution **can provide good guidance for similar questions to national and regional planners across the world** (i.e.: while the issue may appear 'European', **it is actually broader, since it typifies a frequent clash on policy choices, namely between favouring mostly top-down or bottom-up investment priorities on knowledge-based assets**). The long institutional process that led to the modern structure of the European Union had to come to terms with a simple question: *how to conciliate an ever-expanding Single Market which brought prosperity for many Union constituencies, but at the same time increased regional disparities.* Cohesion

[2] *Case Owners:* The National and/or Regional Governments of the European Union, including the local stakeholder Triple Helix constituents (universities, businesses, public and private research organisations, civil society)

Policy (via the European Structural and Investment Funds) strives to reduce regional inequalities in economic development through a bottom-up, participatory and partnership-oriented approach. At the same time, the Union has to advance quickly in terms of competitiveness by making the most of its scientists and innovators, through open, severe competitions (the R&D and Innovation Framework Programme). Since both policy frameworks address the issue of *economic growth,* the question then is how to engineer policy principles and design so that, the two policies contribute to a maximum to national and regional growth (while paying full respect to their fundamental principles). A possible answer stems from the fact that both policies value the Triple Helix concept that they actually use (in their own) way. Acting through a "Smart" Triple Helix concept, countries and regions can advance on this path through the concept of Smart Specialisation that is being put in place through the Entrepreneurial Discovery Process allowing a bottom-up, Triple Helix inspired, identification of the growth drivers with the potential to bring along prosperity and jobs. Large public-private partnerships focused on research and innovation use the S3 mechanisms to achieve a maximum of synergies between the two policy streams.

Case Overview and Track Record:

The concept of Smart Specialisation was born in the context of a High-Level Expert Group of the European Commission (Knowledge for Growth). Coming out from earlier work of innovation economists the concept originated out of examining the causes of the persistent productivity gap between Europe and the USA, a gap blamed primarily to fragmentation of innovation programmes and efforts in Europe and lack of capacity in exploiting better the so-called General Purpose Technologies (Foray & van Ark 2007; Barca 2009; Foray et al. 2011). The expert group then advised in a working paper to "*encourage investment in programs that will complement the country´s other productive assets to create future domestic capability and interregional comparative advantage*" (Foray, David & Hall 2009). In the run-up to the then incoming Multi-Annual Financial Framework of 2014-2020, the concept of Smart Specialisation reached unexpectedly the heights of the European Council (the Heads of State and Government). With a strong backing it found itself as an Ex-Ante Conditionality in the Regulations laid down by the Council of Ministers and the European Parliament for the new Cohesion Policy (2014-20), advocating for Smart, Sustainable and Inclusive Growth. Doing this, it marked a new ground in making a link between a renovated 'Smart' Regional Policy and the Research and Innovation Policy of the Union, energising more Triple Helix links in the process and mobilising new kinds of stakeholders for a new place-based Innovation Policy.

In their own words the experts that conceived the concept urge policy makers to set priorities in certain domains "*in order to realize the potential for scale, scope and spill-overs in knowledge production and use, as these are important drivers of productivity in the domain of R & D and other innovation-related activities*" (Foray, David & Hall 2011).

In the current programming period, more than 120 Smart Specialisation Strategies are active, focusing on Research and Innovation priorities as significant growth drivers and investment orientation choices. Increased synergies are likely to occur between the FP and Cohesion policy since several structured Triple Helix partnerships have by now used these to align strategies and implementation modalities **to foster excellence in their smart specialisation areas.**

Tangible Impact:

The introduction of Smart Specialisation in the regional innovation planning process is expected to have a significant impact on the regional innovation capacity of the communities that have adopted and are running through it and as a result it is expected that the whole process will have a strong impact on jobs

and growth. EU Cohesion policy has already been called a 'Convergence machine' for the economies of Union a long time ago: in the last two decades, Cohesion Policy contributed to prosperity in all EU regions and was a major source of investment, amounting to 8.5% of the total. The Structural Funds in combination with national and regional money managed to directly create almost 1.2 million jobs in the EU over the last 10 years as growth-supportive public investments plunged in many Member States due to the 2008 global financial crisis. Moreover, all Member States benefit from positive spill-overs generated by investments in cohesion countries as new markets are created and trade increases. Boosting innovation strategies, local competitive advantage and strengthening the innovating capacity of local SMEs by allowing better access to digital technologies (some EUR 16 Bn are devoted for developing digital services, digital skills, deploying broadband networks as well as smart energy grids) will allow almost 1.1 million small businesses achieve results through Structural Funds support. Furthermore, Cohesion Policy funds are expected to help more than **7.4 million unemployed people find a job** and concretely support over **8.9 million people gain new qualifications**.

On the other hand, stimulating participation of local stakeholders to the Framework Programme for R&D and innovation through effective synergies could have a significant impact over time: the European Commission's 2012 impact assessment for the ERA Communication estimated that the Horizon 2020 programme increased investment to meet the 3% GDP funding target and a larger proportion of cross-border research funding would together lead to an increase in annual growth equivalent to 0.25% of GDP in the 15-year period to 2030. It is clear that an important combined effect could emerge from cultivating synergies and interactions between the Framework Programme and Cohesion Policy through Smart Specialisation.

Intangible Impact:

The introduction of Smart Specialisation had a systemic impact on conceiving and delivering regional innovation plans. **The particular characteristics of establishing and running a Smart Specialisation Strategy** provide for a fertile ground for developing synergies between Cohesion policy and the Research and Innovation Framework Programme. It needs be understood that what is actually sought after here is the **maximisation / optimisation of the impact of relevant activities on Research and Innovation, irrespectively of the funding programme that underpins them.** Considering that ESIF related actions are actually broadly planned by the national or regional authorities (albeit in theory at least, through a participatory process where the private sector is normally present) but actually carried out by the regional Triple Helix stakeholders (universities, companies and sometimes non-profits) on the ground; considering also that broadly a similar pattern is followed by the Framework Programme but mostly on a transnational basis and following a centrally designed and delivered competitive selection process, it is clear from the outset that a **thematic approach can form the common starting ground for synergies.** Thus, through the S3 process, crucial choices had to be made on the orientation of investment and then on the accompanying measures that support it including on actions on R&D that normally give it an edge over competitors in the global value chains where ideally it is integrated on successful outcomes.

This fundamentally constructive role of Smart Specialisation can function as a **real accelerator for investments on research and innovation**, especially by allowing stakeholders find **transnational partners** and construct a more sophisticated endeavour, on the basis of the growth drivers / priorities that happen to coincide with some of these, found simultaneously in their RIS3 and the Framework Programme. However, t*his kind of organisation requires particular know-how in the area of priority setting.*

Most commentators agree that an efficient priority setting exercise requires careful planning but also an important degree of sophistication that accompany the policy cycle. Starting frequently with a foresight exercise that identifies and inspires policy visions, the exercise is usually deployed via a closed loop where implementation is constantly under scrutiny, evaluation and monitoring for provision of constructive feedback for possible re-adaptation of goals and means to achieve them (Clar, 2018). This exercise is crucial as much as fragile as it is open to serious fluctuations by interest groups and political bargains. Nevertheless, it is an essential part of the Entrepreneurial Discovery Process and has the potential of delivering real synergies within the policies it touches upon. In this particular case, it can link efficiently the process of the ESIF and the Framework Programme competitive participation, through a dynamic, multi-stakeholder process, that owns a lot to the concept of Triple Helix.

Transferability and Lessons Learned in Triple Helix Cooperation:

Powering synergies between EU Cohesion and Innovation policies through Smart Specialisation is a 'triumph' for the Triple Helix concept: Here's why:

- The bottom-up entrepreneurial role (the key starting point to Smart Specialisation) confirms the value for mobilising local and regional stakeholders from the knowledge and business communities, through facilitation from government authorities. This is essential for identifying and prioritising investment for future growth and jobs.
- This organised facilitation is key to the second target of Smart Specialisation which is to connect local economies to Global Value Chains. In a tormented environment of today's globalised world, identifying the key pathways and transition points to the global economy is essential. The Triple Helix provides herewith an efficient toolbox for achieving this, through its inherent capacity for structured exchanges.
- Finally, the Triple Helix adds the necessary social dimension to the economic discussion that underpins the Entrepreneurial Discovery Process: the particular nature of the TH stakeholders i.e. the knowledge institutions (universities and research centres) and the business community provides for reminding the social values that need to accompany the business process. The role of Universities as honest brokers should be stressed, particularly in this context.

For extensive evidence, information and data on the Smart Specialisation process please see the website of the European Commission's Smart Specialisation Platform.

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National Research Council of Italy (CNR) and Université Laval Example of Application of the Triple Helix Model of Bilateralism in Research Approaches [3]

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Abstract:

The Joint International Research Unit (JIRU) between the CNR and the Laval University (ULAVAL) was born in 2016 with ambitious objectives related to the development of re-search projects, innovation and knowledge transfer in the emerging field of the biomolecular study of the microbiome. The creation of this important partnership between CNR-ULAVAL has generated a new vision of international cooperation, useful to support an integrated approach that allows the development of a precompetitive Network model with an open system, involving the industrial world, the Institutions through a linear comparison (in this case Provincial and Federal), and the scientific community of the two countries. In short, Joint International Research Unit between the CNR and the Laval University is a concrete application of the Triple helix model with the difference that the players of the two countries work in a wide synergy to create a precompetitive development useful for improving the quality of the life (Dynamics across borders).

