

Towards a Typology of Growth through the Axes of an Innovation Network

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ABSTRACT

The objective of this paper is triple:

1. Firstly, it seeks to determine the contribution of innovation networks to business growth, and in particular SMEs.
 2. Secondly, it tries to propose a typology of growth. In this context, it has the innovation networks as an element that focuses on three axes: innovation, information, and knowledge. Combining pairs of these three axes leads to four types of growth: growth provisional, negotiated growth, random growth and sustained growth. It should be noted that the latter (i.e. the sustained growth) is the goal of any leader/ manager.
 3. Thirdly, it specifies the contribution of each axis for each type of growth.
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1. Introduction

The growth of the companies is a topic which has generated, for years, thinking of researchers and practitioners. It developed from a variety currents. This development was accompanied by an expansion of all its dimensions: principles, methods of choice and implementation, means of financing, and measurement criteria.

The term, growth means 'a positive change in a given indicator' (Boissin et al, 2008). Indeed, it undergoes, as highlighted by Tremblay & Seguin (2009), the influence of three categories of factors that are both internal and external. There are factors dependent on the leader, the internal context of the company and its external environment (Tremblay & Seguin, 2009; Boukar & Tsapi, 2011).

Moreover, the reading of the work focused on growth through external ways, allows us to identify several topics approached by the authors: the partnership and alliances (Bchini, 2003) as well as partnerships with universities (Niosi, 2003), technological innovation (Kim and Mauborgne, 1997), the company's customers (Gupta, 2004) and the strategies to be adopted (Gertz & Baptista, 1996). From this perspective, the contribution of the corporate networks and in particular, innovation networks, to the growth of the companies did not have the required attention from the authors. Indeed, we cannot also ignore the lack of studies on the relationship between these two axes, although innovation networks have made in recent years, the object of special attention, as the part of the business as academic centers. But it should be noted that the studies which related to these two axes, developed in a largely parallel way.

It is meant by innovation network, developing links with a set of heterogeneous partners (competitors, suppliers, customers, as well as research centers), with the objective to develop and disseminate innovation (Callon et al, 1991). It is also a set of vertical and horizontal relationships with all types of organizations (public / private; partners / providers), controlled by a pivot (the carrier of project) in order to promote the invention of the latter. The pivot is a company network, and the most important member of the network. It is who controls the allocation of resources: capital, information, etc. Moreover, it is the organization occupying the central position in the network, in charge of the selection of the members (Gardet & Mothe, 2010)).

Moreover, a reading of the specialized literature shows that until now, most studies relating to SME are more focused on the factors, strategies and logics that contribute to their survival and their growth (Achi & al, 1996; Gertz and Baptista, 1996; Kim & Mauborgne, 1997; Niosi, 2003; Gupta et al, 2004) rather than on the understanding of the impact of innovation networks on the growth of the companies. Very few studies

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have analyzed, but not so explicitly, the issue of the use of innovation networks to determine their contribution to the growth of the companies.

Highlight the current focus of growth and innovation networks, is of a major importance to wonder about the purpose of this article, which is resolutely seeking a deeper understanding of the relationship between these two axes. It is for us, in this article to focus on innovation networks in order to better understand their influence on the growth. Thus, the present research goes beyond a critical analysis, only, to the extent that it proceeds to a proposal for a typology of growth through the axes of an innovation network.

With this intention, we will arrange our development in three times. We will, first of all, proceed under investigation of the problems of the growth of the companies, in order to position thereafter, innovation networks, as the preferred vehicle to finally release their contribution to growth. The conclusion of this article will include a proposal for a typology of growth.

2. The growth is a goal sought by all companies

In this regard we will first present the direction of growth, and then the problem of its measurement.

2.1 The significance of growth

A company seeking to increase its level of growth tries in fact, to develop its managerial power and further improve its performance. These should be a strategic lever for sustainability.

