

Innovation Function within the company: literature review and modelling attempt of related process

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Abstract

Nowadays, studying *Innovation function* is a strategic priority within the company. The focus of this paper is to carry out the literature review of *Innovation* empirical concept using academic inputs and industry best practices.

For this purpose, we will start by exploring different conceptualizations of Innovation notion and its evolution since *Schumpeter*. Then we will focus on *Innovation* typologies presented in the main *Innovation theories*.

Lastly, we will address the central issue of *Innovation Process*. We will attempt to analyze the different existing approaches and then come out with a model proposal.

The main theories and authors who deal with this issue have been highlighted.

Keywords

Innovation approaches, Innovation Process models, Innovation management

1. Introduction: Innovation, a major pillar for firms competitiveness

Due to the global economic crisis, innovation is now an important driving force for economic performance. At the risk of fail, companies are no longer able to only concentrate their efforts on reducing cost prices and selling prices. Innovation is becoming an option to escape market tough competition.

Indeed, 65% of corporate leaders (all sizes and sectors) consider *Innovation* among the top three strategic concerns (Chan V, Musso C, Shankar V, 2008). The staggering success of big firms such as Google and Apple have changed the company's vision of *Innovation*. Thus, boosting the Innovative capacity in order to increase competitiveness, is now at the heart of business strategy.

Furthermore, the innovation's vision that has prevailed for a long time, as being centered on R&D (Research and development) becomes less and less relevant. A broader vision has emerged, in which Innovation is covering all the company processes in order to create and/or renew demand for goods and services.

Innovation has become a major Function in the company, just like "Production" or "Marketing", its main objectives are as follows (S Le Loarne-Lemaire, S Blanco, 2012):

- Shortening product lifecycle
- Creating new products and services
- Introduction of new working methods for better efficiency and effectiveness
- Responding to users demand regarding products quality
- New technologies integration for cost reduction
- Conquering new markets

This brings us to consider Innovation following a holistic approach that affects all company processes transversely.

2. Innovation concept, literature review

In the beginning of the nineteenth century, the interest shown to the concept of innovation most often concerned "technological innovation", from a narrow perspective of specific fields. It is only at the beginning of the 20th century that we start to address this issue from a new angle, which is "non-technological" innovation (B Godin, 2008).

Joseph Schumpeter, one of the pioneering researcher in *Innovation*, had developed a theory highlighting the existence of "*creative destruction*" process that generates products replacement, and which is closely linked to economic cycles (J Schumpeter, 1939). He defined *Innovation* as a cyclical process inherent to the economy, which simultaneously creates new activities and eliminates other ones. This process is related to one of the following five phenomena:

- The introduction of a new good or a new quality of the good
- The introduction of an improved or better method of production
- The opening of a new market
- The conquest of a new source of supply
- The carrying out of the new organization of an industry

Since then, many researchers have been studying this subject, and have issued progressively several definitions that have evolved over time to lead to a predominant vision in the late 1990s. This vision defined the concept of *Innovation* as "The ability to create value by bringing a new product to the market with a sustain able integration into its environment (Boly, 2008).

Most recently, over the past decade, we found several definitions generally linked to "Market Matching" concept (without which it would not be possible to talk about *Innovation*), among which we mention:

- «*Innovation* is bringing a new idea into the market that can be exploited economically to produce an added value» (F. Barnu, 2010)
- «*Innovation* is the process that provides a new product (good, service or procedure) while ensuring the optimal matching with the market» (A. Arnaud, 2009)
- «*Innovation* is an inherent characteristic of the entrepreneurial process, related to dissatisfaction with the status-quo leading to a change that intends to provide a temporary response to this dissatisfaction» (B. Godin)

In the literature, there is also mention of *Creativity* concept, we should carefully distinguish between "*innovation*" and "*creativity*". Creativity is a "cognitive process" that generates ideas, whereas *Innovation* is an "entrepreneurial process" which converts those ideas into practicable solutions in a meaningful Market context.

In the following, we choose to adopt the OECD*1 definition as formulated in the OSLO Manual*2: « An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations».

3. Innovation Typology, attempt to categorize

In the literature, we found two types of classifications :

- A classification according to "*the outcome*" of innovation process.
- A classification according to "*the intensity*" (degree) of the innovation.