Keywords: triple helix, knowledge and technology transfer, science diplomacy

[3] *Case Owners:* a) National Research Council –Italy - The National Research Council (CNR) is the largest public research institution in Italy, the only one under the Research Ministry performing multidisciplinary activities. Founded as legal person on 18 November 1923, CNR's mission is to perform research in its own Institutes, to promote innovation and competitive-ness of the national industrial system, to promote the internationalization of the national research system, to provide technologies and solutions to emerging public and private needs, to advice Government and other public bodies, and to contribute to the qualification of human resources. In the CNR's research world, the main resource is the available knowledge which means people, with their skills, commitment and ideas. This capital com-prises more than 8.000 employees, of whom more than half are researchers and technologists. Some 4.000 young researchers are engaged in postgraduate studies and research training at CNR within the organization's top-priority areas of interest. A significant contribution also comes from research associates: re-searchers, from Universities or private firms, who take part in CNR's research activities.

b) Université Laval of Quebec – Canada - Since its founding, Université Laval has been training, equipping, and guiding the decision makers who grapple with the major issues of society. Through the advancement and sharing of knowledge, its culture of excellence, and its global outlook, our academic community contributes to the development and interna-tional profile of our province. Still today, with the world at a crossroads, Uni-versité Laval plays a bigger role than ever in Québec City and on the national and international scene, both as a catalyst for change and a visionary institution where knowledge, curiosity, and innovation are part of everyday life. A well-rounded university with 500 programs, renowned mobility and exchange programs, 5 study profiles (Sustainable Development, Entrepreneurial, Interna-tional, Honours and Research Custom), 750 partnership agreements with some 500 universities in 70 countries, a library of over 6 millions documents, over 42,500 students of which 5,600 international students.

Geographic Coverage: The Joint International Research Unit (JIRU) is a bilateral research unit between the Italian National Research Council (CNR) and the Université Laval of Quebec (Canada).

Strategic Aims and Problem Addressed by the Case:

International cooperation in the fields of scientific research and technological innovation is a strategic component of the foreign policy of the National Re-search Council (CNR). The National Research Council is geared towards stimulating cooperation through an integrated approach aiming at a comparison between research systems and the development of a pre-competitive Network model with wide involvement of the whole community Science, and the industrial world. The theme of technology transfer and, more generally, the theme of transforming knowledge into productive value, has always been the focus of re-search and innovation policies. In recent years there has been a particular development of the relations between Italy and Canada in the field of technological innovation and technology transfer, determined by the intensification of scientific collaborations.

On the other hand, by 2022 Québec aims to position itself among the 10 leaders of the Organization for Economic Cooperation and Development (OECD) and to do so, it needs to realize a real scientific diplomacy, through academic collaborations to develop joint projects and share experience and skills.

The ability to produce knowledge and, at the same time, to quickly transform such knowledge into an economic value, and thus to produce quickly a high quality innovation, even if with different intensity but with the same Management and direction of the institutions, research and the industrial world this model, represents the key to economic growth and the competitive success of a country.

Case Overview and Track Record:

Québec, the Canadian province that spends on scientific research a value equal to an OECD country ($ 1.3 billion GDP in R&D), has planned (2017-2022) a strategic five-year investment in scientific research of $ 580 mio.

By 2022, Québec aims to position itself among the 10 leaders of the Organization for Economic Cooperation and Development (OECD) and to do so, it needs to realize a real scientific diplomacy, through academic collaborations to develop joint projects and share experience and skills. With these premises the CNR and Université Laval, Quebec, Canada, signed in February 2016 an Agreement establishing a Joint International Research Unit (JIRU) lasting 7 years. The objective of the JIRU is to be a world reference in biomolecular chemistry, micro-biome, nutrition and cardiometabolic health. The Université Laval financed the JIRU activities to be carried out in Canada with an initial contribution of 2.5 million Canadian dollars for 5 years.

The ambitious objective of JIRU is the development of research projects, innovation and knowledge transfer in the emerging field of the biomolecular study of the microbiome. The creation of this important partnership between CNR-ULAVAL has generated a new vision of international cooperation, useful to support an integrated approach that allows the development of a precompetitive Network model with an open system, involving the industrial world, the Institutions through a linear comparison (in this case Provincial and Federal), and the scientific community of the two countries. In short, Joint International Research Unit between the CNR and the Laval University is a concrete application of the Triple Helix model with the difference that the players of the two countries work in a wide synergy to create a precompetitive development useful for improving the quality of the life (Dynamics across borders).

Tangible Impact:

The emergence of this important partnership between CNR-Ulaval has generated a new vision of international cooperation, useful to support an integrated approach that allows a linear comparison of the development of a pre-competitive Network model to Open system involving the industrial world, the institutions (in this case provincial and federal), and the scientific community of the two countries (Dynamics across borders process). In short, the international mixed unit between the CNR and the University of Laval is a concrete application of the Triple Helix model with the difference that the players of the two countries work in broad synergy to create a pre-competitive development useful for the improvement Quality of life as well.

Intangible Impact:

This model represents the key to a country's economic growth and competitive success. Researchers have the ability to produce knowledge and this model pro-pose at the same time, to quickly transform such knowledge into an economic value, and therefore to quickly produce a high quality innovation, even if with different intensity but with the same direction and towards the Institutions of Research and Industrial world.

International cooperation, in the fields of scientific research and technological innovation, is a strategic component of the foreign policy of the National Research Council (CNR). The National Research Council is oriented to stimulate cooperation through an integrated approach that aims at a comparison between research systems and the development of a precompetitive Network model with wide involvement of the entire scientific community, and of the industrial world. The theme of Technology Transfer and, more generally, the theme of the transformation of knowledge into productive value, has always been at the centre of research and innovation policies. In recent years there has been a particular development of relations between Italy and Canada in terms of technological innovation and technology transfer, determined by the intensification of scientific collaborations.

Transferability and Lessons Learned in Triple Helix Cooperation:

On both Italian and Canadian side of the JIRU, two Scientific Offices (experienced Project Managers have been hired for this purpose) have been established in order to identify potential sources of financing. Furthermore, they have to deal with request and proposal for scientific and industrial partnership with third parties on the basis of the guidelines adopted by the Steering Committee. They develop specific projects agreements with third parties, sources of financing or industrial partners. The Project Managers are scouting National and International financing request in order to secure long term operation.

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Promoting Triple Helix through Innovation Summit[4]

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Abstract:

Invention to Innovation Summit is jointly planned by industry, academia and government to promote innovation culture in the society of Pakistan. The summit was piloted in one province and offered now in four provinces of Pakistan. Total 18 summits are organized till mid of 2019. It is a two-day innovation plate form presents innovation ecosystem for three helixes of society to interact, exchange and collaborate.

More than 100 organizations from academia, industry and government jointly organize these summits. 1000s of technologies are presented to industry and society for feedback and adoption. Innovation stakeholders interact with each regularly and realign themselves according to each other's needs. The innovation summit presented technology sessions, technology expo, technology awards and many other interaction opportunities.

IRP has made the innovation summit sustainable and replicable for other countries too. The innovation summit is backed by IRP portal, IRP commercialization services and IP management.

Keywords: Triple helix; Innovation summit; University-industry-Government (UIG) links; Pakistan

Geographic Coverage: Pakistan

[4] *Case Owners:* Institute of Research Promotion (IRP) www.irp.edu.pk has been established to provide services in research related activities to promote quality research culture in the universities and corporate sector of Pakistan. IRP is a non- profit organization working under the leadership of academics and industrialists. IRP has academicians, researchers, scholars, corporate consultants and institutes/organizations associated of international repute, and in various disciplines. IRP is helping researchers of universities and managers of industry to sit together and meet today's challenges together by conducting research individually and collectively. IRP regularly conducts seminars/symposium/exhibitions on indigenous technologies, providing a common stage to researchers of academia and executives of corporate sector. At IRP platform, new ideas, experiences and technologies are shared and new ways of R&D collaborations are discussed. IRP has facilitated numerous research papers, doctoral level theses and industrial research projects in the areas of social, economic, pure and applied sciences. The studies facilitated by IRP are presented at national and international level forums/conferences and published in scholarly journals of international repute. IRP is in regular process of technology identification, marketing and commercialization of indigenous R&D. Number of local technologies are in process of commercialization and being transferred to industry. IRP serves in trainings, surveys, data management, publishing, research commercialization and institutional building for R&D.

Strategic Aims:

IRP has facilitated numerous research papers, doctoral level theses and industrial research projects in the areas of social, economic, pure and applied sciences. The studies facilitated by IRP are presented at national and international level forums/conferences and published in scholarly journals of international repute. IRP is in regular process of technology identification, marketing and commercialization of indigenous R&D. Number of local technologies are in process of commercialization and being transferred to industry. IRP serves in trainings, surveys, data management, publishing, research commercialization and institutional building for R&D.

Case Overview and Track Record:

Pakistan is struggling for its development and facing many crises due to its political inconsistency (Adnan and Fatima, 2018). However, general society including industry, social sector and education sector is trying hard to cop up with growing developments around the world. Therefore, society at large has grown up and shown progressed in many years. There are many good examples from some government institutions also. Based on IRP working for innovation eco system and technology transfer in Pakistan, the concept of innovation summit is coined. The innovation summit is a unique model which exercise and promote triple helix in Pakistan leading to culture of innovation and entrepreneurship. As Danson & Todeva (2016) mentioned that triple helix model is guiding principle that is often used and industry specialisation and stakeholders are emerging through this. The innovation summit is started in 2012 and term invention to innovation summit is coined by CEO IRP, Mr. Abid H K Shirwani who is also president South Asia Triple Helix Association.

