

► Inclusive innovation or inclusive growth?

The evolutionary dilemma for SMEs and clusters in developed and developing countries: searching the 'X' factor

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The evolutionary theories of Darwin and Lamarck cannot be applied independently to describe the evolution of some world-class clusters but a merging of those theories is still driving the evolution of clusters and enlarged eco-systems where the role of intermediaries has been emphasized. The new challenge, policy makers are facing, is coupling growth with innovation thus not letting down traditional industries or sectors only because they're not innovative enough. In developing countries the inclusive innovation approach or frugal innovation, is becoming a trendsetter in searching innovations that from the very beginning are designed to be inclusive and propulsive. The so-called developed countries still fight with global competition unexpected (?) economic challenges and consequences of recession. Which is the best 'evolutionary approach? Everyone must radically innovate or die? Can incremental innovation still play a role to rise wealth? Is paper will start from the most common evolutionary theories and how some eco-systems have changed and make emerged the role of intermediaries. In the second part it will come up the dilemma of 'forcing' innovation or smoothly making it happen. The evolution process is now affecting the eco-system as a whole and not only the single species or the single elements (ie SMEs, large enterprises, policy makers, government, research organizations, universities etc.). The new paradigm require more flexibility and adaptability but increases the complexity and eco-system overall entropy. Species (stakeholders, ecosystem components) are evolving, thus appearing new champions (ie start-ups), new domains (digital economy), new approaches (inclusive and jugaad innovation). The ecosystem next stage is pushing for collaborative projects (multi-companies, mix-up of large enterprises and SMEs) and new actors (dynamic intermediaries that can offer also solutions, easy-to-use tools and services). The common and shared results of all the cases presented take to the acknowledgment of the innovation intermediaries role to support technology innovation or economic growth or both. Is the winning formula a mixed theory of evolution? Will the offspring keep the 'x' factor?

Keywords: evolutionary path, innovation, economic challenges, intermediaries, evolution factor, empirical evaluation, policies

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PREFACE

The main results of this paper are based on 15 years long professional experience of the author¹, dealing with 500+ Small and Medium Enterprises (SMEs) in Italy, India and Europe. The continuous interaction with entrepreneurs, R&D directors and export managers has made this article possible as well as the Innovation and Internationalization match-making that drove last 10 years professional assignments.

To not create confusion, the terms 'district' and 'cluster' are for simplicity referred to grouping of companies linked by sector and territory presence. The Textile/clothing district/sector for instance is intended as the sum of different companies (production, mechanic, ICT, packaging, logistic, software etc.) that are insisting on the same industry in a broad sense.

➔ Some 'Take home messages' are highlighted in each paragraph.

ABSTRACT

The evolutionary theories of Darwin and Lamarck cannot be applied independently to describe the evolution of some world-class clusters but a merging of those theories is still driving the evolution of clusters and enlarged eco-systems where the role of intermediaries has been emphasized. The new challenge, policy makers are

facing, is coupling growth with innovation thus not letting down traditional industries or sectors only because they're not innovative enough. In developing countries the inclusive growth tries to match with inclusive innovation approach (or frugal innovation) thus becoming a trendsetter in searching innovations that from the very beginning are designed to be inclusive and propulsive. The so-called developed countries still fight with unexpected (?) global competition economic challenges and consequences of recession. This paper intends to provide a contribution to the discussion, based on real cases and hands-on experience, on how single company or district evolution approaches are differentiated based on economic priorities and infrastructure. Namely intermediaries, government lead agencies etc. and try to shape the evolutionary 'x' factor that leads to a new concept of (evolving) industrial ecosystem. Is the same evolution path applicable to both developing and developed countries?

INTRODUCTION and DEFINITIONS

The economic and innovation situation

In recent decades, the majority of European industrial districts have shaped a context conducive to the development of SMEs, a place where the vitality and entrepreneurial-, work- and social-skills have been a flywheel for the growth of the local economy and community. From another perspective, the conventionally labelled developed countries have designed strategies to keep the momentum and boost the rise back from the crisis: 'scrambled' or 'last-minute' innovation policies, government funds, access to finance and equities, technology transfer, start-ups funding have been some of the conventionally adopted schemes. In some cases something went wrong. South European countries like Spain, Italy, Greece and France launched reforms later than expected and wrongly assuming that the backbone of their economy, ie SMEs could have filled the gap as fast as the crisis hit their businesses in late 2008.

This economic picture can be also matched with the innovation level in Europe as depicted in the "Innovation Union Scoreboard 2015" [33] and graphically described in the below figure.

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EU MEMBER STATES' INNOVATION PERFORMANCE



“Global growth remains moderate, with uneven prospects across the main countries and regions. It is projected to be 3.5 percent in 2015. Relative to last year, the outlook for advanced economies is improving, while growth in emerging market and developing economies is projected to be lower, primarily reflecting weaker prospects for some large emerging market economies.”²

Despite official economic outlook/reports [1], if we look at the so-called developing countries, the ‘Next Eleven’³ or BRICS + MINT⁴ innovation policies and linked economic results, their performance can be evaluated as outstanding from the value-for-money and return-on-investment time unless their challenges are quite different and more oriented to inclusive innovation and social inclusion (along with economic benefit and growth). In some countries the innovation policies have been designed following western countries experience after a sort of SWOT analysis and since the beginning innovation was one of the fundamentals on which base the next decade economy.

“Iran has pursued a development strategy of self-reliance with some success. Iran adopted an import substitution policy and used its oil revenues to acquire foreign technologies to industrialize. Iran is today a middle-income developing country, with a significant industrial base, a relatively well-developed science and technology infrastructure and good human

development. However, unlike other middle-income countries, Iran is still largely a natural resource-based economy. Diversification is an imperative, not only because natural resources are exhaustible but also because export success in world markets increasingly demands knowledge-intensive production and innovation-based competition. The shift to a more knowledge-based economy will require creating a national innovation system that can not only import and adapt technologies, but also improve upon them, innovate new technologies and diffuse them economy wide. There is need to better link the science and technology infrastructure to the needs of the productive sector generally, and in particular to build up capabilities in high technology areas such as biotechnology, petrochemicals and new materials.”

The latter was the central message of a report published by the United Nations Conference on Trade And Development (UNCTAD) in 2005⁵ and reflects also the motivation on which the author based his activity as in charge of the ‘Textile and Clothing Technology Centre Support project’ during his tenure as officer for the Italian Ministry of Industry⁶.

➔ SMEs growth is the cornerstone to produce wealth and favor growth.

Setting the scene

As briefly anticipated, today we currently experience another layer of complexity: next to companies in serious difficulties, which often result in the closure of the business and abandonment of production facilities, there are companies that are in growing need of skilled staff (eg. Italy) and on the other side technology providers are more oriented to foreign collaboration rather than domestic technology transfer (eg. India). The geography of innovation is very diversified and characterized by a multi-parameter modelling: cost reduction, productivity increase, quality enhancement, market share, revenues and margins are some of the economic challenges. Those parameters shall be coupled with social challenges (eg. social inclusion, disparity reduction, population rural diaspora, ageing population, etc.) as well as

² World Economic Outlook 2015 "Uneven Growth: Short- and Long-Term Factors"

³ Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, the Philippines, Turkey, South Korea and Vietnam

⁴ Brasil, India, China, South Africa + Mexico, Indonesia, Nigeria, Turkey

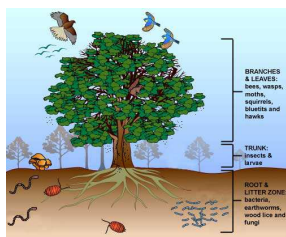
⁵ Science, Technology and Innovation Policy Review - The Islamic Republic of Iran

⁶ Ministero dello Sviluppo Economico aka ‘Istituto per la Promozione Industriale’

technical ones (eg. urbanization, lack of innovation, low technology level, manufacturing conditions, environment friendly and greening industry, etc.). Going through the main reports on innovation [1][18][25] and global economic perspectives [26] is difficult and hard finding an all-comprehensive indicator on how innovation can be of help if backed by a sustainable growth, economic reforms and proper policies adoptions as seen from the perspective of an evolving industrial context.

- ➔ Innovation and Internationalization are the way forward for economy recover and industrial boost but the evolutionary pathway for both SMEs or grouping of SMEs is diverse and changing according priorities of different countries around the world.