3.1 According to the "Outcome":

In 2005, the OECD*1 used the term of "product innovation" to designate a "good or service" innovation, and integrated concepts of "Marketing innovation" and "Organizational innovation". This classification has therefore become the most widely used.

The following figure, which we have constructed based on OSLO manual definitions, summarizes the 4 categories previously mentioned:

		Example	
INNOVATION	Product innovation	Introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses (can utilize new knowledge or technologies, or can be based on new uses or combinations of existing knowledge or technologies).	Touch screens, smartphones
	Process innovation	Implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software (can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products).	Organic farming processes
	Marketing innovation	Implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. Marketing innovations are aimed at better addressing customer needs, opening up new markets, or newly positioning a firm's product on the market, with the objective of increasing the firm's sales.	Online sale
	Organizational innovation	Implementation of a new organizational method in the firm's business practices, workplace organization or external relations (can be intended to increase a firm's performance by reducing administrative costs or transaction costs, improving workplace satisfaction).	Corporate reorganization, partners integration

Figure.1: Main types of innovation: Product, Process, Marketing & Organizational

In 2013, Larry Keeley, Helen Walters, Ryan Pikkell and Brian Quinn proposed another classification model based on the concept of "innovation visibility level" toward the company external environment, especially its customers. This model consists of 10 subcategories attached to three main categories (L Keeley, H Walters, R Pikkell, B Quinn, 2013), it is more exhaustive but much more complex than the OSLO manual four-categories.

3.2 → According to the "intensity":

The intensity of innovation refers to the level of novelty that it brings. An innovation may disrupt the market and consumption habits, or may bring significant improvements to existing products without far-reaching changes in conditions of use. Thus, we are talking about "Radical Innovation" and "Incremental Innovation»:

- Radical innovation generates a complete change of uses, references and user's habits. It could change the structure of the market, create new markets or render existing products obsolete. A good example is the invention of the printing press that had changed the world.
- Incremental innovation which is quite close to the notion of "kaizen", concerns an existing product, service, process, organization or method whose performance has been significantly enhanced or upgraded without fundamentally changing the basic concept. Diesel injection engines versus diesel engine is an example of incremental innovation.

This typology, quite generic, was taken up and elaborated by Rebecca Henderson and Kim Clark in 1990 to produce a matrix representation by introducing the notions of "core concepts" and "components" (R Henderson et K Clark, 1990).

The innovation subject is considered as a compact system with components and subcomponents. In this configuration, the innovation may affect either the core concept or the components and subcomponents, thus we are talking about "architectural innovation" and "modular innovation".

- An architectural innovation concerns an enhanced interaction that changes the linkages between components, the core concept is not overturned, but could be reinforced (Figure-2)
- A modular innovation changes the core concept without affecting the linkages between the components (Figure-2)