Here are few triple helix characteristics of the Innovation Summit:

- The Ideation of Innovation Summit IRP being a private organization presented the idea of innovation summit to Government organization called Pakistan Science Foundation (PSF), Ministry of Science and Technology, Government of Pakistan. Then Chairman, Prof. Dr. Manzoor Husain Soomro appreciated the idea of innovation summit and jointly presented to vice chancellor University of the Punjab, Prof. Dr. Mujahid Kamran. The heads of three organizations from industry, academia and government sat together, did brainstorming and finalized decision to organize innovation annually. The challenge was how to connect academia, industry and government for innovation. The innovation summit was designed to respond to this challenge of triple helix model of working. The innovation summit was planned by three helixes and executed by three helixes too. The following fundamental characteristics were planned to respond to triple helix challenges;
- The innovation summit will be a two days event presenting innovation ecosystem;
- The summit will be joint effort of organizations from academia, industry and Government;
- The summit will be financially supported by organizations from academia, industry and Government;
- There will numerous activities covering multiple aspects of innovation;
- The various activities will be conducted by three helixes as industry, academia and government;
- The innovation summit will be an overall two days platform where three helixes can interact, exchange and collaborate for future projects;
- The summit will include technology sessions, policy sessions, technology expo, awards and other promotional activities;
- The Triple Helix Design of Innovation Summit – The Country Wide Technology Cover The innovation summit started in Lahore in the province of Punjab, Pakistan. After two years of piloting it expanded to other three provinces of Pakistan. Now the summit is organized regularly

in four provinces of Pakistan. The triple helix model exercised in one province is expanded to all over Pakistan. The academia, industry and government of four provinces connected to each other's and across the provinces too. The summit gave the opportunity to industry, academia, and government to meet each counterparts of each province once in year. Here are three examples of cross the provinces working of innovation summit.

The remarks of Vice Chancellor, University of Balochistan after hosting innovation summit in Balochistan reflects this development. "*Our province is terrorism-affected where world listens news of bomb blasts every day. We are the province known for killing, death and shooting. This summit has created different news of research, innovation and creativity from our Province Balochistan. We are afraid of sitting together and standing together. This summit made us living together for two days. Ministers, Director generals, secretaries, industry executives, academic deans and heads, social activists and students smile together, laugh together and think together for innovation in the province. We are thankful to summit as it brought us together and make us work together*". Dr. Anwar ul Hasan Gilani Chairman, Pakistan Council for Science and Technology said; "*I represent the premium policy body of Pakistan which custodian of science and technology in Pakistan. I see many colleagues from government joining here in the summit. We while living in Islamabad never had been together like we are here together discussing science and technology issues. Thanks to Summit for connecting us*".

Dr. Mirza Habib Director Research, Pakistan Science Foundation said: "*I run funding program of 2 billion plus. Similarly, my friend from Higher Education Commission also 2 billion program of technology funding. Living in same city and working for same government we never met each other. We met first time here in the summit*". The innovation summit has become technology tourism as stakeholders from each province participate in the summits of other provinces, interact with each other's and plan collaborations.

- The Triple Helix Design of Innovation Summit – Technology Sessions The innovation summit includes various sessions related to commercial technologies, policy reforms, start-up ideas, business productivity and academic reforms. The sessions are organized jointly by academia, industry and public sector organizations. The sessions are also attended by people from various sectors and walks of life. In technology sessions, academics present viable technologies and industry provide feedback on technology diffusion and revision. In policy sessions, policy advocates present policy revision and government representatives provide feedback and response on its implementation. In funding session government funding agencies present funding opportunities for industry and academia for collaborative research. Triple helix actors interact with each other and participate in each other's activities during two days of innovation summit every year in each province. Here is a model example Ripha Institute of Public Policy- RIPP is a specialized institute for research and teaching on public policy issues. RIPP planned to contribute in industrial sector through policy reforms and revision. RIPP selected gems and jewellery sector for the years 2016-2017 and organized policy sessions in the innovation summit. RIPP collaborated with the industry of gems and jewellery to conduct industrial policy sessions in the innovation summit. The four policy sessions are organized in four provinces and attended by related industry, government representatives and university scientists/students.

  The actors of three helixes in gems and jewellery sat together, discussed development issues, proposed revised policy measures and finalized future growth agenda based on common interest. This was a unique exercise in Pakistan where three stakeholders jointly planned a sector development and policy reforms. RIPP has collaborated with Pakistan Institute of Development Economic and South Asia Triple Helix Association to jointly develop a final policy reform draft. The industry and Government has actively participated in the industrial policy development work. The policy proposals are finalized and policy advocacy has been started to motivate concern public sector

department to implement the proposals. The sessions of innovation summit has responded to another challenge of joint working in Pakistan. The most of policy reforms and interventions are failed due to absence of industry or academia as these are made by public sector only. The stakeholder engagement in public sector polices seriously lacks in Pakistan. The next agenda of RIPP policy sessions in innovation summit is "Policy Reforms for Urban Planning and Smart Cities".

- The Triple Helix Design of Innovation Summit – Technology Expo The innovation summit presents a triple helix demonstration of technology expo. This is the place where three helixes demonstrate their strengths, services, innovations, potentials and offerings. Following are prominent examples:

- Academic Stalls – The innovators of universities and R&D organizations display their new ideas, innovations, technologies, prototypes, and other developments as output of their labs and laboratories. The visitors from industry and society visit academic innovations, give feedback and exchange ideas on discussion and utilization of academic technologies. University faculty made lot of collaborations with industry and society through these displays. R&D organizations, S&T laboratories and research institutes of public sector also put their stalls in technology expo and offers technologies to industry.

- Industry Stalls – Industry is also invited to display their innovative products and services. Industry presents their current developments and future business needs for technologies. The brief academics about collaboration opportunities and available support from industry for academic research. Academic scientists visit industry stalls and explore joint R&D options.

- Government Stalls – The government services and facilitations departments also put their stalls and showcase. They mostly showcase testing services, standards services, vocation training services, instruments offers and IP related services. The funding agencies showcase their funding opportunities and guide academia and industry on how to avail the state funding.

- Startup Stalls – The summits also include a pavilion for start-up ideas. The entrepreneurs initiating new ventures are given opportunities to show case their business ideas. The start-ups generate new customers, create lot of referrals and test their ideas through wide demonstration. The start-ups meet lot of potential investors and partners in the summit.

- The Triple Helix Design of Innovation Summit – Innovation Awards The summit includes a big range of awards of various categories given to various triple helix actors as token of appreciation.

- SATHA Innovation Award- The awards are given on executive dinner by high profile personalities from Government of Pakistan. The awards are promoted all the years in all over the country and applications are received. The SATHA award target those contributors who significantly improve people and organizations life in their respective fields. The applications are collected from industry, academia and social sector. The SATHA award has become the pride for winners. The SATHA award appreciate those contribute significantly in their respective fields and do innovations.

- Cash Awards – The cash awards are announced by various donors from academia and government. These awards are given to viable technologies presented in the innovation summit. The industry gives awards in search of some potential technologies. For example, SRC is a chemical producer. They give cash award to a potential technology related to chemistry. They evaluate awarded technologies for investment and commercialization. ECOSF is inter-governmental organization serves the science objectives of 10 ECO countries. They promote development to respond to SDG millennium goals. They give cash award to technology related to SDG 06- Water and sanitation. Similarly, Akhuwat is a social development organization provides interest-free microfinance and number of other services related to education and community development. They give cash award

for technology making social impact. The case awards are also given to startup ideas and newly created ventures.

- Technology Awards - The technology awards are given to students' ideas displayed in the technology expo of innovation summit. Around thirty technology awards are given to displayed posters and technologies. The exhibited technologies are assessed on the factors like import substitution, export potential, utilization of local resources, solution to potential problems and overall social and economic impact.

- The Triple Helix Design of Innovation Summit – Innovation Stars Program

Innovation summit presents opportunity to schools' students to bring their models and display along with higher education students. A partner organization AFAQ leadership club conducts a competition in schools for model development and innovation. The selected innovative models are invited for display in the summit. The students are given cash prizes, certificates and appreciation lectures. Many schools' kids are invited to visit models and stalls of other universities and industries.

Innovation summit plays active role in developing future innovation leaders.

Tangible Impact:

The innovation summit is organized by more than 100 partners from academia, industry and government in four provinces of Pakistan. This reflects triple helix working and sustainable collaboration of many partner geared by the innovation summit. Around 40 industrial sectors are offered viable technologies by session organizers which attract 100s of new industries toward academia. Around 50 innovative technologies are awarded cash awards by various organizations with to hope adopting these projects once completed after revisions and modifications. Many projects are initiated based on interaction between academia and industry during the innovation summits. Many projects are applied to donor agencies after getting briefing from donor during the summit.

Intangible Impact:

Pakistan lacks a platform seriously where triple helix actors can start interactions and exchange perspectives for collaborative development. The innovation summit has become a strong platform to interact and connect. The summit has country-wide coverage as organized in four provinces of Pakistan every year. Now the academia has platform to display their innovations for industry and society. The industry got the platform to visit and interact with academia and see potential business solutions. They government found the place to interact with both academia and industry for offering their services and introducing new opportunities. The message of summit reaches to millions of people in Pakistan through social media, emails, digital and non-digital publishing and through physical media like seminars, conferences and meetings. This message itself a very strong ambassador of triple helix and inspires people for entrepreneurial research culture. The summit is organized jointly by three helix actors and by design creates a sense of collaboration in the society for science, technology and innovation.

Transferability and Lessons Learned in Triple Helix Cooperation:

The innovation summit is replicated from one province to four provinces of Pakistan. The summit design is standardized and sustained over many years. The summit is backed by IRP services of commercialization. IRP is looking for opportunities to offer the summit in other countries to promote triple helix culture in the hosting countries. The other countries can also learn and organize the same summit in their countries. The summit participants are referred to IRP portal of technologies to see potential problems of industry and bring solutions in the summit.