The attention paid to the issue of the growth of the companies, and particularly, of SME, is as highlighted by Boissin et al, (2008), relatively old, but constantly revived both by the political power and the academic world. Indeed, it began with the work of Penrose in 1959, on the conditions of existence of a complete theory of growth. But since that date and until the 1970s, there has been the emergence, according to Raston (1985), of three major attempts to consider:

- the first is the work of Marris (1964), in his attempt to theorize the 'engine' of growth, at the holder of power in the firm;
- the second is on the development of logical models of Ansoff (1965), and Mathematical models of Lesourne (1973);
- the third is marked by the study of the growth of the firms in relation to the sectoral or global environment of Bienaymé (1971, 1973).

It is emphasized on this level that the pattern of growth only concern:

- the internal growth, which refers to the use by the company, of the existing potential, resources and skills;
- the external growth, through mergers, absorption, or takeovers.

But from the 1980s, and with the proliferation of agreements intercompany reconciliation, theorists have begun to wonder about a third form of growth i.e. contractual or joint growth, according to De Montmorillon (1989). This third way is nowadays increasingly adopted and followed. It has also been growing in popularity (Johnson & Scholes, 2000). It corresponds to various forms of cooperation and in particular the agreements alliances and partnerships.

It is clear that growth is a complex and multidimensional phenomenon. Obviously, the growth process does not happen continuously, but it is marked by the existence of phases, the transition from one to the other is due to the emergence of an event closely affect the life of the company, this is what justifies, moreover, the existence of several models of the evolution of the company.

Given the above, the growth of the company requires setting up several measuring criteria in order to evaluate and follow it.

2.2. Measuring the growth of the firm

With respect to the measurement of growth, a set of authors of which Jansse (2005) and Boissin et al. (2008) attempted to synthesize the various criteria retained by the authors. It is use for example:

- the turnover and employment (Dunkelberg and Cooper, 1982; Almus, 2002). These are two criteria that are not related (Boissin et al, 2008).
- the intermediate balances of management, employment, value of net assets in equity and patents (Boissin & Trometter, 2003);
- the market share, profits, physical output of the firm (Delmar, Davidson & Gartner, 2003);
- the cash flow (Vanacker & Manigart, 2006).

It should be noted that these criteria have limitations in quite particular contexts like that of the technological innovation, including biotechnology contexts (Boissin & Trometter, 2003; Boissin et al, 2008.). In addition, there is no consensus about the best indicator measuring growth (Bierley & Westhead, 1990; Delmar, 1997; Weizimmer et al, 1998; Wiklund & Shepherd, 2005; Mahamadou et al, 2007).

3. Delimitation of the concept of innovation networks

The term innovation network means a combination of 'different actors linked directly (customers, suppliers, company partners may be competitors, etc.) or indirectly (the authorities, chambers of commerce, etc.) to business environment of the company' (Amabile, 2007). It is seen as a set of links with various organizations to develop an innovation (Dhanaraj & Parkhe, 2006; Gardet & Mothe, 2010). It is also defined by the creation of relations, bilateral or multilateral agreements with a heterogeneous set of partners (competitors, customers, as well as research centers), in order to develop and disseminate innovation (Callon et al, 199; Puthod & Thévenard - Puthod, 2006). These relationships can also be also more or less formal, depending on the structures connected. Some of them can in addition be described as alliances, as they depict two potentially competing firms (Puthod & Thévenard - Puthod, 2006). They prove to be a choice by companies to carry out several types of benefits, including the acquisition of new technologies and know-how, the introduction of innovations, etc. (Garrette & Dussauge, 1995; Masne, 2007).

The corporate network, and in particular the innovation network is to be distinguished from the firm - multinational network which is the result of a process of outsourcing (Delapierre & Michalet, 1989), Where there is a company leader which coordinates the operations of a large number of SME (Halary, 2006).