The industrial eco-system

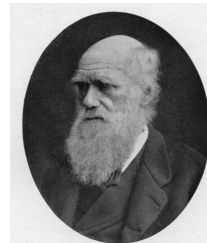


The basic unit of study in environmental science is the eco-system (short for 'ecological system'). An eco-system consists of a biological

community and its physical environment. An eco-system can be as small as a drop of water or a puddle, or as large as a forest and vast, such as an ocean. Some eco-systems (such as caves) have clear boundaries, while others (such as forests) do not. An eco-system provides the organisms that live in it what they need to survive: food (energy), water and shelter. The number of producers (or plants) in an eco-system determines that eco-system's productivity potential. Plants and animals depend on each other to survive. This connection of living things to each other is called biodiversity. Eco-systems provide services, such as food production (farmland), water filtering (wetlands), carbon removal, raw material production (timber, rubber), and aesthetic value. The balance of an eco-system is delicate, and a disruption such as the introduction of a new element can damage it. Because many modern human societies get their food, water, and other resources from all over the planet, you can consider the entire globe to be the human eco-system.

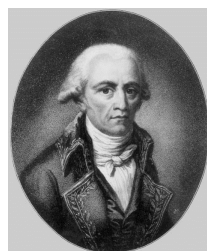
Using the same approach we can also define the enlarged industrial society (ie expanding the triple helix concept⁷) an eco-system where different actors are benefitting from common resources (ie energy, services, provisions, etc.) and contributing to the sustainment of the system (tax, wealth, income). Each actor is an independent being with own characteristics (it can be a manufacturing unit or a research organization, a service provider or a school, a public entity or an intermediary), weaknesses and strength but all contribute to the 'biodiversity' and complexity of the system [8], although it could be (at macro level) a specific domain of interest (ie industry and sectors of activities in which the eco-system is operating, like automotive, health, agro-food etc.).

THE EVOLUTIONARY THEORY



Charles Darwin (1809 – 1882) believed that the desires of animals have nothing to do with how they evolve, and that changes in an organism during its life do not affect the evolution of the species. He said that

organisms, even of the same species, are all different and that those which happen to have variations that help them to survive in their environments survive and have more offspring. Other individuals, that are not so well adapted, die off. Most elephants used to have short trunks, but some had longer trunks. When there was no food or water that they could reach with their short trunks, the ones with short trunks died off, and the ones with long trunks survived and reproduced. Eventually, all of the elephants had long trunks.



Jean-Baptiste de Lamarck (1744 – 1829) is best known for his Theory of Inheritance of Acquired Characteristics, first presented in 1801 (Darwin's first book dealing with natural selection was published in 1859): If an

organism changes during life in order to adapt to its environment, those changes are passed on to its offspring. He said that change is made by what the

⁷ http://triplehelix.stanford.edu/3helix_concept

organisms want or need. For example, Lamarck believed that elephants all used to have short trunks. When there was no food or water that they could reach with their short trunks, they stretched their trunks to reach the water and branches, and their offspring inherited long trunks. Lamarck believed that giraffes stretched their necks to reach food and their offspring and later generations inherited the resulting long necks.

If we paraphrase the same sentences written above to describe the Darwinian theory and shift them to an SMEs-oriented vision it is incredibly matching a real industrial situation: “in some cases the desires of SMEs (ie turnover and margins increase, cost reduction, market share consolidation, export and promotion) have nothing to do with how they evolve (maybe something went wrong due to a product failure, a wrong campaign, weak-minded investments, market conditions, economic crises, customers behavior etc.) and that changes in an organism during its life do not affect the evolution of other SMEs. SMEs, even of the same ‘species’ (industrial sector), are all different and that those which happen to have variations (ie new products, cautious financials, known brand, ‘value for money’, etc.) that help them to survive in the economic (market) environments survive and have more offspring linked to it (ie spin-offs, new business units, new product lines, etc.). Other SMEs, that are not so well adapted, die off or, likely, try to group together to face the problem or the new challenge”. Some examples can be the so-called gazelles that paved the way for new products, companies like Vibram, Geox, 3M, Apple, Tecnica Group, Arduino started as small (or micro) companies unleashing disruptive innovation that became gold-standards or best-of-breed within their domain.

The same ‘game’ can be played with the Lamarckian theory and the cluster/district concept. “If a group of SMEs change during their life in order to adapt to economic environment and new challenges (macro, micro, social, technological, legal, etc.) those changes are passed on to other similar SMEs. Change is made by what the cluster/district want or need. The Lamarck example of elephants short trunks versus the shortage of food or water is perfect to describe the current situation in many countries: new

challenges are forcing aggregated SMEs to think in an open manner and find general solution to be singularly adapted”. For example the environment sustainability challenge has forced companies in many sectors (ie leather, footwear, paper, etc.) to find solutions and inventions (ie new materials or processes) to face new import regulations, product traceability, etc. It’s given that the coming generation of companies in the same sector will start from those general assumptions and differentiate on other aspects (product design, added value, marketing, etc.).

- ➔ Before the economic crisis the first matching that could have been done, in a very broad sense, was Darwinian theory with SMEs and Lamarckian theory with clusters.

THE ECONOMIC CHALLENGES

As said, to certain extent the industrial (and innovation) eco-system [2] can be associated to a biological community. The different ‘organisms’ like Public Administration, Local Government, Agencies, Intermediaries, SMEs, Large industry, Micro and Small Scale Industry, Universities, Research bodies, Professional schools contribute to the life of the overall system and are subjected (as a single or as a whole) to evolutionary process. If we consider the single enterprise or the cluster, their evolution is a mix of endogenous and exogenous stimulus according also the different challenges they might face [3][4]. The eco-system is driven by many factors and of course *in primis* by the geographical, socio-economic and political environment. If we consider those aspects as primary, the challenges that the newly defined eco-systems (or single SMEs) have to face are different and complex.

Macro challenges

The brand new challenge policy makers are globally facing is coupling growth with innovation thus not letting down traditional industries or sectors only because they’re not innovative enough [5]. In developing countries the inclusive innovation approach or frugal innovation [21], is becoming a trendsetter [20] in searching innovations that from the very beginning are designed to be inclusive and propulsive [6][28]. The so-called developed

countries still fight with global competition unexpected (?) economic challenges and consequences of recession. A first exercise of coupling innovation with the above mentioned challenges have been made by the European Union through its 'Europe2020'⁸ strategy depicting societal challenges on which structure R&D and Innovation funding schemes, namely Horizon2020⁹. Reshaping the United Nations Millennium Development Goals and the European Union societal challenges, the macro-themes can be listed as: (i) new generation social trends (ii) growing population (iii) multicultural environment (iv) active ageing (v) digital divide (vi) climate change (vii) biodiversity (viii) poverty reduction (ix) science and technology (x) energy. The one-fits-all approach is of course not valid as some of them have to be adapted to specific country conditions.

- ➔ 'Inclusive growth' is the goal of developing countries where the need is to rise the wealth and face the growing population therefore not requesting high level of innovation.

Terms like frugal or jugaad innovation [16][19] are very popular in India and affordable (accessible) to the majority of micro-SMEs but the general innovation level provided is low if compared to other countries. It's true that India has become the ICT hub for the world as well as competence center for other sectors but the results are all for the benefit of foreign multinationals and poorly transferred to the locals.

- ➔ 'Inclusive innovation' approach is based on innovation as the main driving factor and favoring the spread of innovative culture and high-end technology adoption

The developed countries are struggling in facing low-cost production countries competition by 'forcing' companies in adding technology and innovative solutions to new products/services. The limit is in the cultural and innovation related mind-set of SMEs who might need external help and their financial capacity.

Micro challenges (examples)

Italy - Looking at the picture below where each red dot is representing a company in a range of 50-250 employees, it is clear how Europe is very much driven by SMEs and how Italy can be assumed as the cradle of manufacturing districts.