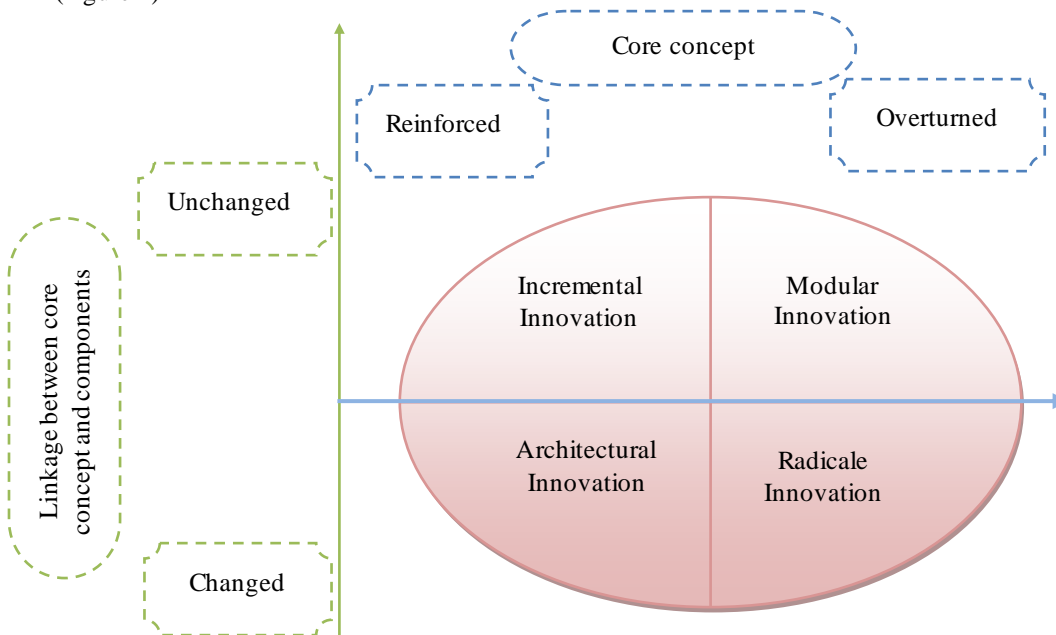


Figure 2, Innovation typology, matrix representation-(R Henderson et K Clark, 1990)

4. Innovation Process, modelling attempt

The attempt of modelling innovation process was of particular interest to the scientific community since the last decade. We found in the literature a multitude of converging models, most of them trace their origins back to Joseph Schumpeter and Leon Walras works (S Le Loarne, S Blanco, 2012). We were able to sort three flagship models that seem to us to be the most relevant for our review:

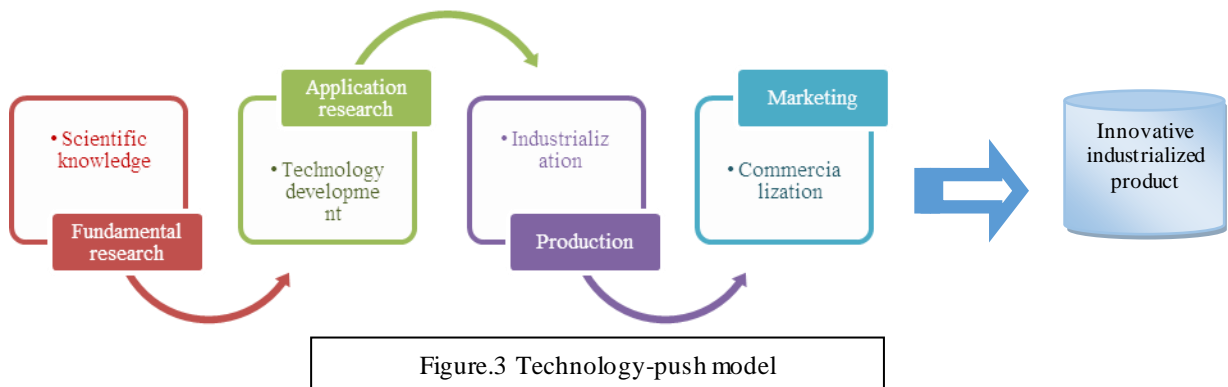
1. «Technology-push model» : this model allows to understand the mechanisms behind the second model
2. « Market pull model »
3. « Funnel model »

In the next paragraphs, we will try to present a comparative synthesis, analyze each model limitations and then conclude with the model that we consider as the most appropriate for our innovation approach.

4.1 Technology push model :

The *Technology-push* model is based on the hypothesis that fundamental research is the single driver of *Innovation*, because it generates scientific insights that are used by applied research to develop new products, then follows industrialization and commercialization phases (Figure. 3).

Under this model, new inventions are pushed through R&D, for the reason that only R&D entities are endowed with specialists in charge of conducting researches in specific fields to develop new technologies, as shown in the following figure:



The most cited example is pharmaceutical industry as illustrated below :