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How Universities Aim to Serve the Regions - Self-Assessment Criteria for University Role Transformation: Case of Russia[5]

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Abstract:

This case represents an attempt to transform higher education policy in Russia in terms of university self-description and self-determination on the basis of university roles in the new economy and the development of civil society. This step is similar to approaches introduced by HEInnovate self-assessment scoreboard and the contest “Entrepreneurial University of the Year” (United Kingdom), when universities are tasked to describe their best practices and competitive advantages in setting strategic goals and changing institutional environment within the organization and in the region. Such universities, which rhyme their own development with the regional development inscribing university practices into regional agenda, are the best cases to study for promoting Triple Helix consensus in the region. Basic (core) and variable (optional) indicators allow universities to translate regional development tasks into university activities as well as to assess their contribution to the regions.

Keywords: university roles in the new economy, regional development, university self-identification

Geographic Coverage: The Russian Federation

Strategic Aims:

to increase the involvement of the leading universities in economic and social development of Russian regions

Case Overview and Track Record:

This project, as a new practice initiated in 2016, logically continues university innovative programs, which were initiated by the Russian Ministry of Science and Education 10 years ago in the framework of the national project "Education" (nation-wide implementation of the Russian National Project "Education - Universities as drivers of innovative development"). Also, it provides continuity in relation to university landscape transformation through creation of national research universities, federal universities, ‘5-100’ Project (globally competitive universities) and regionally embedded flagship universities.

The project is aimed at development of workable university models with the best operational mechanisms to scale up practices and translate these models into real implementation. It previews expansion of university autonomy with the emphasis of granting universities with maximum number of

[5] *Case Owners:* Ministry of Science and Education of Russia, and National Research Tomsk State University as an organizational and analytical support provider.

rights in determining their own organizational structure and development strategy. The outcome of the project implementation is a list of universities which reflects the differentiation of university activities in regional socio-economic practices as well as an attempt to introduce basic and optional university performance indicators based on proposals of universities - potential participants in the priority project. These indicators should manifest variations in university engagement in social and economic development in different Russian regions.

Tangible Impact:

As a positive tangible impact resulting from the adoption of the practice is financing of educational programs from non-budgetary sources and research funding.

Intangible Impact:

As beneficiaries of this initiative we can name regions where universities are located, universities, national innovation systems, regional communities. Applications for participation in the project were received from 121 universities from 63 subjects of the Russian Federation. 51 higher educational institutions were selected as pilot university centres of innovative, technological and social development. Since Russian regions are different, the university tasks and challenges differ for each region. Therefore, each university should be at the centre of regional development and innovation in the sense of a project approach through self-identification in terms of contribution to regional development.

Some intangible impacts can be translated into lessons learned, potential for improvement and further steps to undertake: (1) it turned out to be very difficult to involve the academic community due to possible inertia of the academic activities, (2) the key question is how to measure the development of the social sector in terms of university contribution, (3) an attempt to calculate university third mission was undertaken of the university in the absence of clear methodology.

Transferability and Lessons Learned in Triple Helix Cooperation:

The transferability of the practice includes the following:

- algorithm for compiling a new list of universities basing on their role in the development of the region;
- core and optional university self-description parameters for technological and social innovative regional development;
- approach of university self-identification and self-positioning according to the model of engagement on the regional development.

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TRIPLE HELIX IN THE REGIONS

Lombardy Region Open Innovation Platform[6]

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Abstract:

Lombardy Region Open Innovation Platform (www.openinnovation.regione.lombardia.it) is a collaborative web environment that gathers government, industry, academia and civil participants around strategic R&I topics. The Platform is an instrument to enable dialogue between public and private players, a space where the strategic R&I goals of the regional government are shared, discussed and integrated: all regional innovation stakeholders are informed and actively engaged. More than 2500 news and 1700 discussions have been posted, ten public consultations allowed a broad participation of all relevant actors in shaping and managing strategic priorities. With a strong focus shift from institutions and organizations to individuals, citizens play a role alongside professionals within enterprises to identify needs and solutions in the whole life cycle of the regional R&I policy. Professionals working in Companies, Research institutions, Public Administrations, Organisations representing the civil society and citizens themselves meet on the platform and discuss by means of a broad range of targeted tools designed for knowledge and ideas sharing, project creation and management, dissemination of research results. The platform is open and inclusive, with very low entry barriers while ensuring a good quality of exchanges thanks to superusers that provide support to other participants, manage communities (more than 500), validate content and stimulate user engagement. A reputation-based approach is promoted at all levels, limiting centralized activities to a minimum. Today the platform counts over 8000 participants lending substance to the principle of multi-actor, public engagement. The platform offered 15.000 collaboration proposals worldwide. The software framework powering the platform has been released under a free, multilingual open source license with the specific aim to facilitate its adoption in similar or complementary user scenarios and promote collaboration among them (other Regions, company networks, clusters, large collaborative projects etc.) maximizing content sharing and interoperability: we count more than 200 down-loads of www.open2.0.regione.lombardia.it.

[6] *Case Owners:* The Lombardy Region General Directorate for Research, Innovation, University, Export and Internationalization supports research in emerging strategic sec-tors, encourages the transfer of results on the market and boosts competitiveness of the economic-social system. Main initiatives promoted by the General Directorate aim at:

- Strengthening public and private investment in Research and Innovation
- Encouraging open innovation
- Enhancing Export and Internationalization strategies for SMEs

The DG is in charge of managing the Regional Operational Programme of the European Regional Development Funds for the 2014-2020 period.

Keywords: Open & Social innovation, Multi stakeholder platforms & Responsible Research and Innovation (RRI), Knowledge sharing, Stakeholder engagement, Interoperability, Partnership, Triple Helix

Geographic Coverage: Italy, Lombardy Region, Milan.

Strategic Aims:

The open innovation paradigm assumes that firms should exploit external ideas (and/or external paths) to market their innovation process. For big enterprises it's quite easy to follow this path, whereas small and medium sized firms encounter difficulties and might not be able to exploit this potential.

In order to face this challenge, the regional platform represents an inclusive instrument that enables all stakeholder to take part in the innovation process with-in a regional policy framework, that provides a fertile innovation ecosystem where challenges and know-how are shared.

Case Overview and Track Record:

The solid and highly diversified economy of Lombardy (ranging from industry to trade, to services, to finance) makes the region an attractive place for knowledge-intensive start-ups (over 15,000 between 2007 and 2014). The dynamic system connecting small, medium and large firms is home to over 4,200 well-integrated multinational corporations. Innovation and qualified human capital make of Lombardy and Milan a knowledge hub. The region is home to the main Italian research centres and institutions: 12 CNR (Italian National Research Council), 19 IRCCS (Institutes for Treatment and Research) and 13 universities, 3 sections of the Italian Institute for Nuclear Physics, 1 European Joint Research Centre, 700 Research and Technology Transfer Centres. High growth potential is identified in leading sectors such as Life Sciences, Agribusiness, Manufacturing 4.0, Art culture and design, and Finance. With a rich cultural offer and the excellence in fashion and design, Lombardy and Milano are leaders of the national creative industry.

Approved in late 2013, the start-up phase of the Open Innovation Platform was financed in the frame of the Regional Operational Programme - European Regional Development Funds of 2007-2013: it foresaw the implementation design of a collaborative platform to enable the creation of a web environment where "innovation actors" from academia and industries could join in order to work together.

The second phase of development and maintenance of the tool foresees:

- the implementation and management of functions (plug-ins), contents and promotion activities aimed at involving through diversifies approaches and paths different kind of users (industry, academia and citizens);

- the introduction of a new participatory approach (based on RRI principles, defined in the new regional framework act - Law 29/2016 on Innovation and Research) that implies the planning and implementation of new tools to enable the citizens to become fully engaged in the Public Administration (PA) activities (i.e. through surveys).

Starting from 2017, QuESTIO (Quality Evaluation in Science and Technology for Innovation Opportunity - a repository of all R&I competences in the region) merged into the Open Innovation Platform, increasing the availability of data and knowledge generation. This shift enabled also the integration of the competence repository with related activities, networks, international relationships and interests in different technical and economic topics.

The last effort was to enable an “Open source” application of the platform, re-leased under a free, multilingual open source license with the specific aim to facilitate its adoption in similar or complementary user scenarios and promote collaboration among them (other Regions, company networks, clusters, large collaborative projects etc.) maximizing content sharing and interoperability.

Further attention will be dedicated to the engagement of the citizen who needs solutions and offers ideas towards an ever increasing RRI approach in the PA. Innovation actors within enterprises will be given major opportunities to share challenges within the platform and gather solutions to their specific innovation needs.

TH Champions from Government, Industry and Academia

Government

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Tangible Impact:

The Open Innovation Platform was enrolled in the Software Reuse Catalogue, a list of programs developed by public bodies made available and downloadable for free, according to a logic of rationalization of expenditure, promoting innovation with information technology.

The open source application ‘Open 2.0’ has already provided a free collaborative work environment for several organisations, including other regional governments (i.e. Regione Campania), representative bodies (i.e. Manageritalia, the national association of top and middle managers and ANCI, the National Association of Italian Municipalities), as well as Technology Clusters (i.e. AFIL – the Advanced Manufacturing Systems cluster of Lombardia).

Intangible Impact:

The platform has the ambition to become a "one stop shop" for the regional research and innovation ecosystem, whose members are part of a collective effort to share information about competencies, experiences and opportunities with the ultimate goal to create and manage open innovation projects meeting the strategic goals of the region.

From the point of view of Industry and Academia, the platform provides free collaborative working tools (plugins) hosting communities, work teams, projects, organizations; it maximizes synergies and network capability bringing together individuals with common interests, skills and competencies. The platform has published about 2500 news and 200 R&I projects involving 600 participating organisations. Until today, the number of posted discussions is about 1700, the number of communities created is more than 500. The platform has promoted 15.000 collaboration proposals followed by 500 expressions of

interest. More than 4.000.000 views on social profiles and 200 downloads of Open 2.0 (open source) testify its appeal.

