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Technological Entrepreneurship and Asymmetries

Florin Paun[1] and Ingrid Vaileanu[2]
[1]ONERA – The French Aerospace Lab, Palaiseau, France
[2]XVALUATOR, universal digital hub converting big data in shared value, Member of Cap Digital and Finance Innovation, Paris, France

Synonyms

Actors management; Technological innovation management

The concept of asymmetries is adapted to the technological innovation, process aimed to create a new sustainable business based on a new couple of technology related to a targeted (created) market. The entrepreneurial team which leads this process is facing an important challenge while developing the technology up to the ninth Technology Readiness Level (TRL) corresponding to the market certification. Asymmetries, between the entrepreneurial team and the other actors among the different stages corresponding at the various levels of the TRL scale while progressing on it, are identified and described in this contribution (first sales and market issues are not addressed hereby). Newly identified asymmetries (Paun 2011) in the innovation process occurring on different risk, cultures, and timescales are introduced together with the classic one (information asymmetry) (Stiglitz and Weiss 1992), occurring from different possessed information (particularly related to the technology gap in this described case). These asymmetries could induce barriers to the technological development process. Finally, examples of collaborative tools developed to compensate or reduce these asymmetries are proposed (Paun 2011).

Notion of "Technological Entrepreneurship"

This contribution identifies the eventual barriers occurring between the entrepreneurial team (or individuals) and the other actors while carrying technology-based innovation projects.

Technological Entrepreneurship

Regardless of the new idea sourcing approach, provided by a promising new emerging technology (technology push) or by the identification of an existing expressed need in the market (market pull), the successful exploitation of such a new idea will be possible only when the technological development chain will take end by the introduction in the market of a new product or service. The technology development process, by creating new technologies or by adapting existing ones up to a new product or service, is thus a fundamental process related to any technology-based innovation. The commonly used tool for measuring the progression of the technology development

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process is the Technology Readiness Level – TRL scale (first definition by Mankins 1995). This scale is proposing nine levels, starting from level 1, meaning fundamental research, and finishing at level 9 related to the market certification and sales authorization, passing through TRL levels 3–4 related to laboratory demonstration or proof of concept and through TRL levels 6–7 related to operational conditions demonstration or industrial prototype.

The success of such a development process is partially given by the ability of the entrepreneurial team (or individuals) to define, identify, obtain, and manage the appropriate capabilities able to provide technology progression relative to the TRL scale, and this is regardless of their socio-economic environment (individuals, company employees, state agents . . .).

At each level, the actors are changing and their characteristics too. Up to the level of TRL 3–4, the work will be carried by scientists; between TRL 3–4 and TRL 6–7, by industrial R&D offices competencies types; and beyond, by industrial process designers. The decisions will be made on thinking patterns adopted by R&D directors, then by design offices, marketing directors, and production and supply chain managers. The investments will be driven from business angel to venture capital thinking patterns while progressing on the TRL scale.

All these actors are different, and the entrepreneurial team will need to understand, negotiate, and work with all of them using and being adapted to their specificities.

Notions of "Asymmetries"

Certain barriers for the technological entrepreneurship are mostly related to the various existing asymmetries between parties and could be reduced, for the information asymmetry, or compensated, for the risk, cultural, and timescaling of other newly identified asymmetries (Paun 2011) specific to the technological entrepreneurship, with specific collaborative tools.

Asymmetries Definition and Identification-Induced Barriers

Some of the actors involved in the technology development process (identified like a fundamental process inside the technological entrepreneurship), who will collaborate along the TRL scale stages with the entrepreneurs, will be highlighted and analyzed.