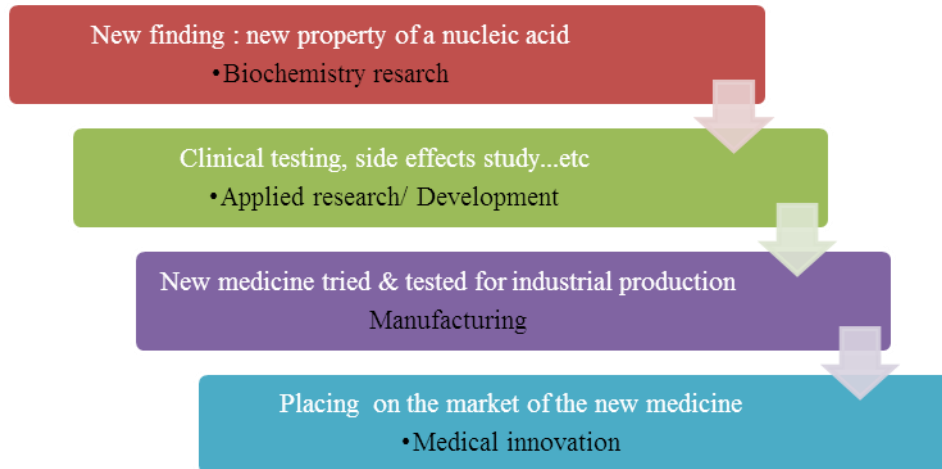


Figure.4 pharmaceutical industry, example of technology-push model

4.1.1 Limitations

This model presents a major limitation: there is no interactions with the market. Scientific finding is used in a sequential way moving from one *department* to another until the product is placed on the market. As a result, we have a lengthy process (this can be considered as another limitation). Furthermore, the market and end-users cannot generate ideas or express needs, the model totally ignores consumer needs & market requirements (Millier P, 2005).

4.2 Market-pull model :

In the late 190s, there is a growing trend towards taking the market as innovation's driver, practices are being put in place to enable companies to draw from their market to generate innovation's ideas (S Le Loarne, S Blanco, 2012).

The main characteristic of the Market pull model- contrary to what its name might suggest - is that the need/requirement for a new product may come from the Marketplace or from Research, it draws on both of them, thus it could be presented as a chain-based model with looped interactions between Research & Market (Kline S, G rosenburg, 1986), as shown below:

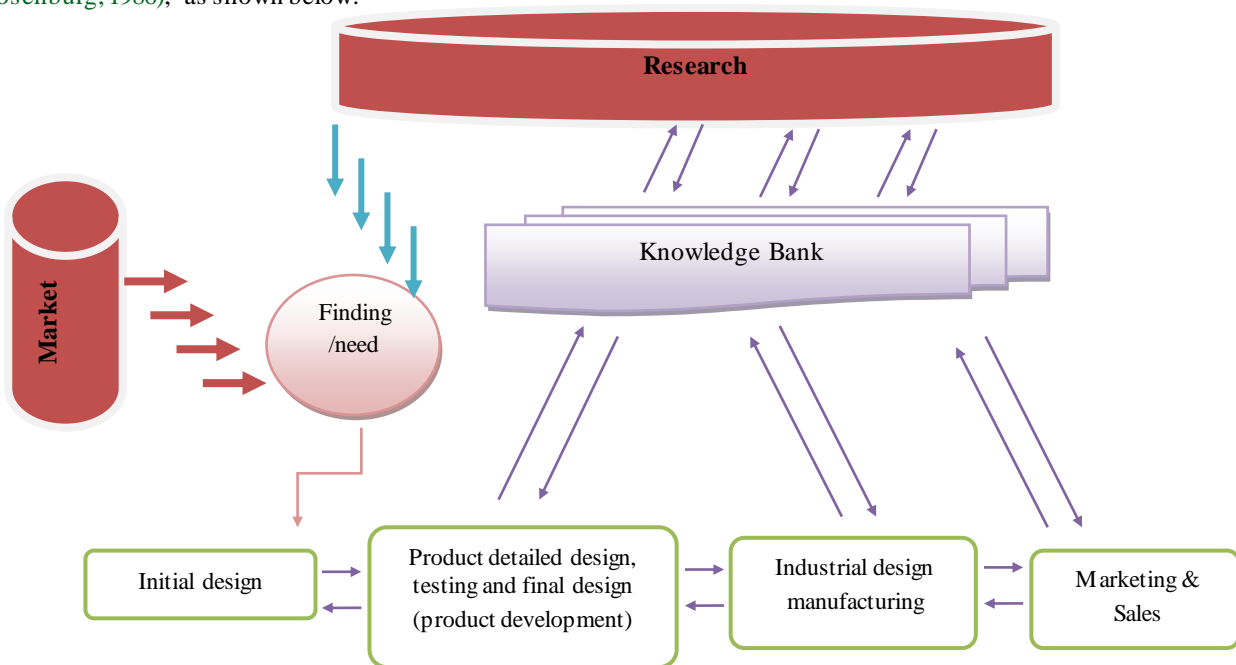


Figure. 5 Market pull innovation model

It can be seen that this model gives a better reflection of the innovation reality within the company, and provides the advantage of starting with a *focal point* (Finding/need) (Fig-5) that comes as said before, either from Market or from Research (science/ technology).