The 141 Italian industrial districts (identified by National Statistics Institute¹⁰) account for about a quarter of the country's productive system in terms of employees (24.5% of the total) and local production units (the 24.4% of the total). Manufacturing district represents over one third of the total (still in line with what has been observed 10 years ago) and are home to about 22% of the Italian population. The greatest number of districts (45) is located in the north-east regions (ie Veneto [30], Trentino Alto Adige, Friuli Venezia Giulia), traditionally the territorial area of reference for the Italian district model. The districts of the 'Made in Italy' are 92.2% of the total and divided in mechanics (27.0%), textile and clothing (22.7%), household goods (17.0%) and leather and footwear (12.1%). The global market slow-down, the credit crunch and weak (as well as late) economic reforms have affected the general re-boost of production and decapitate the employment rate (especially in south regions). Many SMEs intended innovation as a quick-and-dirty affair and the collaboration with Knowledge/Innovation providers as a customer-supplier affair.

India - The Indian definition of innovation is twofold, from one side a hub for high end technologies and competence (IT and BPO sector in Bangalore, IIT national network [9]) but from the other side a scares experience on technology transfer to nation-wide SMEs. Indian innovation is targeted to diverse scope: (i) Enable

⁸ http://ec.europa.eu/europe2020/index_en.htm

⁹ <https://ec.europa.eu/programmes/horizon2020/>

¹⁰ <http://www.istat.it/en/>

solutions/inventions that have impact on social and economic value (ii) Fulfill unmet needs (iii) Moving beyond R&D to mean new applications of old technologies. In a wide sense the local challenge is to scale up the so-called inclusive/frugal (improvisational) innovation that is driven by scares resources and customers' needs [14].

Iran - Iran has a relatively well-developed science and technology infrastructure among developing countries. It has also built up a significant industrial base, mainly by licensing technology from abroad. However, the export base is narrow and, in the long-term natural resources are exhaustible. It is, therefore, of paramount importance to diversify the economy. In order to achieve this, Iran started creating an innovation system that can not only import and adapt technologies, but also improve up on them, innovate new technologies and diffuse them economy wide. Iran's efforts to transform from natural resource-based economy towards a knowledge-based economy are reflected in its past science, technology and innovation policies.

LOCAL ECONOMY, GLOBAL REACH

It has been demonstrated through experience and hundreds of interviews conducted in the last 10 years with entrepreneurs (mostly in Italy, Europe and India) that the SMEs evolution pattern could be described in principle with the Darwinian approach. In short and simplified words, a specific entrepreneur or his/her technical staff (rarely and R&D manger if we consider SMEs), incidentally became enlightened and gives birth to an innovative product or service. Another part of the discussion is the evaluation of the innovation proposed and the quality (incremental in most of the cases, disruptive in rare cases). We can assume it is an endogenous event. If we look at the clusters approach, namely a multitude not-always-well-organized of SMEs but keen on pouring towards new ideas/technologies, the innovation incentive is coming from 'outside', it is an exogenous instigation therefore a stimulus generated by the environment ie a Lamarckian approach. The latter means that when external solicitation (ie economic urge, standards and norms, new competitors, technology uptake) are there, the survivors will be the ones who are better adapting (modifying) themselves. These are the conventional western approaches and the ones

who inspired also strategy and competitiveness publications in the late 90s. The following examples of international approaches based on past and current professional assignments of the author, will take to a different conclusion that will be clear in the coming sections, matching also the outcomes of [7].

Yazd (Iran) - Since 1990, Iran's economic plans have emphasized a gradual move towards a market-oriented economy and development of private sector. In particular the Fourth Five-Year Development Plan (FYDP) released in 2005, was supposed to commit the government to a program of liberalization, diversification and privatization while Iran was gearing up its national innovation system for this transformation by focusing on building up capabilities in high technology areas such as biotechnology, petrochemicals and new materials. Iran's strength lies in its human resources (well trained scientists and engineers) and its natural resources (a large variety of flora, fauna and oil and gas). These resources if used effectively, could have transformed the economy in a reasonably short period of time.

Iran has built up substantial technological capacity in terms of research institutes/universities, scientists and engineers and production capability. According to one index, the 'Technology Achievement Index (TAI)' [13][24], developed by UNDP, Iran was ranked 50 out of 72 countries that were assessed in 2001 and 2nd among Muslim nations with TAI>0,5. The TAI is one of the most recent sets of indicators developed to assess technological capacity of a country: 'how well a country is creating and diffusing technology and building a human skills base'.¹¹ The countries that

¹¹ The "Technology Achievement Index" (TAI) is used by the UNDP (United Nations Development Program) to measure how well a country is creating and diffusing technology and building a human skill base, reflecting capacity to participate in the technological innovations of the network age. The TAI focuses on four dimensions of technological capacity (i) the creation and use of new knowledge and technology (with indicators for patents granted and license fees received per capita), (ii) diffusion of recent innovations (Internet hosts per capita and tech-based exports as share of all exports), (iii) diffusion of old innovations (log of telephones and electricity consumption per capita) and (iv) human skills (mean years of schooling and enrolment at technical tertiary levels). The TAI also provides indicators to measure potential direct and indirect inputs into an innovation process such as the share of educational expenditures in total government expenditures, the

rank highest on the TAI are described as technological *leaders*. This group includes Finland, US, Sweden and Japan, along with the Republic of Korea and Singapore. The second level of *potential leaders* in technology includes a larger number of developing countries: Malaysia, Mexico, Argentina, Costa Rica and Chile. The third level, *dynamic adopters*, includes: Iran, South Africa, Panama, Brazil, China, Egypt, Indonesia, Sri Lanka, India and others.

Iran has a relatively high expenditure on education as a proportion of total government expenditure and a fair ratio of science enrolment in tertiary education, compared to several other developing countries, however, it has a very low proportion of technology-based exports. In order to transform its economy into a technology-based one, Iran needs to increase its R&D expenditure substantially. In this respect Iran is lagging behind several other economies such as Brazil, India and South Africa.

The 4th FYDP was comprehensive, contained abundant quantitative targets, and constituted the first of the four pillars of a 20-year economic and social vision to significantly upgrade Iranian economic, political, and social international status [10][12]. The 4th FYDP underscored a smaller government role in the economy, drew attention to enterprise privatization, and stressed more reliance on market forces. However, the plan's implementation responsibility was assigned to President Ahmadinejad's government, with little conviction as to its content, assumptions, and objectives and only modest desire for its success or modification. Under these conditions, the 4th FYDP missed a golden opportunity to use high oil and gas revenues to facilitate an environment conducive to transforming the Iranian economy from a state of high inflation, protracted unemployment, and low growth to a platform with

higher standards of living that the hard-working Iranian people deserved [11].

After the 4th FYDP, the government deliberated on a 5th FYDP with many targets that were much less quantitative. The Iranian authorities lost the opportunity to learn from the results of implementation of the 4th FYDP and did not attempt to revise many similar and improbable assumptions under the 5th FYDP [11]. While there is no doubt that both the 4th and 5th FYDPs were comprehensive encompassing most of the country's desires in social, security, and foreign relations and in scientific, technological, cultural, and economic areas- they were nevertheless unachievable and unworkable.

The experience gained in the textile district of Yazd witnessed the incoherence of science and technology (missing) policy of Iran versus the standard and remarkable level of schooling and education as well as research capabilities.

➔ Clear needs, good policies design, bad implementation due to government weakness and political blindness.

Treviso (Italy) – The area of Treviso (along with the area of Vicenza) located in 'productive north-east' region of Italy (ie Veneto region) is characterized by the highest rate of productive activities per inhabitants in Europe. It is considered the engine region of Italy, as well as Milan and Lombardy, and the cradle of the 'district' concept.



number of scientists engaged in research and development per million population and the share of R&D expenditures in Gross National Product (GNP). GNP is the market value of all the products and services produced in one year by labour and property supplied by the citizens of a country; unlike Gross Domestic Product (GDP), which defines production based on the geographical location of production, GNP allocates production based on location of ownership.