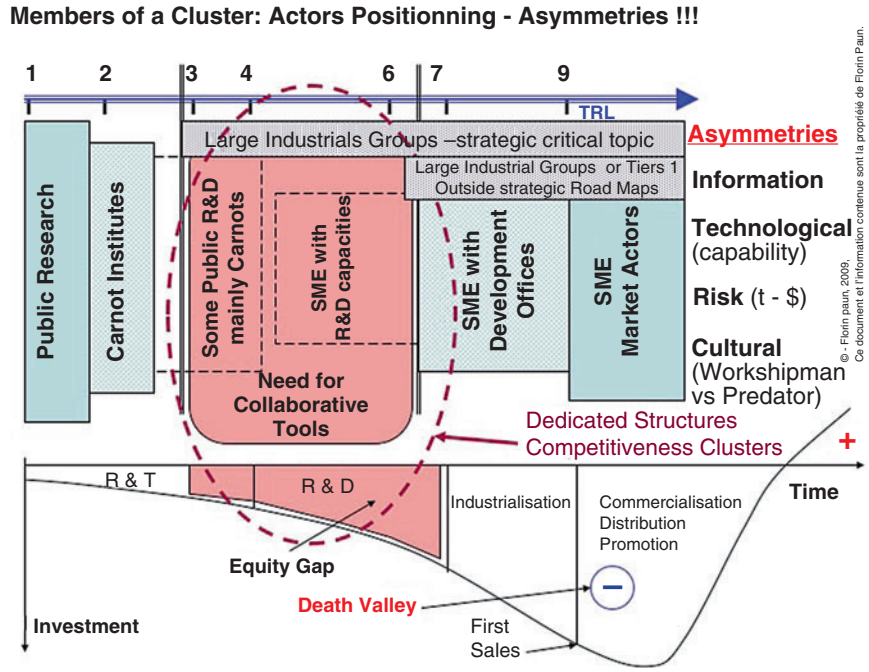
What about the characteristics of scientists, industrial researchers and developers, design engineers, industrial process executives, and marketing, financial, or supply chain managers? Or about business angels or venture capital partners, who will invest in the particular case of a technology-based venture? Are they thinking and behaving in the same way? Do they have the same type of competencies? Obviously no.

Does the entrepreneurial team (or individuals) involved in a given technological entrepreneurship posses all these specific competencies? It is impossible and not necessary. Are all of these actors different and specific? Yes, and it is good like this because they all have complementary skills. Do the entrepreneurs need to collaborate and work with them? Yes.

The differences between the various actors are defining the existing asymmetries. These asymmetries will create value and will lead to the successful exploitation of the new idea if well coordinated and managed.

The specificity of the technological entrepreneurship is thus the one of being a highly collaborative process (Paun 2011). If it is well proposed by Stiglitz theory that the information asymmetry (Stiglitz and Weiss 1992) in a transactional relation could create value, it has to be acknowledged that within a collaborative relation, asymmetries must be compensated (sometimes even reduced) in order to avoid barriers otherwise impeaching the agreements.

The ***information asymmetry*** related to the technological entrepreneurship could be identified as the difference existing between the scientist competencies, operating between TRL 1 and TRL 4, and the industrial process designers, operating between TRL 7 and 9 (see Fig. 1). They need "technological translation" between them, and this specific role could be assumed by developers



Technological Entrepreneurship and Asymmetries, Fig. 1 Information (from technology perspective) asymmetry showcased on the TRL scale between public R&D laboratories and small and media enterprises (Source: Paun 2011)

from both sides or by appropriate training. For example, if the entrepreneur is a scientist, he will need to learn what industrial process means at least to a sufficient level to be able to understand an appropriate specialist.

A scientist is minded on a "workshipman" instinct as Veblen described it (Veblen 1914). An entrepreneur is mostly a "predator" type for Veblen. This strong ***cultural asymmetry*** could lock the process if not compensated, and it is generally acknowledged by various practitioners that working with a scientist "is not so easy." This is coming from this newly conceptualized cultural asymmetry (Paun and Richard 2009). They also need specific compensation tools (e.g., "translators") activated between them in order to be able to understand each other, while the scientist will be interested by the knowledge progress and the entrepreneur by the prototype design.

Other important asymmetries are occurring while an entrepreneurial team is contracting R&D works with a laboratory. The value of the R&D contract could represent an important percentage of the financial resources in the case of a small enterprise and very few for an important R&D laboratory.

This ***financial risk asymmetry*** (Paun 2011) has to be compensated while working together in order to guarantee for the execution of this type of contract the same importance for both parties, especially if the R&D laboratory is working with main industrials on important R&D contracts which could get a priority to the small enterprise one.