Research is sought all throughout the process, in all phases, whenever the knowledge available for the current phase actors is lacking to provide appropriate solutions, to enable them moving forward the next step.

Thus, Research is no longer the component that initiates the process and then disappears, but there is a successive back-and-forth that are carried out throughout the whole process (Kline S.G et rosenburg N, 1986).

4.2.1 Limitations

This model, fills an important gap in the previous model, however, it has certain limitations.

The first one is related to the rise of the concept of “*Company business network*” by the 1990s. This *Network* is defined as a set of heterogeneous actors (private or public laboratories, partners, customers, suppliers, financial institutions... etc.) that participate actively and collectively in the design, development, production and dissemination of an innovation (Loilier T, Tellier A, 2001). This *Network* emerged to promote cooperation on R&D projects around specific themes and rapidly become a valuable source of innovation. *Open Innovation* platforms such as Planetinnov or NineSigma are an example.

The *Network* thus presents itself as a key actor in the innovation context, and we realize that the Market-pull model should be revised imperatively to make full use of the *Network* concept (S Le Loarne, S Blanco, 2012).

A second limitation is linked to the necessity to build on the experience and know-how of the company. In this era of knowledge-based economy, the products life cycle is ever shorter, a learning process (related to success/failure of innovation projects) becomes not only a necessity to protect company's organizational assets but also a competitive advantage (linked to *Time factor*).

Hence the need to bring that aspect into the attempt of innovation process modelling and to formalize it.

4.3 Funnel Model

The *Funnel model* consists of two major phases: the exploration phase and the exploitation phase.

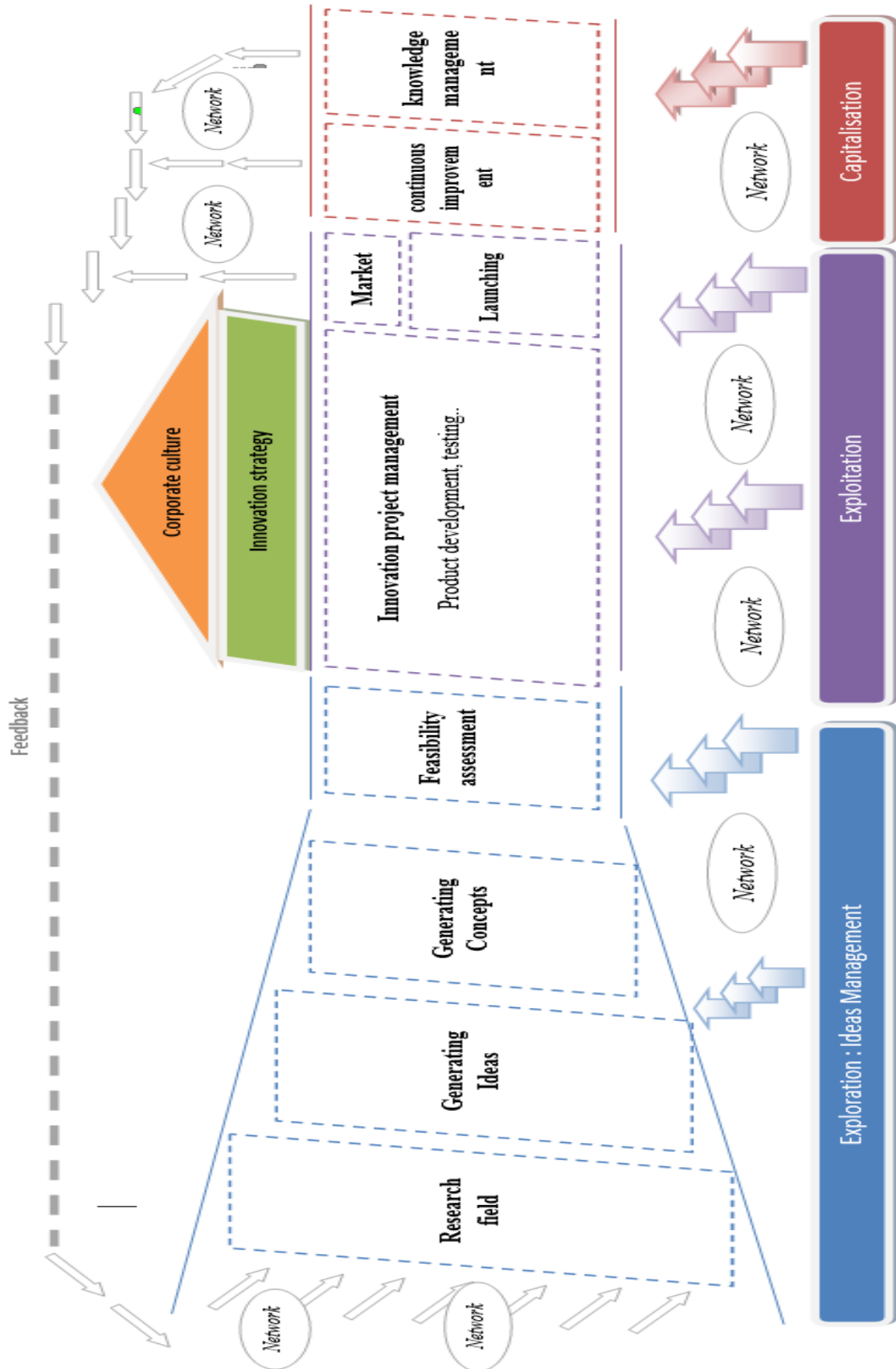
The exploration phase contains the "Ideas Management" step, including: defining search fields, generating ideas, defining concepts and assessing feasibility (Figure-6).