The district is characterized by a fragmented and diversified industry [3][4] represented by 84,256 active companies (38% industrial sector, the highest in Italy), 81,31% SMEs (excl. Agriculture and Fisheries), 99,9% with less than 250 employees and not focused on specific domain. The spectrum

of sectors is wide and comprising white-goods industry, plastic, sport-system, footwear, ICT, automotive, furnishing and woodworks, textile-clothing, eyewear, etc. The global recession has of course affected the local business and made some 'natural selection' [31] but during the last year some positive trend has started [32]. Those data are half good if we consider that the 'internationalization' feature was the driving force while the 'innovation' component has been misinterpreted. The capacity to innovate is set in SMEs mind (in the majority of them) as the capacity to solve the customers' problem. Before the crisis (2007-2008), very few companies were discussing with external technology/knowledge providers, namely universities or private research centers, about the development of new products or inclusion of new technologies. From 2010 the trend started changing but it was too late. The companies who were used to such kind of collaborations and welcoming the Open Innovation approach didn't suffer the race to 'innovate to face crisis' and along with increasing international exposure have been considered the genetic factor that made them resilient to the crisis, thus survivors. The clear need was expressed by micro-small companies (< 100 employees, < 50 M€ turnover) and clusters. Despite the presence in the eco-system of the different component, the collaboration mood boosted only because of the crisis. Business-to-business and research-to-business were the main needs. In 2007 the local associations decided to launch an initiative called "Fast Forward"¹² to support companies in responding the European FP7¹³ call for proposal and co-fund some research activities. The 200 companies met in the first two years (entrepreneurs, CEOs, R&D managers) were not ready to start such ventures, there was something missing. Good (innovative) ideas and reliable technology providers were the main missing factors. Some project were launched but the adoption at cluster level was scares and not involving all the actors. The Italian government through the Ministry of Industry launched, once in the last 5 years, a support program for industrial research named "industria2015", but the political turnover, the delays and the weak follow-up made it almost unsuccessful. Subsequently most of the

funds allocation have been diverted to Italian southern regions benefitting also from European funds but the SMEs system and the research community were not used/ready to match-make.

- ➔ Internationalization and innovation are intended as driving forces for economic re-boost; diversification on technology applications (ie Open Innovation) and focus on innovation-led distinctive factor are the pillars of the like-to-have policy.

Vadodara (India) - Government of India has declared 2010-2020 as the decade of innovation with a special focus on inclusive growth [16]. The National Innovation Council (NIC) was set up to help implement strategy and prepare roadmap for the decade. NIC main objective is to create a cross cutting system to provide policies, recommendations and methodologies to boost innovation performance in the country with focus on Indian model of innovation. From the past experience and interaction with Indian counterparts, especially based in district of Vadodara, the general recommendations outlined were: (i) the inclusive growth policy has supported rural micro-scale companies and aiming at supporting start-ups (new meadow) but no mention on "Technology Transfer for SMEs", that point should be emphasized (ii) The indicators of innovation are inadequate and not valorizing the return on investment in technology (iii) the Indian innovation eco-system aim is to support birth of new ideas adopting overseas models (USA *in primis*) but should emphasize more the micro-SMEs and Research (or education) dialogue.



Prime minister Mr. Narendra Modi recently launched the "Make in India"¹⁴ campaign, allocating

funds for the acquisition of technology and creation of patent pool. The Union Budget of India¹⁵ details huge investments in crucial sectors but there is no mention on technology transfer for SMEs or innovation eco-system concept [17]. At a certain stage the German experience of structured tax reduction for research collaboration have been studied but not applied massively. On the other

¹² <http://fastforward.tvtecnologia.it/index.asp>

¹³ http://ec.europa.eu/research/fp7/index_en.cfm

¹⁴ www.makeinindia.com

¹⁵ <http://indiabudget.nic.in/budget.asp>

hand, the Indian innovative SMEs deserve the global stage but only few of them are able to move on foreign markets leveraging on technology and innovation and not only on labor cost. Therefore the “Make in India” initiative could be integrated with sub-themes like: “Design in India”, “Concept in India”, “Prototype in India”.

During the recent Vibrant Gujarat Global Summit held in January 2015 it was mentioned how in the “Global Innovation Index 2014” [18] (entitled “The Human Factor in Innovation”) India ranked only at 76th place thus requiring adoption of new culture of innovation and new culture of technology transfer (including employees and researchers skills empowerment).

"I want to change the ABCD culture—avoid, bypass, confuse, delay—to the ROAD to success—responsibility, ownership, accountability, discipline"

This declaration, released on Economic Times of 29th December 2014 by PM Mr. Modi should be adapted to innovation boost in the country.

The NIC indications suggested in its last report [19], dated 2013 that the new Indian innovation paradigm require to take into the picture new elements, like: Crowdsourcing tools, ICT to support innovation for BoP (Bottom of Pyramid), Open government approach, Low cost - high technology products, new possible models for Technology transfer, New financial stakeholders (ie Public/Private Partnership), empowered competence, IPR VS Innovation [15]. This activity was part of the NIC mandate, ie (i) Delineate policy initiatives required to spur innovation (ii) Create appropriate eco-system and environment to foster inclusive innovation (iii) Facilitate innovation by SMEs (iv) Encourage multidisciplinary and globally competitive approaches for innovation.

- ➔ Policy myopia on technology transfer for local SMEs; micro and small scale enterprises make evident the gap between world-class research organizations and SMEs. Environment open to new approaches (eg. VCs, FDI, Corporate Venturing, Start-ups etc.) [22]; education and infrastructure main pillars for inclusive growth.

THE EVOLUTIONARY ‘X’ FACTORS

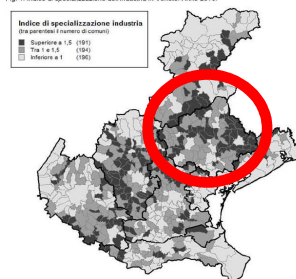
Evolutionary pathway

The SMEs-being as well as the human one is very complicated. Evolutionary dynamics are difficult to be predicted only through numbers, statistics and schemes. Looking at the **Treviso** area SMEs, in 2007 they were seen as “well respondents” ie very good in execution and solution of problems given by customers (for a certain time the Veneto region was nicknamed as the “China of Germany”). In those conditions the company Technical Department was also (mis)called R&D Department only because they were ‘researching the best solution to solve the problem’. Some companies (in a Darwinian way we should say) happen to split the Technical Department and create an internal R&D unit as a result of very diverse factors (accidental date with a researcher, curiosity of the entrepreneur, matter of ‘fashion’, customer request, management need, etc.); others continued working keeping the same organization, maybe empowering some skillset or retaining long-dated customers.

- ➔ Some companies happen to ‘evolve’ passing from Solution Providers to Innovation Providers.

This trend was challenged by the crisis: during the period 2009-2014 the R&D expenditure was seen as a cost (and not as a commodity) therefore only the brave and innovation-addicted companies accepted the challenge and continued investing. This rationalization of the game players contributed to launch few new products, shorten the lead-time (optimization of process) and delayed research results due to reduced (not canceled) R&D investments.

Fig. 1. Indice di specializzazione dell'industria in Veneto. Anno 2010.



From the districts point of view, the situation is very diverse and fragmented. The black spots in the red circle (highlighting the area of Treviso in the overall Veneto

Region scheme) are representing the level of

specialization of the companies thus their belonging to a district. Again, analyzing their situation in 2007, the district 'entity' was a fuzzy logic driven body: no coordination, all independent private bodies in competition with each other and no shared interests or activities. Only some companies per sector (ie the best performers, the most known, the brands, the iconic ones) were taken as trend-setters and inspiring the overall district. The economic growth was constant and valuable for all. In 2010 the crisis brought uncertainty and chaos, from the "*ognun per sè e Dio per tutti*"¹⁶ approach it started a sentiment of common difficulties and shared economic losses. The focus moved then on finding the common challenges, shared solutions and reliable supporting entity (that was supposed not to match the district coordination body, if any).

➔ The district is evolving thus responding to an external factor, ie modification of the environment, but it is not clear which are the 'off-springs' that will survive or if the modified factor is going to be maintained.

The period 2009-2014 was peculiar in identifying the right intermediary and district 'animator' to rely on and be invested as *super partes* coordinator.

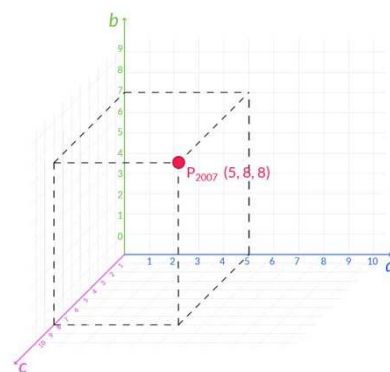
The profiles of SMEs in the analyzed area have been evolved but still three normo-type can be identified: (i) 'Fast' - they recognized the power of technology and its role in defeating competitiveness; brave and courageous in facing economic battles (ii) 'Still small' - in need of networking, guidance or support; don't have the capability to drive specific research or collaboration with RTDs but are interested in adapting general outcomes to specific needs (iii) 'Delaying' - Slow adoption of broad-research results; financial problems made technology or innovation not a priority; unless belonging to a traditional sector or have close mindset they want join the 'action' anyhow and be part of... something.