In addition to compensating for risk and technological asymmetries between the two parties, this contract has also subsequently proved to be a good tool for reducing transactional information asymmetries (Akerlof 1970; Stiglitz and Weiss 1992) between the start-up partner and its investors. Indeed, at the time of the phase of "due diligence" between the creators of the start-up partners and the business angels, the shared risk development contracts (Paun and Richard 2009) yield paramount information on both the product

and the target market and on the technological developments and their costs.

The ***time scaling asymmetry*** (Paun 2011) could occur in the same phase of contracting R&D works between an SME and an important R&D laboratory which are used to work with main industrial or state agencies. Indeed, in this case, some laboratories are programming their activities on a yearly base (eventually revised once or twice per year), while the SMEs are expecting actions and acting themselves on a monthly base (sometime even faster). This asymmetry could be accepted for eventually the negotiating stage of an agreement but will endanger the SME in the case of eventual delayed works (due to a monthly scale against a yearly one).

Example of Collaborative Tool as Asymmetries Reduction or Compensation Mechanism

To compensate and equilibrate the various described asymmetries occurring between a small enterprise (or a start-up) and an important R&D laboratory, a new type of R&D contract is being observed in practice recently (Paun 2011). Based on a negotiated business plan for the new product or service proposed for a targeted market by the entrepreneurial team, the R&D laboratory could invest in its own work to be carried for developing the needed technology. The financial risk taken by the laboratory is sufficient enough to prioritize the negotiated contract between the parties and give the same importance of succeeding the technological development to both parties. The various other asymmetries will be compensated by the strong managerial support inside the R&D laboratory provided on this type of ***risk and benefits sharing development contract***s (Paun 2011).

Technological demonstrations that result in innovation can arise in any of the market sectors in which the SME receiving the technology can itself control the innovation process completely (until the successful introduction of the new product to the market). For example, some niche markets will be accessible, even in the aerospace sector (green aviation, small-scale drones, leisure, etc.). Once the technology is demonstrated, there are strong chances that the large aerospace groups will integrate this technology as a tested module into the systems they are designing (Mouchnino and Sautel 2007).

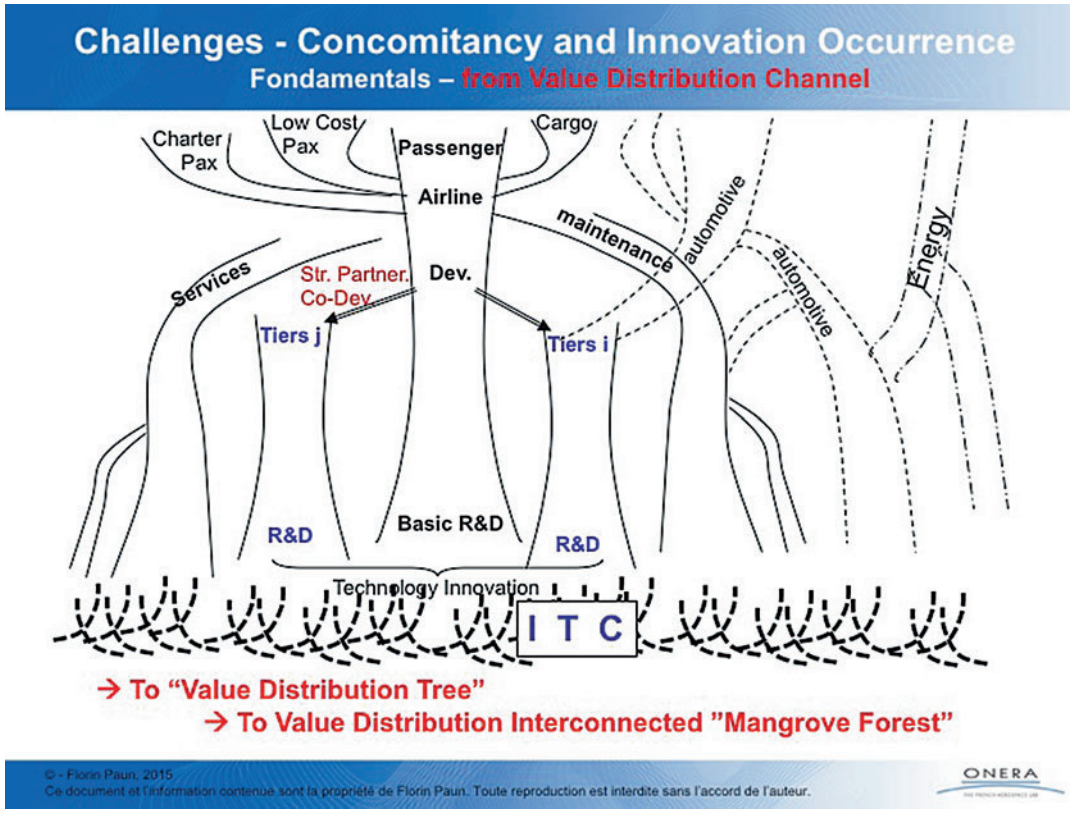
The economists have anticipated the complexity of the collaborative process like Open innovation (Chesbrough 2003) that are no longer "linear models" starting with research activity and aiming a specific market as single objective. In Open Innovation strategies, the opportunities can come from different sectors, actors outside the firm and even outside their own ecosystem. The classical value "chain" resembles today to a "mangrove forest" (see Fig. 2) which makes difficult the anticipation of markets evolution but open opportunities for strategic development of "dynamic capabilities" and collaborations with different innovative ecosystems in different sectors enhancing the innovative potential.