Innovation networks can have various forms. We find: the technical- economic networks (Callon et al, 199; Callon, 1991), inter-companies networks with the existence of a partnership Research and Development (Combe, 1996; Puthod & Thevenard - Puthod, 2006), networks of databases by the technical and scientific cooperation (Freeman & Barley, 1990), networks innovating 'University - Companies' (Creplet & Schaeffer, 2008) and other forms of networks. The diversity of forms, testifies to the wealth of the concept, especially that the internationalization process of research has increased since the 1990s (Masne, 2007). It is mainly explained by the major nature of the objective to reach, such as growth.

These networks are developed by SMEs seeking to share resources and skills, heterogeneous and complementary, in order to develop innovation projects, extend knowledge, and transmit information. None of the members of the network controlling the entire value chain and the added-value of the network are due to the fact that the resources and skills developed by the latter are (supposed being) higher than to the sum of skills of each Member (Gardet & Mothe, 2010).

By their originalities, particularly in terms of operation and their contribution to the life of SMEs, innovation networks have what to hold our attention. It is a further issue raised, following the movement of globalization and development of information and communication technologies.

4. Attempt for the determination of the contribution of innovation networks to the growth of the companies

This contribution oscillates between ambitions to reach and constraints and risks to avoid.

4.1. The ambitions of innovation networks: maximizing the rate of growth

The levers of the maximization of the movement of growth are identified with both the theoretical developments and international experience.

4.1.1. The ambitions identified in the theoretical developments

Just like what we have developed, the ambitions associated with innovation networks can be broadly gathered in three main categories:

- to invest in research and development and develop innovation projects (Akrich et al, 1998; Laban et al, 1995; Perrin, 1999; Ahuja, 2000; Loilier & Tellier, 2002; Puthod & Thevenard-Puthod, 2006). This helps companies to create new knowledge for the use to implement and manufacture new products or processes (Grawes & Landgowitz, 1996; Landry et al, 2002; Sternberg & Arndt, 2001);
- to benefit from the expertise available so far (Masne, 2007) and especially the technical skills shortage (Hennart, 1988; Kogut, 1998; Puthod, 1998; Bartelety, Fulconis & Mothe, 2001), in order to conceive innovation more quickly and at lower cost;
- to facilitate the movement of people and information, effective generators of services for the partners.

In light of the foregoing, we can determine the relationship between the three axes: growth, innovation, and innovation networks. Indeed, it is the growth prospects that stimulate innovation efforts within companies (Amabile, 2007). Following this idea, Weil (2003) suggests that the most innovative sectors have higher rates than others growth. Thus, innovation is for SMEs, the main growth factor (Baldwin, 1996; Niosi, 2003) because the investment in innovation enables companies to generate profits that could be reinvested to achieve other benefits.

Innovation can be considered in two forms: minor and major. But, unlike minor innovations that are profitable in the short term, major or radical innovations can support the development and competitiveness of companies in the long term (Becheikh et al, 2006).

In fact, SMEs do not have the financial resources and necessary skills to innovate and to bear the costs and risks of innovation projects (Damanpour, 1992; Majumdar, 1995; Tsai, 2001; Becheikh et al, 2006), where the recourse to the innovation networks is the main mean to increase.

Even limiting to the authors clearly identified in the field of collaborative networks (Becheikh et al, 2006; Amara et al, 2004; Landry, Amara & Lamari, 2002; Romijn & Albaladejo, 2002; Le Bas, Picard & Suchecki, 1998), we can note the networks which a company develops is a strategic vector:

- allowing to fill the deficit of resources, skills and knowledge of the companies (Becheikh et al, 2006.) having a positive effect on the ability of a company to develop radical innovations (Amara et al, 2004; Landry, Amara & Lamari, 2002) can help the companies to overcome their weaknesses (Romijn & Albaladejo, 2002);
- leading to a climate of confidence and develop social capital among stakeholders. This reduces transaction costs and establishes good communication between organizations, members of a network, which is conducive to the development of radical innovations (Landry, Amara & Lamari, 2002; Le Bas, Picard & Suchecki, 1998).