Evolution design

The SMEs observation in the area of Treviso conducted in the last 10 years has been made following three main KPIs: (i) entrepreneur's willingness to innovate and level of expectation; (ii) outcome of R&D activities applied to production; (iii) revenues generated by new (innovation and research driven) products. If we three translate those KPIs in empirical values they can be matched with:

- **a** (former (i)): **investment** on internal and external R&D activities. Values expressed as a percentage on companies turnover (range from 0 to 10)
- **b** (former (ii)): **TRL** as per the European definition¹⁷ (for simplicity the values have been translated from 0-9)
- **c** (former (iii)): **return** on investment in technology. Values expressed as (set of ten) percentage of turnover generated by new products or result of research activities

The 3D graph can be upgraded to 4D if we consider the time (ie evolution timing) as another variable. Other empirical and statistical evaluations are still ongoing at the time of this paper. The general description of a single SME situation has been studied according three key moments: 2007 (pre-crisis), 2010 (full crisis), 2014 (end of crisis), along with a forecast ('nice-to-have') for 2019 (expected growth). Each year can be described with a three dimensions point:

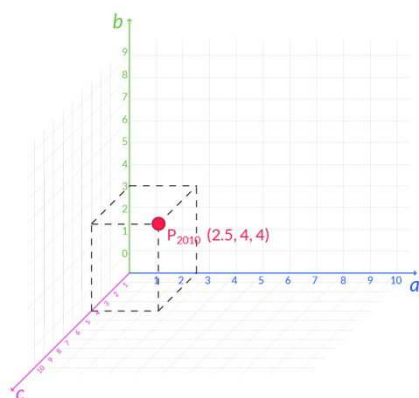


P₂₀₀₇ (5,8,8): The investment level (a) was quite high if compared with the Europe2020 target of 3%

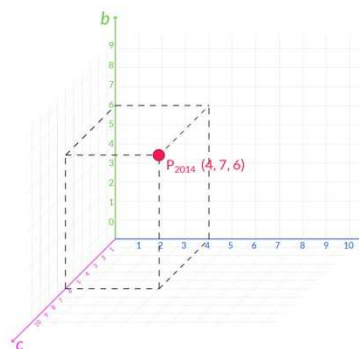
¹⁶ Quote of Eng. Nicola Bergamin, CEO of Bluewind srl (first interview with a Treviso base company, March 2006) [translation: "every man for himself and God for all"]

¹⁷http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-tr1_en.pdf

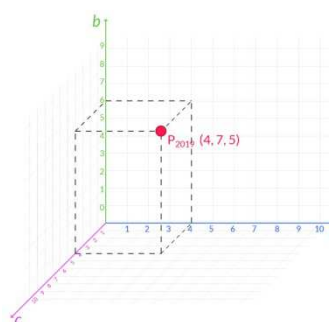
in terms of EU's GDP to be invested in R&D¹⁸ but it is considering for most of its value the internal research activities. The TRL level (b) has been very high due to the fact that internal research was more focused ready-to-produce products (the 'D' of development rather the 'R' of research), spamming from 6 to 8. On the other side, the return of research investment was effecting very much the overall company turnover (c).



P₂₀₁₀ (2.5,4,4): During the crisis peak, a research investment fall (a) has been witnessed. This value is one of the cornerstones of the evolution of local SMEs. The ones who persist (even with 50% budget reduction) were candidates to face the crisis with new products and ideas. The TRL level (b) has been spamming from 3 to 5 because unless the investment made the industrialization of potential new products was requiring bigger investment and the credit crunch disheartened further steps so the research result have been only at 'technology validated in industrial lab'. The turnover generated by new products (c) has been reduced dramatically due to change of priorities: cost reduction, customer fidelity and keeping the *status quo*, working with clients in search of solution providers and not innovation providers thus with short lead time (not compatible with R&D timing where results might come later).



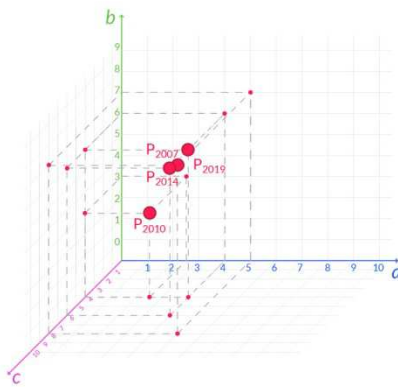
P₂₀₁₄ (4,7,6): The feeble recover from crisis [34] has pushed up both the investment and TRL parameters (a,b) but the reasons are different: internal and external R&D investments have surged but the internal component has increased for companies working with foreign customers (thus requiring customized solutions) and the external R&D has been diverted to third parties (private) or research entities (public). This trend is growing and new in the scenario (innovation outsourcing) but happen only due to the help of innovation intermediaries and expert brokers. The TRL level is a bit higher than previous years (6 to 7) but not at pre-crisis level because the situation of most of the companies is not allowing them to fully reply on R&D for the development of new products. The return of those investments (c) is still low but growing thus a signal of R&D spending optimization. The latter factor has been happening due to internal factors or external support, namely in-between organizations that help companies taking better decisions on technology and research before designing new products.



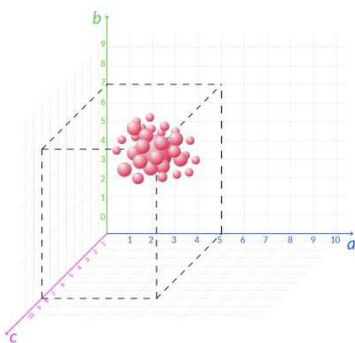
P₂₀₁₉ (4,7,5): The nice-to-have situation is of course the one where you are positioned on the top corner of the 3D square: high R&D investment that generate ready-to-produce products that contribute to the majority of the turnover. This situation is very difficult to happen after such

¹⁸ 3% of the EU's GDP to be invested in R&D

economic turmoil. In principle we could expect in the coming years a situation where the R&D investments (a) could remain stable but with a different proportion between internal and external expenditures. The TRL level (b) can get back to pre-crisis levels but it will be difficult to reach the final stage (10 as per the graphic convention adopted). The return on investment (c) is affected by other factors like design, usability, market segments that in little part can be embedded in conventional R&D activities. It can be, incredibly, lower than during the crisis but only because the R&D results have to be coupled with 'intangible' factors as mentioned above.



A joint graph can give the idea of the evolution space and the evolution path in terms of the three variables studied. Another interesting evaluation is the 2D combinations (ie 3D point projection on 2D axis) a-b, b-c and a-c and a further study shall be conducted on the search of a mathematical rule (function) that can describe such evolution.



With the same approach, the graphs representing the cluster situation are very similar and can be represented as point clouds. All the points are laying within the 3D boundaries of the cloud so 'normal' and 'evolved' population is mixed-up.

The representations provide so far are quite different if we consider some developing countries where the R&D investment is very low and the turnover is generated by low-technology products leveraging on labor costs, infrastructure and public subsidies. The effort of public policies might make them run on two axis only graph (b-c) in case government driven agencies are also taking care of technology acquisition, deployment and adaptation before micro-SMEs spread out (like Tunisia and Iran in textile/clothing sector).

Mixed theory of evolution

The examples described in previous paragraphs have all highlighted the fact that the evolutionary path for SMEs and districts is driven by endogenous and exogenous factors. The internal (endogenous) ones can be listed as:

- **Entrepreneur's** availability (and readiness to innovate)
- Direct **contact** with external R&D or technology providers
- Need of external **support** (ie from private entities like consultants or facilitators or semi-public intermediaries)
- Good **ideas** with business possibilities
- Well prepared **management** and technical staff open to internal discussion

The external (exogenous) ones have been resulted from the interaction with SME as:

- Global **competition** and widest challenge
- **Value** for money as new driver for customers
- My **competitor** is geographically near and far both
- **General problems** and particular solutions are the new factors of growth

The evolution path in which the developed countries SMEs (and districts) are moving cannot be framed in a scheme like Darwinian OR Lamarckian but is the result of a mixed factors. Evolutionary theory implies that life evolved (and continues to evolve) randomly or by chance or in response to an outside factor.