The difficulty of anticipation of innovation demand could be compensated by the strong connectivity and interaction capabilities supported by innovative ecosystems like Competitiveness Poles in France reinforced by strategic tools to "compensate asymmetries of innovation actors" (Paun 2014, Charte ONERA-PME 2007, Charte Open Innovation Pole SAFE – PACA, 2017) and co-evaluation of the Demand of innovation following (DRL, Demand Readiness Level, Paun 2009) the maturity of the expression of the demand compared to the maturity of the technological or social solutions.

Economists anticipated that the "Knowledge accumulation as an increasing collective phenomenon" (LIU, UZUNIDIS, 2016) forms networks that develop technological cooperation between firms and different institutions.

Conclusion and Future Directions

Succeeding the technological entrepreneurship implies to correctly identify, obtain, and manage the appropriate capabilities (Paun et al. 2012) able to provide the successful exploitation of a new technology (or a new couple of technology crossed with a market). Obtaining the capabilities will be a matter of rightly identifying and



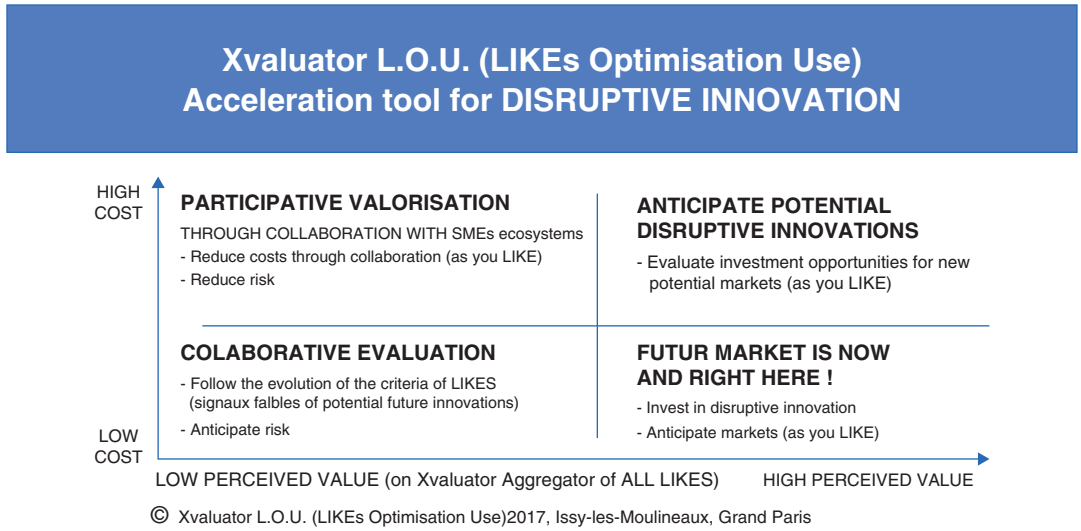
Technological Entrepreneurship and Asymmetries, Fig. 2 "Mangrove forest": the complexity of the collaborative process of shared value creation in an innovative ecosystem of the Twenty-first century (Source: Paun 2015)

compensating (Paun 2011) through collaborative tools the various asymmetries existing between the different actors who possess these capabilities.