As for Citizens, the Platform enables individuals to take part of the innovation process of their territory. Citizens are informed about regional R&I initiative and related public surveys (about 10 have already been realized i.e. on the update of R&I strategy, Responsible Research and Innovation, etc.).

From the policy makers' point of view, the platform delivers a valuable feedback to the regional government. It informs about main regional measures (programmes and projects), it monitors the performance of partnerships and projects created along strategic sectorial areas, it gathers needs and interests (to work on foresights), it fills the gap between PA and all significant actors in terms of innovation policies and decisions. Presently, the platform connects over 8000 users and over 2000 organizations.

Transferability and Lessons Learned in Triple Helix Cooperation:

'Open 2.0' is the open source application built on the experience of the regional platform of Open Innovation. Provided by Lombardy Region and made available for free, Open 2.0 is a scalable, interoperable, reusable, multilanguage environment.

Open 2.0 is a framework that creates integrated and modular collaborative platforms. The generated platforms are web based, and their goal is to make easy the sharing of knowledge and the cooperation in the operational processes. The set of available plugins is configured, parameterized and customized based on the processes to be represented and carried out on the platform.

Among the main lessons learnt are:

1) The platform underlying process entails a deep cultural change for all involved actors. Institutions must embrace transparency at all levels; Academia must be open to share knowledge and vision to a wide public: research not only happens in labs but it involves citizens, because it changes their life (RRI); Industry can benefit from external resources, ideas and projects that go beyond internal assets.

2) In a fast-paced environment, where the speed of technological innovation and advancement is quick, institutions are continuously challenged to keep up to date and drive the change. The regional platform gives Lombardy Region a key role in responding to the need of collaborating and networking, providing a barrier free environment where all innovation stakeholder can meet, discuss and work together on specific R&I topics.

3) The platform is a tool for effective cooperation among representatives of the triple helix. If one of the helix is missing, the outcome is compromised. Big attention is therefore given to the continuously engagement of all stakeholder in order to enhance the dialogue and multiply the partnerships among representatives of different entities. The platform is now shifting to the quadruple helix model, where citizens become active in the co-creation of innovation policies. The result is Responsible Research and Innovation (RRI) where researchers, citizens, policy makers, business, third sector organizations, etc. work together in order to better align both the innovation process and its outcomes with the values, needs and expectations of society.

The platform is a collaborative environment, where all the stakeholders of research and innovation in the Region are invited to share the effort. Furthermore, the software framework powering the platform has been released under a free, open source license: other users of the platform are therefore expected to contribute for free to its development. As the platform is one of the main implementation tools of

the regional strategy for RRI, Lombardy Region is prepared to bear the marginal cost of the project with own resources and ERDF funds.

The Platform has been recognized as a successful instrument for the implementation of the Research and Innovation policy of the Lombardy Region and part of its governance during different public events, ceremonies, workshops and publications.

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The Role of Regional Government in Developing Triple Helix Systems: Case of Tomsk Oblast on Regional Transformation into Innovation Hub[7]

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Abstract:

Increasing the resources and the efficiency of their application to new economic development in the region need to harmonize approaches and tools of regional and national authorities. The creation of special project office "INO Tomsk" for the dissemination of ideas, knowledge and relations between participants of the Triple Helix is a new practice in the field of public administration based on the establishment of interagency mechanisms. Integration of regional economic, innovation and scientific and technological policies, using the principle of the Triple Helix model, provides consensus initiative and the concentration of resources, which leads to an increase of national and global visibility of the region. It is possible to put the experience in other countries where the state has to compensate partially the lack of entrepreneurial activity.

Keywords: cluster approach, effectiveness of regional development, mechanisms for inter-departmental and inter-agency cooperation.

Geographic Coverage: The Russian Federation, Tomsk Oblast

Strategic Aims:

The current project aims at:

- Coordination of approaches and tools of territorial and federal organizations for the generation of resources for the development of the region's economy;
- Practice of implementing a cluster approach in the governance of regional and national economies;
- Organizational support (methods and mechanisms) of new practices for the adoption and implementation of economic decisions.

This case focuses on the goals to increase the efficiency of regional development programs, to concentrate resources through the collaboration of Triple Helix actors, to create a special project office for circulating ideas, knowledge and connections between the organizations (actors) engaged in the project.

[7] *Case Owners:* Russian Federation, Tomsk Oblast, Regional Administration, Vice Governor on Economy and relevant departments, project office «INO Tomsk» as consulting and analytical support provider.

Case Overview and Track Record:

Years of operations: 2014-present time (with the Strategic Concept up to 2030). It is a new practice in public administration, based on the creation of mechanisms for inter-departmental and inter-agency cooperation of federal ministries for the implementation of Triple Helix based initiatives. The acronym INO in Russian stands for industry, science and renovation. The Project's implementation is based exclusively on reconfiguration and intensification of the collaborative links between Triple Helix participants.

Tangible Impact:

Case impact tangible. In 2015-2017, 500 mio EUR were allocated for the implementation of the INO Tomsk Concept, with the volume of investments of companies of 2 times higher than state investments. Tomsk region is the leader among the regions of Siberia and ranks 5th in Russia in terms of the share of research and development in GRP, an increase from 2.25% in 2014 to 2.54% in 2017. Growth in the number of exporting companies, small businesses - 2 times, medium companies - 3 times.

Intangible Impact:

The regional government, as a result of the active cluster policy, was able to work with the consolidated position of SMEs, with alliances of the companies, which provided feedback on the most important issues of innovation and economic policy, supporting small and medium-sized businesses, attracting large companies. The creation of innovative and industrial clusters made it possible to intensify cooperation between companies, aimed at strengthening their position in the market. Within the framework of regional economic, innovative and scientific and technological policies, the principle of Triple Helix model ensures consensus, leading to creation of Triple Helix based initiatives and consolidation of resources for their implementation which also results in growth of the region's visibility at the national level and the growth of global visibility of the region through the export companies appearance and promotion of universities in world rankings.

Transferability and Lessons Learned in Triple Helix Cooperation:

In 2016, two Russian regions - the Republic of Tatarstan and the Novosibirsk region – focusing on innovative development launched similar projects jointly with the Government of Russia on the basis of the experience of the Tomsk region.

It is possible to transfer experience to other countries where the state dominates the economy, public investment and priorities stimulate private investment and where the state is compelled to partially compensate for insufficient entrepreneurial activity. At the same time, practice requires a number of important locally embedded conditions:

- high concentration of scientists and PhD-candidates per 1000 inhabitants;
- a high concentration of innovative companies per 1000 inhabitants (entry into the top three at the national level);
- the existence of a consensus on the directions and approaches to the innovative development of the region's economy between triple helix actors.

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Popularization of Entrepreneurial Science[8]

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Abstract:

There is world over concern of academic role beyond the teaching and basic research. The academics are expected to play role knowledge exploitation, wealth creation from research and technology diffusion. This new hybrid role is termed and described as entrepreneurial role of academia. IRP as technology and research organization-initiated popularization of this concept entrepreneurial research by promoting success stories. The model success stories play critical role in inspiring others to choose the same path.

We initially studied the scientists who play hybrid role and understood this phenomenon. Then we selected 10 international cases and 10 local cases of entrepreneurial scientists who successfully served the science and the society. The project included case writing, publishing of annual directory and video documentary of these scientists. This project has inspired many new scientists, stakeholders, donors and entrepreneurial scientists themselves to believe in entrepreneurial sciences.

This project needs to be replicated in other countries and regions. The culture of entrepreneurial research resultantly strengthens the expertise of Triple Helix concept in the society. The authors are connecting other countries to collect data of entrepreneurial scientists of respective countries, write success stories and publish their case studies.

Keywords: entrepreneurial role, scientists, industry, popularization, innovation, society

Geographic Coverage: Pakistan

Strategic Aims:

Institute of Research Promotion (IRP) has been established to provide services in research related activities to promote quality research culture in the universities and corporate sector of Pakistan. IRP is a non- profit organization working under the leadership of academics and industrialists. IRP has academicians, researchers, scholars, corporate consultants and institutes/organizations associated of international repute, and in various disciplines. IRP is helping researchers of universities and managers of industry to sit together and meet today's challenges together by conducting research individually and collectively. IRP regularly conducts seminars/symposium/exhibitions on indigenous technologies,

[8] *Case Owners:* Institute of Research Promotion - www.irp.edu.pk

providing a common stage to researchers of academia and executives of corporate sector. At IRP platform, new ideas, experiences and technologies are shared and new ways of R&D collaborations are discussed.

Case Overview and Track Record:

IRP has been working in Pakistan for a few years to promote entrepreneurial research culture and Triple Helix philosophy. Mostly faculty argues for one track of either publication or technology development. The Triple Helix approach advocates for working with multiple stakeholders and serving both science and society.

How to effectively convince faculty for entrepreneurial role in academia was a big challenge in Pakistan?

The birth of idea of documenting success role models solved this problem. IRP initiated the project of popularization of entrepreneurial science. This project included two activities as

1. Publishing stories of entrepreneurial scientists who serve science and society
2. Making video documentaries of these scientists

Phase 01 of Idea Development

The idea was conceived back in 2013 and working was started by two authors. Later on two team members are involved to sustain the project.

The first two years were spent on studying international academic practices where academic professors have developed products and services for the society and industry. We studied cases from various university websites, IPO offices websites and websites of technology transfer offices. We developed our understanding on how university faculty adopt and perform dual role of serving science and society. This survey led us to WIPO website also which presents around 300 cases of IP management and licensing. There are around 100 academic cases where some technologies are developed and solutions are transferred to society and industry. The authors studied these 300 cases to develop orientation of this phenomenon and model it in Pakistan.