The "x" factor (the "i-for-innovation" gene) of such advanced ecosystem (SMEs, R&D actors, third parties, consultants, etc.) is represented by the

inclusion of new characteristics/service favoring this evolution step:

- Technology audit in order to better understand the needs
- Scouting of solutions and knowledge suppliers with an Open Innovation approach and easy-to-use tools¹⁹
- Analysis of returns, drawbacks, financials and business impact
- Evaluation of Return On Investment vs Return On Technology
- Make the 'last mile' (Innovation to product) real!

➔ It has become evident how the most advanced western districts evolved (in the singular form of SME or as a whole) thank to an organization that assumed the leading role (coordinator, animator, facilitator), expression of the political governance or as public-private partnership.

Intermediaries common aims are to favor information flow, technology spread and deployment of new services, networking and contacts with Research and Technology Performers (RTD), make easy access to new tools.

The eco-system scale-up and mix both the Darwin and the Lamarck theories leading to:

- The genetic **mutation** of SMEs is an evolving continuum but it is clear that the strongest will survive
- The SMEs bunches can **survive** if they see as allies (and not enemies) the RTDs

The innovation intermediaries and other stakeholders, known to the author, in a number of 110 from countries like Italy, France, Spain, Portugal and Greece have in common some peculiar characteristics like: (i) Physical presence on the territory (ii) Involvement and (deep) understanding of ALL the components of the new (heterogeneous) eco-system (iii) Drive and support policies with local government (iv) design and deploy on-hand added value services (v) 'human touch' and personal contact with the entrepreneurs (trust worth)

Policy makers new objective is the financial support to make evolution happen and set the conditions to have off springs continuing the path, as single or group.

➔ The evolutionary theories mash-up is the best compromise if we want to state how SMEs 'happen' to become innovative if they have some stimulus from outside and favored in their path by added-value intermediaries.

Do you have the 'X' Factor ?

The entrepreneurs met from 1999 to 2014 (540 representing SMEs and 80 Large enterprises, 70% located in the north part of Italy, ie Regions of Piedmont, Lombardy and Veneto) represented a good sample to understand their evolution before, during and after the crisis. With most of them (60%) the contact is still on a monthly base through meetings, emails, events, conferences, trainings and direct activities. As said earlier, the role of the entrepreneur in the small scale industry is crucial both in positive (idea and investment) and negative (bottleneck) perspectives. In principle the common characteristics of the leading entrepreneurs (the one who are candidate for the 'happened' evolution) have been detected as:

- **Foresight:** the capacity to see ahead and to how the product could upgrade in the coming 5 years and how it will be differentiating towards the state-of-the-art;

- **Perseverance:** 'failure is a success' if the lessons learnt can be helpful anyhow and the ultimate goal is clear and strongly believing in it

- **Investment capacity:** financial capacity is an issue but in many cases it can be coupled with public or private funds (eg. financial partnerships, call for proposals, local/national support, etc.)

- **Market objectives:** clear understanding of the market after a comprehensive study on how the new product will be positioned with reference to the state-of-the-art

- **Team:** the one-man-band era is over, the late 90s entrepreneurs were friends or former colleagues who had an idea and rent a barn; in the

¹⁹ See the OPENiSME case at the end of the paper

last 15 years the role of the collaborators have been emphasized and complementary to the success of the company

The experience had in the developing countries (India *in primis* but followed also by Iran, Tunisia and Egypt) showed how the role of the public organizations (ie institutional and government-led) have been of paramount importance in the development of new ideas. The entrepreneurs were helped with subsidies and infrastructure (common or shared) and assistance for market search but the side-effect was a strong link with government and public participation thus control. The cases of Chinese state-owned companies, Tunisian Oil & Gas sector, Iranian textile/clothing are self explanatory. This approach is trying to force innovation injecting finance liquidity and boosting growth for a larger set of users (suppliers or outsourcers), like the case of Yazd textile district in Iran.

Is the same evolution pathway applicable for developing countries?

The evolution routes described so far and applicable to western (developed?) countries could not be adapted to developing countries as their micro-challenges are not the same as the others. India and Iran have been already described but also countries like Tunisia, China (author's background), Thailand [35] and Colombia [36] have put in place innovation policies more oriented to inclusive growth rather than inclusive innovation. Some World Bank experiences like the Indian states of Rajasthan, Madhya Pradesh and Chhattisgarh project "Revitalizing leather and textile handicrafts" have highlighted in their final report how the technology transfer issue was intended at a very early stage and not aiming at cutting edge innovations. Can incremental innovation still play a role to rise wealth? The local eco-systems in those countries are relying on government and public initiatives despite new venturing opportunities [23]. The evolution is therefore more linked to exogenous factors and driven by elements outside the micro-SMEs but 'innovation elements' have been proved to be remunerative in terms of growth if applied with perseverance. It's quite evident the two decades long evolution of South Korean eco-system and the role given to government-lead organizations

[37]. The two opposite approaches were evident: help smooth incremental innovation or force technology driven innovation? The latter was a vision towards the radical innovation instead of slow step-by-step approach that could take more time and belated economic benefit.

- ➔ In a broad sense is therefore evident in all approaches that the role of intermediaries (public-private in developed countries and public in developing ones) is peculiar and crucial.

The success in both approaches is not given for sure. The Iranian case is a good example on how if policy and politics doesn't have clear ideas the evolution is very hard and sometimes not happening at all. Tunisia and Egypt suffered from the revolution movements and still ongoing turmoil. Singular is the case of Singapore, Macao, Hong Kong where manufacturing sector cannot be considered as a pillar of the local economy and the innovation policies directly moved towards finance, start-up, so-called third sector (ie tourism, services, entertainment, media, etc.). The Lamarckian theory driving developing countries clusters evolution favors incremental innovation rather than radical one but it is differentiating from the mixed approach of developed countries because of offspring. If the political situation is stable and the final targets (eg. growth, economic reforms, manufacturing sector support) are fixed in the medium-long term, it is likely to have more than one generation of companies involved in the process. This definitely helps inheriting approach and methodology (if well designed) and guarantee evolution of the species. Pro and cons are of course very much linked to single state policy and target. Everyone must radically innovate or die? It interesting to see how the evolution of companies in developing countries have been kaleidoscopic, emblematic is the case of India. IT technologies hub of the world but still striving to become a manufacturing workplace.

- ➔ Can incremental innovation still play a role to rise wealth? In developing countries the answer is 'yes' as the macro and micro challenges are different from developed nations.

In the recent years the evolution process is weakly (they'll become strong time by time) affecting the eco-systems as a whole and not only the single species or the single elements (ie SMEs, large enterprises, policy makers, government, research organizations, universities etc.). In many cases the copy-paste of innovation policies deployed in other areas is not working: an example can be the start-ups launch in China where finance is largely bigger than the Valley or the attraction of investments in Chile through new companies unless weak industrial background like Singapore.

Last remark has to be made on the offspring: shall all be forced to innovate or only the adapted ones shall survive? This dilemma is still with no reply as some countries like Vietnam, Laos, Cambodia, Bangladesh have based their economy on outsourcing skills and on capacity to produce on-order relying on low cost and ability to work. This approach is still running but even those countries will face global competition sooner or later. The innovation policies are very weak and intending innovation as being prepared to use new machines, face new requests and (in some cases) be ready for new norms and legislation. The research system is very weak and miles far away from companies but those countries will definitely not let the latter down as they are sources of growth, income and GDP.

The 3D graph for developing countries shall be mostly reduced to a 2D with b-c axes as investment in research is very low (and in some cases incurred by intermediaries or public agencies) but TRL is high (ie ready to produce) and with reasonably good impact on turnover.