By compensating these asymmetries and facilitating communication and collaborative process in different sectors with a large diversity of actors embracing experimental strategies of 'open innovation' (Chesbrough et al. 2008; Paun 2014), "systemic innovation" (interview Gérard Roucairol in TOUS entre-preneurs, Paun 2014) or "frugal innovation" (interview Navi RADJOU in "Tous entre-preneurs", Paun 2014) not only of firms but also of their innovative ecosystems, the demultiplication of knowledge and capabilities (Paun and Von Tunzelman 2009) the Competitiveness Poles in France are aiming to support thanks to specific evaluation criteria and innovative tools to support collaborative innovation (Paun 2009) of only the individual innovative firm's performance but also serves to shares value creation by all their ecosystems. New tools and strategies are proposed for an analysis and co-evaluation process of maturity scale of the demand for innovation solutions compared to the maturity of the offer of Technology or Social innovative services. Innovation is thus no longer the business of entrepreneurs alone but a shared objective of interrelated ecosystems of regions, research labs, consumers, investors, multinationals, start-ups, SMEs etc.

The sum of competencies and capabilities then gives a figure for "capacity," as in building capacity both external and internal resources need to be meshed together (Paun et al. 2012).

Many authors have identified, in the various studies of the conditions and mechanisms of financial support for innovation and their impact on economic growth, that information asymmetry



Technological Entrepreneurship and Asymmetries, Fig. 3 Xvaluator Like Optimization Use (L.O.U) Diagram to accelerate the Open Innovation through collaborative valorization tools (Xvaluator 2017)

(Akerlof 1970; Stiglitz and Weiss 1992) is one of the major factors influencing the financial risk taken to generate innovations in our societies.

The generalization of this type of collaborative tools will no doubt mean the constitution of a better business angels culture and venture capital in France, and especially the appearance of new investors because of the reduction in financial risk as a result of the reduction of information asymmetry between the SMEs (or start-up partners) and investors.

Innovative digital tools like Xvaluator (www.Xvaluator.com), the universal converter in real time of big data ('LIKE') in co-evaluated and aggregated shared information (opinions and Bottom-up criteria), could also accelerate (by reducing asymmetries) the value creation through more efficient and adapted innovation strategies (see Fig. 3) thanks to continuous co-valorisation monitoring of all stakeholders.

XVALUATOR L.O.U. Diagram (Likes Optimization Use Diagram) based on the Xvaluator innovative start-up in France and on its universal aggregator of all LIKEs and their divers criteria, contributes to the acceleration (but especially to an increase of efficiency) of innovation process by identifying and compensating some of the asymmetries. XVALUATOR L.O.U. Diagram brings support to anticipate and follow the evolution of all what we LIKE together (real time and continuously) and expressed on different platforms, apps, evaluations. Understanding what people LIKE and WHY and how this shared and followed transparently not only offers the possibility to anticipate, reduce risks, accelerate innovation but also to follow in real time the evolution of this participative valorization (through aggregated LIKEs and their divers criteria) having an impact on the accelerating process of innovations (especially disruptive innovation).

As a transition to the macroeconomic level, an important perspective could directly impact the development policies of regionally specialized clusters, as with the national strategies for innovation. The R&D laboratories will adapt their behavior by intensively using asymmetries compensation/reduction mechanisms (Paun 2011) in their relationship with the regionally specialized SMEs, but also with other SMEs, not regional or acting in other domains.

Thus, the regionally specialized clusters (supposing there is more than one present in the same region) will be interconnected through direct collaborations occurring between some of their "provider" (R&D labs) and technology "consumer" (technology adopter SMEs) members.

They will also be interconnected with other non-regional clusters. These types of interactions, driven through either market-pull or technology-push (or hybrid) approaches, will exchange technology inside and outside their related clusters, with no more monitoring by clusters authorities. To upgrade this type of a possible multiply embedded innovative system, mainly based on TT between providers and consumers of technology, the smart grid models could be an appropriate approach (Paun 2011).

Cross-References

- Business Angels
- Clusters
- Informal Venture Capital
- Innovation Systems
- Open Innovation
- Organizational Behavior
- SME
- Technology

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