Phase 02 of Execution of Idea

IRP is already working with 100s of industry projects given to academia. We launched a call for participation in the study and decided to include 10 cases of entrepreneurial scientists in the initial study. Two years were spent as 2015 and 2016 observing and studying these selected cases with single question as how they are doing entrepreneurial science. Three cases were dropped and new were included due to data access issues. We visited these scientists, conducted interviews, made field visits, met to stakeholders of their projects and documented stories. We produced a directory of entrepreneurial scientists of Pakistan, published by South Asia Triple Helix Association.

We picked 10 model international cases of entrepreneurial scientists and 10 Pakistani cases. We published a book based on these 20 scientists. This book also presented a unique framework of entrepreneurial research called PESE framework. We planned to develop video documentaries of these scientists for popularization of this approach. The Pakistani scientists are included in the documentaries and detailed context, impact and feedback on their entrepreneurial interventions are covered in the video documentaries. These video documentaries are promoted through social media and put on YouTube also.

Tangible Impact:

Numbers of international organizations are approached for participation in this project. Currently two universities and one industry are supporting this project as

- University of Management and Technology, Lahore
- Jinnah University for Women
- Quantaxis

As tangible outcome of the study and project

- 10 video documentaries are made
- Annual directory is published
- One book is published

Intangible Impact:

The cases of scientists who link academia and industry and Government in many cases helped other scientists to believe in Triple Helix approach. The success breeds success proven true in this working as live examples inspired many other scientists to adopt the dual role of academic services and technology commercialization.

The scientists who are promoted through publications and video documentaries got very satisfied due to wide acknowledgement of their efforts. Especially the trust of donors and supporters has increased as they were promoted too through these documentaries.

The video documentaries motivated many young scientists to follow the entrepreneurial spirit of their successful seniors.

The study has responded to industry which was very sceptical about the effectiveness of academic outputs. Now they are being satisfied after showing successful technology transfer from academia to industry.

The Government also god evidences of research funding impact on society. Government always needs to prove the right use of tax payers' money. These cases and documentary videos made politicians satisfied and realized them to increase research funding.

Transferability and Lessons Learned in Triple Helix Cooperation:

The case has very significant global impact in the context of going Triple Helix phenomenon. The universities in emerging world are trying to move on the path of triple helix. There is pressure on universities to become entrepreneurial universities and encourage scientists to become entrepreneurial too. The hybrid role of the scientists is being demanded in developing and developed world too.

The publication of annual directory and videos of these entrepreneurial scientists who serve science and society are instrumental to promote culture of entrepreneurial research. These can be replicated in every country and every part of the world.

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The Entrepreneurial Scientists Serving Science and Society

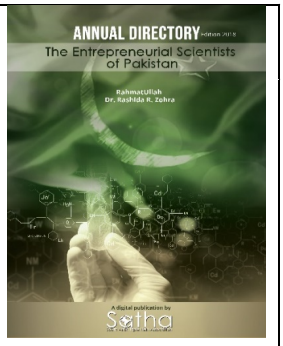
Click to see on Google Book

The book consists of 20 case studies thoroughly selected after a detailed study of around 300 cases from the WIPO website and other sources. The selected scientists are presented in this book and more will be included in the forthcoming versions. The study starts with an introductory chapter based on existing literature review on the subject of entrepreneurial scientists. The second chapter includes 20 case studies of academic professors with a focus on improving the human life experiences of the real world. The third chapter includes thematic highlights of the study extracted from the cases and literature. This is the most significant part of the study. A total of four themes are presented as a PESE framework for entrepreneurial scientists along with summary discussion for each theme.

The Entrepreneurial Scientists of Pakistan

Click to Download

The entrepreneurial scientists of Pakistan consist of an annual directory of entrepreneurial scientists of Pakistan which presents 10 academic scientists of Pakistan annually who contributed to the society and industry. The collection only means the sampled scientists in our study. There are a number of good scientists with great impact, we could not reach out to them yet. Our limitation also includes our interviews and survey about the life of these selected scientists. We have conducted detailed interviews with the scientists, peers, associates, beneficiaries and the people worked or lived with these scientists. Most of the scientists are under the observation of our study for last 2-3 years.



TRIPLE HELIX SECTOR CASES

AgroVegetal - Harvesting Rewards from Open Innovation Collaborations[9]

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Maria Augusta **Mancini**, Senior Expert at TII asbl, on behalf of the INSPIRE project, a Coordination and Support Action funded by the EC *under Horizon 2020*

Abstract:

Innovation in agriculture has great potential to improve people's lives by bringing healthy new foods to the market. A Spanish SME with an overseas connection managed to convert its competitors into collaborators and involve key stakeholders from industry to align its interests with market opportunities. The company was founded by key regional players to produce new high-quality varieties of durum and common wheats and triticale. They were then tested by industry to generate interest in the final products and eventually helped to break the market dominance of poorer-quality products, thereby solving a strong need of farmers and consumers alike. The company succeeded in becoming the second leading (national) market player for durum wheat and made a major breakthrough in the market for triticale and chickpeas thanks to their applied research efforts and open innovation collaborations with key actors within the supply chain.

Keywords: agriculture, business model, lead customer testing, public sector research, cooperatives, open innovation, triple partnership approach

Geographic Coverage: Spain

Strategic Aims:

AgroVegetal was founded by the Andalusian Federation of Agricultural Cooperatives in collaboration with the International Maize and Wheat Improvement Center (CIMMYT) – based in Mexico – and the Council of Agriculture in Andalusia. When the company was created it had to face a challenging scenario: to convince the existing agricultural cooperatives in the region to pay CIMMYT in return for receiving new varieties of wheat. Changing the farming cooperatives' mindset was a challenging task, as they were used to producing and selling royalty-free varieties of wheat that were developed by public research institutes. Back then, the number of private companies selling new varieties of wheat was almost non-existent and the farming cooperatives were reluctant to buy private varieties, as these were worth €30 to €40 / ton more than the public ones.

In this scenario, the cooperatives were used to staying in the low-cost end of the market in order to avoid paying royalties and so maximize profit margins. The problem with this approach was they were

[9] *Case Owners:* INSPIRE, a project funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 691440 - www.inspire-smes.eu

settling for lower quality varieties of wheat which led to a Catch-22 situation: the farmers didn't want to produce quality because industry paid poorly, and industry didn't pay much because there were no large supplies of a homogeneous quality. AgroVegetal saw this market opportunity to bring high-quality wheat varieties onto the market and strove to break this vicious circle between farmers and the food industry.

When the CEO of AgroVegetal, Ignacio Solís Martel, accepted his new role, he had a clear mission. "The aim of the company at the start was very simple: to carry out applied research to produce high-quality and high-yielding new varieties of wheat in order to break the existing poor-quality market prevalence and deliver new quality products for farmers and consumers," explains Solís. His technical background in agriculture, as well as a deep understanding of the business, were one of the keys behind the company's growth and expansion. "When we launched the company, it wasn't foreseen that AgroVegetal would sell anything because the owners were competing amongst themselves," says Solís. "It was only after six or seven years researching and collaborating together, when new products appeared, that we decided to commercialize them together through AgroVegetal as the sole creator, producer and seller of the company's new wheat varieties".

In order to grow, the company organized a network of field trials in the five large cooperative producers in Andalusia and looked for strategic collaborations not only with seed producers, but also to evaluate the quality of the new wheat varieties. "*Our strategy was to produce new varieties of wheat that would be positively received by the farmers in the region and at the CIMMYT, and that would also involve collaboration with industry for quality testing, as well as with scientists at the Spanish National Research Council (CSIC) and public universities for ensuring disease resistance. With this triple partnership approach, we created a strong collaborative network that provided us with the expertise necessary to cover the full value chain*," says Solís.

"*Although our main source of income is the wheat varieties, the farmers who are partners of AgroVegetal are also interested in other types of products such as chickpeas, peas and beans, although these generally have low profits*," says Solís. When he proposed to start carrying out research on other products, the Executive Board accepted to take on this new challenge under one condition: to do so by securing external public research funding through R&D calls. This way the company would keep it's main focus on its core business and would minimize its financial risks while promoting innovation and advancing R&D. Although the wheat market in Spain is large, AgroVegetal is still working on developing other varieties more suited to the rest of Spain's central and northern regions. A few years ago, the company signed an agreement with IRTA, a public research institute based in Catalonia which used to be a direct competitor of AgroVegetal and worked in parallel.

Case Overview and Track Record:

This is the case of a mature company with a well-developed open innovation model based on a strong collaborative network and a solid revenue model (the company earns around € 2.5 million year). Although the company is acknowledged as the second leading market player, it continues to develop other products by exploiting public research funding. This case was elaborated within the INSPIRE project (standing for Integrated Support of Open Innovation Professionalization initiative), a Coordination and Support Action funded by the European Commission under H2020, that has investigated in depth 120 Open Innovation (OI) practices in SMEs across Europe. Its purpose is to distil lessons about how to improve the supply chain and deploy dedicated support measures. In the coming months the INSPIRE team will publish a dedicated OI platform offering an integrated toolbox (ready-to-use tools, support resources and inspirational cases) for enhancing the adoption of OI among SMEs.

Tangible Impact:

The new varieties of durum wheat and triticale have allowed AgroVegetal to establish a good position in the market, offering quality products well suited and sought after by both stakeholders and end users. AgroVegetal has a turnover in excess of € 2.5 million/year with profits that can be re-invested in R&D. Only 12% of total sales are outside of Andalusia. Expansion to other areas of Spain is limited so far because they do not yet have varieties suitable for less arid / hot conditions. To overcome this challenge, AgroVegetal is in the process of initiating OI collaborations with R+D+I teams elsewhere in Spain.