4.1.2. Ambitions recorded in the international experience

In this perspective, Ojasalo (2008) presented the results of a number of studies on the issue of managerial innovation networks, developed by Echeverni - Carroll (1999), Cox & Mowatt (2004), Taatila et al. (2006). Indeed, for Echeverni - Carroll (1999) who studied the flow of knowledge in innovation networks, he compared 'traditional' U.S. companies to Japanese companies. The study showed that:

- the Japanese companies tend to exchange information more frequently with their partners (suppliers, customers and non-profit organizations). As a result, they were able to develop products and processes faster than traditional American companies;
- the models of networks established with non-Japanese companies have also been able to develop products and processes faster than competitors.

Based on the foregoing, it is important to note that these studies tend to suggest that cooperation between individuals and organizations strengthen innovation. Similarly, innovation networks are an exchange lever of information, knowledge and innovation, guarantee of growth.

Concerning Cox & Mowatt (2004), they examined the use of consumer networks - leading innovations in the food industry - UK retail. They found that by the use of information collected directly from their customers

at the point of sale and data collected from supermarkets, they can identify consumer preferences and coordinate the development of new products through innovation networks. For them, an innovation network is a means of establishing a new competitive process in the UK food transformation and industry of the retail trade.

The study of Taatila et al. (2006) had rather social aspects of innovation networks. For them, an innovative idea is constituted by a social network that focus knowledge networks through one or more central people, innovators.

According to what precedes, it is important to note that these studies tend to suggest that the cooperation managed between individuals and organizations strengthen cooperation innovation. Similarly, innovation networks constitute information, knowledge, and an innovation exchange support, guarantee of growth.

Along with theoretical developments and fieldwork, several economic sectors such as pharmaceuticals, biotechnology, automotive, software and telecommunications have been identified worldwide. They could, despite the existence of obstacles, facilitate companies' development, helping to develop a sustainable competitive advantage and improve their performance.²

Delphi, Faurecia and Valeo, for example, symbolize the strategies of innovation networks in the automotive sector (Kaiser et al, 2006). Indeed, it is possible to note that innovation is regarded as one of the guarantors of the competitiveness of each one. Their strategies have been to diversify globally, reorganizing each of their markets and their locations.

A sector such as biopharmaceuticals is also exemplary in terms of innovation, to be the basis for developing new products, new tools, new techniques of penetration of new markets and finding new talent, and geographic diversification. Innovation is mostly considered a radical innovation, which is likely to lead to sustained growth³.

For the Asian companies which were integrated in innovation networks, they have very high growth rates. Indeed, in the design of electronic chips, for example, Asia has increased from 0% in 1995 to 30% in 2002 to reach 50% globally in 2008 (Masne, 2007).

It should be added that innovation networks can also affect the macro-economic level (Masne, 2007). Indeed, for developed countries, there will be reinforcement of the global area networks of production networks by internationalization and expansion of innovation networks internationally (Masne, 2007). However, emerging countries such as India and China, can benefit from a cost advantage in research and development, develop new technologies and catch up with the developed countries (Masne, 2007). While for developing countries, strengthening their systems requires very high costs for access to modern technologies (Masne, 2007). Achieving these objectives is prone to guarantee:

- stabilize, enough, networks to accumulate knowledge and develop collective learning (Halary, 2006).
- better manage the couple uncertainty /irreversibility inherent in any engagement in a research project, especially when investing in an intensive research and development sector such as pharmaceuticals and biotechnology (Hamdouch & Perrochon, 2000).
- have patience in certain sectors such as pharmaceuticals, because the return on investment appears only in the long term (Comet, 2006).
- select partners and create a work environment based on trust, commitment and compatibility.

Moreover, innovation networks can also acquire information difficult to access. They form an appropriate framework for sharing of skills, expertise and development process of collective learning. This helps to support and disseminate new technologies and innovations, despite the existence of constraints. The following section attempts to explain this idea.

4.2. Constraints and risks associated with innovation networks

We will first present the constraints and secondly risks.