The exploitation phase encompasses the stages of product development, offer's launch and continuous improvement (Figure-6).

The *Funnel model* is a cycling model with returns between phases. The *Network* supplies all the process phases from the beginning to the end, and the consumer is omnipresent throughout the process and also throughout the *Network*.

Knowledge Management has become a full stage that includes continuous improvement (of the new products already launched) and capitalization on the project experience.

Figure. 6 Revised Innovation Funnel Model



It should be noted that the literature does not refer to a single *Funnel model* but several ones (in some cases, using other terminologies). Those models share in common the heart of the *Funnel* process which tends to spread within the company and its environment following « pipe line » modeling (L Morel, M Camargo V Boly, 2013).

The *Funnel model* we have presented here, is based on the elementary model of Wheelwright and Clark (R Henderson et K Clark, 1990) combined with a model that we found very relevant which is the *Innovation's House* by A. T Kearney (A. T Kearney, 2006). This model focuses on the Ideas Management phase and integrates the innovation process as a key part of business strategy.

Also, we have introduced the "Knowledge management" phase which we view as crucial to remedy to previous models weaknesses.

5. Synthesis:

Considering the strengths and weaknesses of previous models (Technology push & Market-pull), our contribution to the revised *Funnel model* offers the following advantages:

- It is a user-need oriented process
- It is a model based on an *iterative* Ideas Management and devotes an important place to the exploration phase
- It is a process that allows the company to absorb in real time everything coming from his *Network*, in all project development phases. Furthermore, the customer is not only a source of ideas but he applies throughout the process to validate and to orientate various options and alternatives that have emerged (S Le Loarne, S Blanco, 2012).
- It is a *time-to-market* process, which means that it enables the product to arrive in the market at the right time (Von Hippel E, 2006), on the one hand, because of the accurate and ongoing market observation, on the other hand because it includes the Knowledge Management as integral phase, which allows the company to draw on its accumulated knowledge to quickly find alternative solutions and to be proactive to meet consumers' needs.
- It allows proper, dynamic & continuous interaction between R&D, Marketing, Production and others corporate Functions.
- It increases probability of product acceptance and decreases the risk of Market rejection

6. Conclusion:

We would remind that our purpose is not to formulate a final proposal but rather to analyze the mechanisms behind innovation process evolution. Literature study had shown us that several modelling options are possible as long as they present the following characteristics:

- The *Iterative* nature, which allows a steady interaction between all actors with a step-backwards possibility
- The *real-time* aspect that allows absorption of the informations coming from the *Network* and the ability to integrate them at a later stage in due time to ensure the *time-to-market*.

One deepening perspective would be to analyze the creative mechanisms inherent to *Idea Management* stage, often called "Creative process". We have noticed that it represent a central issue in science area, considering that the challenge for today's firms is not only to innovate but to innovate forthwith (before competitors). Understanding the mechanisms of individual creativity and organizational one becomes then an imperative necessity.

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Biography

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