The successful collaboration within the supply chain for wheat varieties, such as with Pastas Gallo, helped AgroVegetal to convince additional companies and institutions to collaborate on new projects. Among these open innovation collaborations was the Ituci chickpea project. It took nearly ten years, but the result was the development of the high-yielding and disease-resistant "Ituci" variety of milk-white chickpea. Although the market is small compared to wheat, AgroVegetal is already enjoying considerable success on a national level.

Intangible Impact:

The critical success factor at AgroVegetal is the ability of its CEO to scale gaps between research and business. His knowledge of both fields and strong communication skills meant that the open innovation partnerships flourished where they could easily have failed. Building trust among partners and key lead customers creates a spirit of openness to new business opportunities and investments. Moreover, strategic collaborations contributed to raise the company's profile, promote product innovation and acquire and grow new business opportunities.

Transferability and Lessons Learned in Triple Helix Cooperation:

This case shows what can be achieved through open innovation collaboration on a small scale to break into established markets. It is also a good example of a triple partnership approach. The company recognizes the need for additional expertise to manage their R+D+I projects which are externally funded in order to go beyond simply covering basic costs and take full advantage of public-funding programs. Another interesting feature is the management of incentives within the OI network: in some cases (such as in durum wheat) there has been success, but in others there is simply not the financial support in place to carry things through to fruition within a timeframe which makes sense for the company. Therefore, these kinds of projects are always small-scale and developed as a side-line.

<u>Key lessons on transferability</u>:

- The process of strategic collaboration requires negotiations and agreements at different levels and points along the supply chain.
- Collaboration with a PSR can require intense negotiations in order to convince them to focus on a new or slightly different area (especially when it refers to a research line that they have been following for some time and even if there is evidence of market pull).
- The development of trust in a relationship and knowing when to stop joint projects are critical enablers of OI.
- A lack of investment and/or of government policy to help SMEs to extend their innovative work and take it to the next level are a severe limitation.

<u>Lessons learned on TH cooperation:</u>

Innovating the production and processing of agricultural products has always been a feature of the evolution of mankind, which perhaps explains why the agri-food sector is one of the most innovative

economic sectors across the world. In a sector which is characterized by the complexity of the value chains, which put together producers, processors, distributors and consumers, an open innovation logic and aptitude for collaboration have become more important for companies to gain competitiveness and grow. The case shows that the adoption of a triple partnership approach (industry, research providers, government) encourages the creation of strong collaborative ventures throughout the whole value chain and of a solid conducive ecosystem.

This implies the engagement of dedicated resources (the role of an innovation manager with a good market understanding and solid marketing and negotiation skills seems to be crucial), a change in the cultural mindset of the actors involved and the presence of public investment/support measures that can stimulate joint collaboration and innovation projects and encourage the flow of knowledge between research institutions and industry. Trust is the key factor in this combination of ingredients.

AgroVegetal holds the IPR on the genetics and is able to license its IP to third parties. The company's business model is interesting. Its various partners are involved in the field trials of the new varieties; they each choose different new varieties, which ensures that enough can be tested in the development phase. When they get to the stage of having certified the seed first reproduction (R1) - and in order to scale up to R2 (which is when the seeds are ready for commercialization) - each partner buys from the others those R1 seeds they are interested in. Then they choose the R2 seeds that they wish to sell later. Since this is all done under the same company, each year they agree the sales price for the R1 and R2 seeds. AgroVegetal charges the cooperatives a fixed fee for every kilo of R1 and R2 produced, while the commercial profit margin is kept by the cooperatives.

In order for the company to be self-sufficient, they need to sell at least 8 million kilos of wheat per year. They finance the company's core activities through the wheat they sell as any additional income that they receive from external R&D projects does not really help to boost profit margins, nor have they been successful in achieving profits from the new varieties of other cultivars. Nevertheless, additional collaborations are an important strategic goal of AgroVegetal because they are beneficial for raising the company's profile, for promoting product innovation, and for acquiring and growing new business opportunities. AgroVegetal is still working on developing other wheat varieties which are more suited to other Spanish regions.

References:

Innovative SME Award by the Spanish Ministry of Economy and Competitiveness in 2016.

Platoscience, from Lab to Market Adopting Crowdsourcing for Refining a Product Concept and Raising Awareness[10]

Ekaterina **Albats**, Researcher/Innovation Manager at Lappeenranta University of Technology (LUT)

Maria Augusta **Mancini**, Senior Expert at TII asbl, on behalf of the INSPIRE project, a Coordination and Support Action funded by the EC under Horizon 2020

Abstract:

This is the story of a start-up company, which was formally founded in August 2015 by two scientists who were the founding partners of an organization working on neuroscientific research in creativity and problem solving. Within their daily research activity, the core team had detected as early as 2011 an opportunity to develop a totally new concept and a plug'n'play headset device, a brain neurostimulator device (based on electrical micro-doses) for enhancing creativity. It was a disruptive solution at the time, not well-known either at the end-user's level or among the scientific community. From the concept development stage, the company has been actively utilizing external sources of knowledge and expertise (building and maintaining relationships with individual experts, research teams, lead users, other companies) and also shares its internal expertise and knowledge externally. The case is not just about a company, but a crowd-science project which runs a community of neuroscientists, engineers, developers and creative people and also exploits the expertise and resources of the business incubators which hosted the new company. The company finalized its first patent application in December 2016 and raised angel funding. PlatoScience is a case that shows that high level technical skills and knowledge, entrepreneurial spirit, crowdsourcing and a supportive innovation ecosystem are key ingredients for bringing disruptive solutions to market.

Keywords: Triple Helix, crowd-science, crowdsourcing, user-centered, open innovation

Geographic Coverage: Denmark

Strategic Aims:

This new disruptive application of a known technology was not yet well accepted either at the end-user's level or among the scientific community. Since this seemed an insurmountable challenge (there was a lack of alternative products on the market and a general resistance of users to electrical stimulation techniques to the brain) the two scientists abandoned their idea. It remained in the drawer until some years later an industrial player started to work in this field and invested in a huge dissemination action which raised a lot of public interest. Encouraged by this development, the research team decided to go to market by creating a new company and investing in the development of a prototype of a plug-and-play, non-invasive neurostimulation system. A second step was to validate its functionality on a large scale by engaging with the crowd.

The high level of innovative content and the need to create market demand and contain the cost forced the team to engage external sources of expertise:

[10] *Case Owners:* INSPIRE, a project funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 691440 - www.inspire-smes.eu

- An open source project and expert online community called Reddit, an inter-net-based technology forum, where more than 8 000 people are asking questions, sharing information and links to articles and discussing topics, such as the type of technology that the company in question is using. They are based on the “give-and-take” principle which provides fast and useful inputs.
- Potential users, engaged via a pioneer programme, getting them to contribute actively to the product development phase – in this case some 25 people (friends, family and outsiders).
- The company advisory board composed of 20 experts active in the different steps in the value chain (marketing, manufacturing, certification/regulation).
- Business incubators; the user-centred/interaction design-type of incubator, where the team was hosted the first year and a high-tech physical product incubator where they are now - “a very nice place to be, also in terms of talking to the right people and finding the right resources”.

The input collected from these external sources led to the product being refined. While still in the market launch stage (a pre-sale version was launched recently), the core team decided to intensify collaboration with external experts to acquire specific skills and solve technical issues needed for scaling up the technology. The current challenge lies in developing a scalable mass market product with a view to optimizing it for the healthcare sector

Case Overview and Track Record:

This case study relates to a start-up company which assumed for the first time a crowdsourcing logic for developing a new product and creating market demand and which also committed to embed this paradigm in its future business strategy. The case was elaborated within the INSPIRE project (standing for Integrated Support of oPen Innovation pRofessionalization initiative), a Coordination and Support Action (CSA) funded by the European Commission under H2020, that has investigated in depth 120 Open Innovation (0I) practices in SMEs across Europe. The purpose is to distil lessons about how to improve the supply chain and deploy dedicated support measures. In the coming months the INSPIRE team will publish a dedicated OI platform offering an integrated toolbox (ready-to-use tools, support resources and inspirational cases) for enhancing the adoption of OI among SMEs.

Tangible Impact:

In December 2016 the company submitted a patent application and raised the necessary funding from two business angels and a seed fund. Recently, a pre-sale version of the product was launched on the market.

Intangible Impact:

Thanks to this open innovation approach in accessing the necessary skills/know how, the company was able to develop a complete solution which was also tested to obtain user experience. The company has come to the realization that it takes much less time to track down the person who knows the most in the world about a certain subject rather than trying to become a super expert oneself. The team increased its understanding of how to deploy such skills throughout the first year of activity. They built up a wide crowd community which is valuable for collecting hints and feedbacks as well as for covering the different areas of the value chain (from prototyping to manufacturing to product certification).

Transferability and Lessons Learned in Triple Helix Cooperation:

The key lessons learned (find out what you do not know, engage the right people, use the crowd for designing the product concept and not only for testing) are the results of more than two-and-a-half years of experience in the field. We really believe that this case can inspire other start-ups who are developing complex high-tech solutions to understand better the value of both external experts' contributions and user involvement. This case also illustrates well that sometimes a small company could be more efficient in leveraging external sources of knowledge as there is no need and actually no resources and no reason to hire experts from every area required. Of course, this implies also that a positive entrepreneurial culture and a supportive innovation ecosystem are in place (the company benefited both from incubation facilities and seed funding).

Entrepreneurial ecosystems have become more and more important for achieving political objectives. In particular, policymakers recognize that investing in measures to stimulate an entrepreneurial spirit among researchers boosts the growth of regional economies. When offering ad hoc resources and services (expertise, funding, support) it is essential to allow start-up companies to keep up with new technological solutions so that they can transform high-level skills/knowledge into market-ready and scalable products and capture market opportunities.