CASE STUDY ON A LEADING INTERMEDIARY AGENCY AND AN OPEN INNOVATION TOOL

T2i (www.t2i.it)



After the experience of 'Fast Forward' it was decided to empower the agency of the local chamber of commerce (Treviso) at that time named "Treviso Tecnologia" (TT), benefitting from the experience made in two years (2007-2008) and 200 feedback collected from entrepreneurs. After some years TT

embedded other similar agencies thus giving birth to "T2I - Technology Transfer and Innovation" (www.t2i.it), innovation agency promoted by the Treviso and Rovigo chambers of commerce (located in Veneto region) and the largest of its kind in Italy. T2I, a not-profit organization, aims at promoting an innovation oriented business culture among local manufacturing SMEs, (e.g. agro-food industry, sport, textile-clothing, wood/furniture, electronics, appliances, mechanics, plastic, etc.) acting as a facilitator in the information, the training and the development of services. T2I supports companies and the local eco-system through several services organized in 5 areas:

- Design and development of new products and services: partnering with companies wishing to develop new products and innovative applications. T2i has developed specialized competencies and new services like usability and ergonomics tests that can be applied both to physical products and virtual interfaces, allowing increase of user satisfaction and overall product effectiveness.
- Engineering, testing and certification: cutting-edge equipment made available in its labs. T2I can guarantee the qualification and recognition of products, through testing and analysis, in both domestic and foreign markets
- Networking, applied research and technology transfer: through one of the widest network of partners of excellence, T2I supports the development of innovation and research projects, also by delivering an intellectual property rights valorization and enforcement service thus Innovation, technology transfer, and R&D support services at European scale
- Organization and development of competences: development of personalized paths for the empowerment & organizational development of competences to help companies meet the global market challenges
- Support and development of business ideas: supporting the creation of new business ideas through tutoring, coaching, and providing support in project management. New business ideas are also supported favoring access to two own incubators.

The role of intermediary has been granted naturally after many years of activity and internal evolution that lasted 25 years. From TT to T2I the transformation have been anticipated the events and focused on inclusive innovation making available different set of services to SMEs. The new challenge is forecasting the technology evolution and making available companies and stakeholders (local eco-system) new tools and added value services.

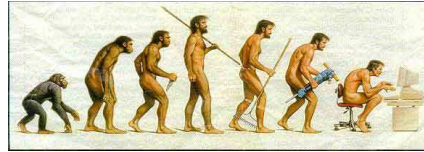
OPENiSME (www.openisme.eu)

OPENiSME Once the role of intermediaries (public or private) has been granted it is of paramount importance putting in place efficient tools that can give companies the flavor of potentiality of innovation. The following example is an action at European level.

OPENISME (www.openisme.eu) is a project co-funded by the CIP initiative (Competitiveness and Innovation Program) of the European Union (Grant Agreement no. 621121), designed to help unlock the innovation capacity for smaller firms that aspire to grow, through the facilitation of new “Open Innovation” partnerships. OPENISME, launched in December 2014, will primarily focus on partnerships between SMEs and research institutions which are able to contribute novel resources, expertise or insights, as this represents a massive yet underexploited opportunity. Through increased automation, the innovative partner matching technology at the heart of the OPENISME platform can significantly extend the reach of SME's, returning the expertise most appropriate and able to respond to specific business challenges. In the second stage OPENISME will also investigate the utility of the techniques developed to other forms of partnerships that underpin effective innovation, including SME relationships with complementary private sector organizations. Typical use-cases start with an SME seeking to solve a business problem but not having the skills, time or money to come up with a solution. In the first stage of the project the Open Innovation Platform will harness automated matching through a concierge service to assist SMEs. Having demonstrated the utility of data driven partner matching in this use-case the project will investigate other contexts where

automated expertise discovery can assist the pace and reach of SME partnering activities.

CONCLUSIONS



If a sociologist wants to shape the normo-

type of firms that innovate or the ones that goes for the real value of technology transfer it's indeed a great challenge. Even though it's hard to design a reliable and trustworthy profile an achievable result could be the identification of macro-characteristics or common/general parameters. With no doubt, a crucial role is played by the intermediary for innovation whose mission is to win the technology transfer match. The variables are so many and the scenario is full of complexity that the one-fits-all profiling is almost a fantasy. Sector focus, policies, country strategies and indicators are only some of those. Some countries like Japan, South Korea, Germany, Denmark, Sweden, have demonstrated that strategy, focus and perseverance could pave the way to victory but a key role has to be played by the intermediaries (public or private) whose main aim is to make the love-story happen, help meet the global challenges and favor the evolution of the eco-system.

Chance and randomness do factor into evolution and the history of life in many different ways; however, some important mechanisms of evolution are non-random and these make the overall process non-random. For example consider the process of the already mentioned natural selection, which results in adaptations, features of organisms that appear to suit the environment in which the organisms live (our Lamarckian approach). Such amazing adaptations clearly did not come about 'by chance. They evolved via a combination of random and non-random processes. The process of mutation, which generates genetic variation, is random, but selection is non-random and we can state that selection favored variants that were better able to survive and reproduce. Over many generations of random mutation and non-random selection, complex adaptations evolved. To say

that evolution happens 'by chance' ignores half of the picture²⁰.

- ➔ The new (mixed) evolution paradigm require more flexibility and adaptability but increases the complexity and eco-system overall entropy.

Species (stakeholders, eco-system components) are all evolving, thus appearing new champions (ie start-ups), new domains (digital economy), new approaches (inclusive and jugaad innovation). The eco-system next stage is pushing for collaborative projects (multi-companies, mix-up of large enterprises and SMEs) and new actors (dynamic intermediaries that can offer also solutions, easy-to-use tools and services). Developing and developed countries have different challenges but it has become evident how they put great expectations on intermediaries actions (technology transfer brokers, innovation agencies, finance, investment attraction, foreign networking, cluster management).

The love-at-first-sight between the two heroes ie Companies and Research is a rarity all over the world and many times they both get tired quickly about each other. Intermediaries shall take the role of marriage agents also due to the fact that the global crisis made clear in many areas how 'united we stand' and 'united we win' are the next keywords.

- ➔ The Darwin and Lamarck theories started from different views and approached but they were both focusing offspring evolution factor to continue. This is the weak point of the joint vision applied to innovation driven eco-systems.

It is not given nor 'by default' the inheritance of innovation factor neither in developed nor in developing countries (despite might be easier in these ones as they are much more driven by public agencies). Innovation approach must be continued (with understandable peak and lows) and kept alive even during difficulties. For example, companies working on web sector cannot deny importance of social web, apps and need of being always on the edge and at the state-of-the-art level; companies of

the sport sector focusing performance (ie professionals and not mass market) shall target new materials, distinctive features and not only marketing and communication; companies who deposit a patent once cannot not be automatically considered innovative, it shall create a curricula.

- ➔ The journey to innovation can be easily transformed in a trip from novelty to innovation and back. Evolution helps looking forward and not at the past.

Everyone must radically innovate or die? Can incremental innovation still play a role to rise wealth? Inclusive innovation or inclusive growth? Questions not easy at all. Despite different challenges, the role of intermediaries (or innovation practitioners) has been acknowledged as crucial. They can be a private legal entity or government driven or public-private joint venture or cluster leaded but their role as eco-system animator has been demonstrated as crucial. To a certain extent inclusive growth can create the conditions (wealth) to push forward the innovation opportunities while the inclusive innovation is by default creating growth. Two different sides of the same coin.

- ➔ *"Technology transfer is a combat sport, it can happen by chance but most of the cases is the result of a hard job"* [Dr. Richard (Rick) Rashid – Founder and Chief Microsoft Research]

The empirical study of evolution characterizing factors made on 500+ companies has demonstrated how the 'x' factors are linked to endogenous and exogenous variables. If a mixed theory can be valid for some parts of the world this is not valid for developing countries but the very common macro-evolution factor worldwide is the cross-contamination of policies or approaches or actions. Countries are studying and learning from other innovation experiences trying to (successfully) adapt to their own micro challenges. Entropy is changing and eco-systems are evolving.

- ➔ *"Rig your Boat, travel near and far, look for a wise partner, knock his door, seek his knowledge, welcome him in your home, this is how your people will prosper"* [Amenophet - 2500 B.C.]

²⁰ Credits
http://evolution.berkeley.edu/evolibrary/misconceptions_faq.php#a1

AUTHOR's BIO



Dr. Anilkumar Dave is an Italian citizen of Indian origin having been in U.S.A. and India before setting down in Italy, 20 years ago. After working as consultant in the ICT sector (i.e. Textile/Clothing and Fashion, Banking, etc.) between Italy

and India he started working on European Commission programs (FP5,6,7, H2020, ECCP, EQUAL, etc.) through many R&D projects (as coordinator or partner) representing public/private bodies and focusing on Technology Transfer and Innovation oriented 'dialogue' between Research (Academia) and Industry. In the last years he has served as officer for the Italian government "Institute for Industrial Promotion", a Rome based organization where he worked on innovation at international level (ie China, Iran, Tunis, EU, NATO, OECD, etc.) and after that continued working as consultant for different stakeholders on the two main themes that are characterizing his 15+ years professional life, *Innovation and Internationalization*. At present he is Head of Unit "Research and Technology Transfer" and in charge of Special Projects for T2i, the largest Italian Innovation Agency in Italy promoted by Chambers of Commerce and Enterprises Association, whose aim is to foster industrial research for SMEs and promote knowledge transfer also through EU programs and other public funds. Mr. Dave is also Advisor for Indian Business Development and collaborating with the Indian delegation to Italy and member of advisory board of some research organizations supporting their international exposure. He is regularly invited as speaker or lecturer on international innovation policies, marketing and technology transfer around Europe and currently collaborating with some Italian leading universities (Venice and Milan *in primis*). His tenure at T2i is mostly dedicated to support SMEs during the development phase of innovative products and the adoption of cutting-edge technologies. Since the last 7 years more than 500 companies have been directly supported by T2i; the unit headed by Mr. Dave have also designed and deployed innovative services like, among others, 'cognitive science applied to design', 'Augmented and Virtual Reality platform for micro companies'. The most recent publications by Mr.

Dave's have been presented during international events like the Vibrant Gujarat Global Summit and the UNU-Merit Globalization and Innovation (EMAEE) conference.

Mr. Dave's background is on Image Processing and Cybernetics and a post-grad on Marketing and Communication. He has launched a consultancy company in 1998 and also contributed to scientific review publication on very different topics, from rice weed control strategies to textile/clothing industry guide, from cross-cultural marketing to stem cell and muscle regeneration therapies. He is a sport passionate and former president of a basket team as well as certified sommelier and supporter of the Inclusive Innovation program launched by the Indian Government National Innovation Council and member of the scientific committee of EXPO Venice 2015 'WATER conferences'.

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REFERENCES

1. World Economic Outlook
2. www.innovation-ecosystems.org
3. A. Dave, *Technology Transfer VS SMEs...and the role of intermediaries to shift from 'VS' to 'FOR', proceedings of the JEUPISTE Project Innovation Workshop No.2: "Smart Communities" in a broader term. Japan-Europe workshop for sharing ideas and experiences towards strategic partnership building, Torino (Italy), 13 November 2014*
4. A. Dave, *Technology Transfer vs SMEs: the challenge within Global Environment, proceedings from the Vibrant Gujarat Global Summit 2015 plenary session "SMEs: Gearing up for Global Competitiveness", Ahmedabad (India), 12 January 2015*
5. *Innovation in Southeast Asia*, series OECD Reviews of Innovation Policy (www.oecd.org/sti/innovation/reviews), Paris (France), May 2013
6. Ann Leahy, Seán Healy, Michelle Murphy, *Poverty and inequalities on the Rise, Caritas*

-
- report by Social justice Ireland, Brussels (Belgium), 2015
7. Markus Grillitsch, Josephine Rekers (Lund University) *Selection and cluster evolution: A conceptual and empirical investigation using the case of Med-Tech*, DRUID Society Conference, Copenhagen (Denmark), 16-18 June 2015
 8. Pierpaolo Andriani, *Evolutionary Dynamics of Industrial Clusters* Published in E. Mitleton-Kelly *Complex systems and evolutionary perspectives of organisations: the application of complexity theory to organisations*, Oxford (UK), 2003
 9. L. Alan Winters and Shahid Yusuf, *Dancing with Giants - China, India, and the Global Economy*, co-publication of the World Bank and the Institute of Policy Studies, Washington (USA), 2006
 10. R. Ghasimi, *Iran's economic Crisis: A failure of planning*, www.muftah.org
 11. J. Amuzegar, *Iran's fourth plan: a partial assessment*, Middle East Policy Council journal essay, Vol. XVII, No. 4, 2010
 12. Lynn Mytelka et. al, *Science, Technology and Innovation Policy Review - The Islamic Republic of Iran*, UNCTAD, Geneva (Switzerland), February 2005
 13. T. Mahmood Ali, A. Kausar Kiani, M. Asrar, T. Bashir, *Technology achievement index of muslim nations – ranking and comparative study*, Islamabad (Pakistan), 2014
 14. Yuriy Gorodnichenko, Jan Svejnar, Katherine Terrell, *Globalization and Innovation in Emerging Markets*, The World Bank Development Economics Department, Washington (USA), January 2009
 15. National Innovation Council, proceedings of the *Global Innovation Roundtable, Innovations to address challenges of access, equity and excellence workshop*, New Delhi (India), 1-2 November 2012
 16. Office of Adviser to the Prime Minister of India, *Public Information Infrastructure & Innovations Towards a More Inclusive and Innovative India strategy paper*, part of the *Creating Road Map for a Decade of Innovation* report, New Delhi (India), March 2011
 17. Indian Ministry of Finance, Union Budget of India 2015-2016 <http://indiabudget.nic.in/budget.asp>, 28 February 2015
 18. Global Innovation Index 2014, www.globalinnovationindex.org
 19. *Report to the People*, National Innovation Council, 19 November 2013
 20. Mark A. Dutz, *Unleashing India's Innovation - Toward Sustainable and Inclusive Growth*, World Bank, Washington (USA), 2007
 21. The Economist, *First break all the rules*, special report on *Innovation in emerging markets*, London (UK), 15 April 2010
 22. R. Ranga Babu, M. Murali Krishna, A. Swathi, *Role of creativity and Innovation in entrepreneurship*, Innovative journal of business and management, Tadepalligudem (Andhra Pradesh, India), October 2013
 23. Bostjan Sinkovec, *India: financing the innovation ecosystem is key*, Weekly brief n. 6 from Knowledge Economy Network, Brussels (Belgium), February 2012
 24. M. Desai, S. Fukuda-Parr, C. Johansson, F. Sagasti, *Measuring the Technology Achievement of Nations and the Capacity to Participate in the Network Age*, Journal of Human Development, Vol. 3, No. 1, 2002
 25. World Bank, *Global Economic Prospects 2015*, Washington (USA), January 2015
 26. World Bank, *Global Outlook and Global economic prospects: Disappointments, Divergences, and Expectations (highlights for Chapter I)*, Washington (USA), January 2015
 27. F. Zakaria, *The rediscovery of India*, McKinsey&Company, November 2013
 28. N. Kaka, A. Madgavkar, J. Manyika, J. Bughin, P. Parameswaran, McKinsey&Company, *India's technology opportunity: Transforming work, empowering people*, New Delhi (India), December 2014
 29. *Rapporto 2014, Osservatorio nazionale distretti italiani*, www.osservatoriodistretti.org, Rome (Italy), 10 April 2015
 30. *Rapporto annuale 2014, La situazione economica del Veneto*, Unioncamere Veneto, Venezia-Mestre (Italy), 2014
-

31. Camera di commercio di Treviso, *Gli indicatori congiunturali*, Report N. 2, Treviso (Italy), May 2014
32. Camera di commercio di Treviso, *Natalità e mortalità d'impresa in provincia di Treviso 2014*, Report N. 1, Treviso (Italy), April 2015
33. H. Hollanders, N. Es-Sadki, M. Kanerva, UNU-MERIT for EC DG GROWTH Unit J3, *Innovation Union scoreboard 2015*, Brussels (Belgium) 2015
34. *European economic forecast winter 2015* – EC DG Economic and Financial Affairs, Brussels (Belgium) 2015
35. National Innovation Agency – Thailand www.nia.or.th
36. *Plan Estratégico del Sector de Ciencia Tecnología e Innovación 2011-2014* part of *La Planeación del Sistema Nacional de Ciencia Tecnología e Innovación (SNCTI)*, www.colciencias.gov.co, Bogotá (Colombia), 2011
37. National Science and Technology Council – South Korea www.nstc.go.kr