The possibility to collaborate is now met with a wide availability of skilled people from different countries and working in different sectors who are accessible, inter alia, via internet forums on the basis of a "give and take" formula. Open-minded entrepreneurs, who are ready to engage with the crowd, follow a user-centric logic from the early stages of the product design, thereby making a difference in matching users' needs and creating a coherent demand. Actions which aim to support entrepreneurship through opportunity rather than by necessity can help create successful companies which are able to scale up internationally within a few years enabled by disruptive solutions.

References:

Best HealthTech Startup - PlatoScience has been nominated for Nordic Startup Awards.

Archimede Solar Energy - an Industry-Research Collaboration from Public Procurement Assignments to a Mutual Knowledge Exchange[11]

Maria Augusta **Mancini**, Expert at TII asbl, on behalf of the INSPIRE project, a Coordination and Support Action funded by the EC under Horizon 2020

Abstract:

This is the story of Archimede Solar Energy, a start-up company spun out from an Italian industrial group for the purpose of commercializing knowledge developed by a major Italian Research Center (ENEA), which was financed by two international investors. From its origins in a large company, it is in practice an SME which faces the same issues as other SME counterparts. Thanks to its manufacturing/industrial expertise and its cooperation with a consortium of selected Italian suppliers, Archimede was able to prove the technical feasibility of a technology patented by ENEA while engaging in a fruitful and long-lasting collaboration. By exploiting this valuable and mutually beneficial collaboration, matured during a public procurement assignment, as well as its know-how/IP portfolio (exclusive licensing agreements and proprietary patents for production processes) and its network, Archimede Solar Energy has managed to become within a few years the world leader in the production of solar receiver tubes for thermodynamic power plants with parabolic trough collectors. This case demonstrates in a practical manner how a long-standing OI collaboration between a leading public research centre and an industrial player, with a clear aptitude for teaming up with strategic stakeholders, can generate not only novel technologies but also a fruitful mutual knowledge exchange which is enriched by their cultural complementarities (technology push vs market driven approach).

Keywords: in-licensing, industrial spin out, disruptive innovation, mutual knowledge exchange, cross-fertilization

Geographic Coverage: Italy

Strategic Aims:

When solar energy started to show promising market potential, Mr Gianluigi Angelantoni, President of the industrial group of the same name, decided to look for new cutting-edge technical solutions in order to grasp the market opportunities offered by this new sector and in the process diversify the group's business activity. In pursuing their goal, Angelantoni Group started to collaborate with research organizations active in the solar energy area and to build up an integrated supply chain with selected Italian manufacturers. An opportunity arose when ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) launched a public tender to build a prototype of the sputtering machine for producing solar receiver tubes based on a patented method which uses molten salts for heat transfer and storage (instead of oil), invented by Carlo Rubbia (former President of ENEA

[11] *Case Owners:* INSPIRE, a project funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 691440 - www.inspire-smes.eu

and Nobel Prize winner). Thanks to its unsurpassed technical skills, the Group won the tender and thereby kicked off a long-standing and mutually-beneficial collaboration between the two organizations.

To advance the prototype from proof of concept to an industrial product, an intensive joint innovation effort was set in motion to optimize the technical features. This involved integrating new patented technologies and setting up a low-impact production process. On the basis of the results which were achieved, Angelantoni decided to move directly to high-quality mass production while relying on collaboration with ENEA and its supply network. In 2007, Angelantoni Group established ASE to engineer and scale up the ENEA-inspired technical development and thereby acquire a leading position in the solar energy sector and widen its product portfolio.

Scaling up to high-volume industrial production implied building a large plant; this required an injection of state-of-the-art skills and fresh financial resources to succeed, as well as a continuous scouting exercise for novel features and expertise to improve the core technology. The exclusive licensing agreement on ENEA's worldwide patent first attracted the involvement of a multinational industrial player; however, following a lack of alignment in strategic vision, Angelatoni Group quickly took back control. Shortly afterwards new investors entered into the capital, while acting also as door openers in new fast-growing markets.

Once the performance of the product was optimized, the main innovation activity focused on improving the production process thanks to synergies with the technical know-how of the research centres involved and the company's own in-house industrial skills. Strategic partnerships played a key role not only in the concept and development stage of their new business, but also in the way ASE approached the market. In order to bid for public tenders to build solar production plants - and to be successful – ASE chose to team up with reliable pre-selected suppliers in a formal consortium, as well as local players. The latter contributed to creating market demand by promoting the ASE technology and its added value to potential customers/decision makers, while membership of sectoral associations facilitated the creation of favourable conditions. In order to fully capture the market, the company decided to widen its product portfolio to incorporate alternative solutions and offer consultancy and engineering services for the construction of thermodynamic solar plants.

To further improve both process and product quality, the company also developed its own new technologies which are protected by various international patents.

Case Overview and Track Record:

The Open Innovation logic is embedded in the company's vision and values. From its beginnings as a joint R&D experience, the partnership with ENEA is still on-going and other collaborations have been initiated with players both on the research side and in industry and finance. To maintain its technological leadership, the company has put in place a focused innovation strategy which concentrates on continuous product development and on the search for new methods to improve the production process.

This case study was elaborated within the INSPIRE project (standing for Integrated Support of oPen Innovation pRofessionalization initiative), a Coordination and Support Action funded by the European Commission under H2020, that has investigated in depth 120 Open Innovation (OI) practices in SMEs across Europe with a view to distilling lessons about how to improve the supply chain and deploy dedicated support measures. In the coming months the INSPIRE team will publish a dedicated OI platform offering an integrated toolbox (ready-to-use tools, support resources and inspirational cases) for enhancing the adoption of OI among SMEs.

Tangible Impact:

The new company is a world leader in the solar energy domain. In 2013, ASE inaugurated a demo plant, the most innovative solar plant with thermal storage in the world and positioned itself as a leading player (50% market share of the European Concentrating Solar Power (CSP) systems and 100% of the molten salt solar receiver tubes, the technology patented by ENEA). Along this Open Innovation journey ASE was able to obtain exclusive licensing agreements and new proprietary patents crucial for the novel process they set up which aimed to reduce both environmental impact and manufacturing costs (it led to a 30% reduction of energy storage costs). Moreover, they were able to build up a consortium of pre-selected suppliers covering the full supply chain for the purpose of submitting joint applications for public tenders. This helped to raise the necessary resources and strengthen strategic partnerships with key players who could act as door openers (Chiyoda Corporation in the Middle East and North Africa; FAL Holding for Saudi Arabia and the vicinity).

Intangible Impact:

"*From our experience we learned that to bring a disruptive and complex innovation to the market, it is fundamental to form strategic alliances with strong partners, both from the research and industrial/business world*", commented the CEO. This case shows that to achieve a win-win collaboration it is essential to overcome any communication barriers due to the different backgrounds and mindsets of the partners. The collaboration with ENEA enhanced the technical skills of the ASE team, while the experience of working with industrial partners has been an important training opportunity for middle management, especially in terms of building a sales network and addressing communication issues thoroughly.

Transferability and Lessons Learned in Triple Helix Cooperation:

The key lessons learned from this case can be inspiring for any company that needs to establish long-standing collaboration with large public research organizations and multinational companies to bring a complex solution to market and for which different skills and expertise need to be developed.

The key highlights are:

- In the high-tech area, interacting with industrial players requires strong skills and an in-depth knowledge of the market.
- Public research centres and universities are generally seen as preferred partners by industrial players for joint research/innovation activities.
- Negotiation with investors can be demanding and is not always satisfactory if agreement is not reached on the strategic roadmap.
- Collaborate with a supply chain of reliable partners with a local presence when the main sales channel is through public procurement.
- Close collaboration between academic and business teams also generates interesting cross-fertilization effects.
- On the other hand, the following key lessons have been learnt: Developing cutting edge/complex products often requires a wide range of resources, skills and expertise and the need to form strategic alliances with strong reliable partners.
- The skill of the entrepreneur to bring together the necessary elements makes all the difference for the company's success; generally, it is stronger in an industrial spin out, such as ASE, which benefited from the solid industrial experience matured by the parent group.

- As shown by this case, it is vital to overcome any communication barriers caused by the different backgrounds and mindsets of the two sides in order to achieve a win-win research-industry collaboration (part of the political agenda of most regional/national governments). This long-standing open innovation practice shows that R&D collaboration generates not only new IP/knowledge but also a fruitful cross-fertilization between teams with a research and business experience/approach with each side complementing the other from a cultural point of view.
- Governments should facilitate this collaboration which is pivotal for the economic development of industrialized countries by acting as a coordinator and setting the ground for a conducive innovation ecosystem. In particular, this means implementing measures and funding schemes aimed at supporting knowledge transfer within public research organizations and, as in this case, acting as an "early adopter" of new cutting-edge technologies. A horizontal cluster covering the supply chain of a specific product can be born spontaneously to overcome a market barrier and enhance its exploitation.
- Governments should therefore support their development with dedicated resources, given the potential impact on regional development in terms of both GDP and jobs created.

Sustainability

The company raised resources from several investors and engaged strategic partners. They are also looking for partnerships to progress and consolidate their market position. For the future the company intends to maintain its technical leadership and to continue their collaboration with ENEA and other strategic partners, while entering the North Africa and Middle East markets and improving their local presence and visibility.

References:

Archimede's Massa (2012) Martana manufacturing plan, designed by Paolo Verducci and Studio Maryfil Perugia, was selected as one of the top 20 sustainable buildings in Italy at the Venice Architecture Biennale 2012.

Winner of the SAPIO award 2009.

Index