²[http:// www. anrt.asso. fr.](http://www.anrt.asso.fr)

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4.2.1. Identification of constraints

A set of authors have mainly focused their attention on the concept of proximity between partners. This one can become a *sine qua non* condition for developing innovation process (Michel et al 2005). It can be a geographical type (or linguistics) (Masne, 2007) and seems as potentially facilitator of coordination between agents (Rallet & Torre, 2001; Pecqueur & Zimmerman, 2002).

However, with the development of information and communication technologies, informational proximity between researchers has largely replaced the geographical proximity (Masne, 2007) and innovation activities can develop properly without a geographical proximity between actors (Rallet & Torre, 2001; Pecqueur & Zimmerman, 2002).

In reality, these arguments do not resist to criticism, since there must also be a close organizational and cognitive proximity (Hamdouch & Depret, 2009), in order to ensure transfer of knowledge and information and contribute fully to the growth of the company. These two types of proximity return to the membership, of the various actors, with the same organization and the same community of destiny, on the one hand, and with adhesion with the same the same design of the innovation, the same paradigm, the same routines, etc.. the other hand (Hamdouch & Depret 2009).

Referring to the automotive sector, we see that the logic of Delphi, for example, in its establishments consists in taking account of the competence of the country in which it settles.

In the biopharmaceutical industry, the constraints in front of this type of network are of three orders:

- spatial proximity that allows for increasing returns.
- an organizational proximity that leads to achieve increasing returns and access to key skills.
- cognitive proximity which refers to the coordination of various investment projects by innovators.

For the pharmaceutical industry, investment in this area is marked by:

- the uncertainty of the results;
- the total cost of discovery which is very high;
- the highly experimental nature of knowledge and biotechnology tools; organizational and regulatory constraints (Hamdouch & Perrochon, 2000).

These constraints induce, decidedly, an individual and a contingent vision on the pharmaceutical industry, which is limited, to the extent that it does not provide information on the intensity of each obstacle. But this deficiency has been remedied by Le Masne (2007), who notes that the issue of internationalization in the pharmaceutical industry is mainly due to the search for lower costs, including wages.

But it should be noted that pharmaceutical research is more difficult to internationalize than that of electronics or automotive, and even of chemistry. This informs us about the characteristic of this industry that relies on knowledge more complex and difficult to standardize. As a consequence of this, the difficulty of the dispersion of research. The other industries, however, based their research on a codified knowledge and a common scientific lexicon. In this case, the dispersion of the research and development becomes easy (Masne, 2007).

In another form of discussion of the constraints, Bidault (1993) draws attention to the management of innovation. This implies a minimum of flexibility, on the objectives and the means to deal with the uncertainty that characterizes it. The Innovations are the basis for developing and maintaining a sustainable competitive advantage (Brown & Eisenhardt, 1998; Porter, 1985, 1999; Souitaris, 2001; Stock et al, 2002).

4.2.2. Investigation of risks

There are, at this level, two types of risks (Das & Teng, 2000). The risk of non-performance and the relational risk. The risk of non-performance (Ring and Van De Ven, 1992) should be considered in its various dimensions: commercial, technological and financial. It is inherent in any development project. However, relational risk returns to the characteristics of alliances.

These two types of risk affect mainly intercompany alliances in research and development, to the extent that, these last are characterized by:

- an instability related to uncertainty in the future behavior of the partner (Parkhe, 1993);
- an opportunism behavior;
- the possibility of loss of control of a skill or resource in a cause learning (Das & Teng, 2000);
- an incessant negotiations that could lead to disincentives, conflicts and premature rupture of the relationship (Garrette & Dussauge, 1995).

Moreover, it should be noted that these two types of risks are independent (Das & Teng, 2000). Every company has to make an accurate diagnosis to identify, measure, and manage their intensity (Das & Teng, 2000). Let us note that the risk of non - performance is first of all important because innovation is both very costly, time consuming and characterized by a high degree of unpredictability (Pisano, 1990; Hagedroom, 1993). But the relational risk has been so exacerbated in collaborative research and development (Takalo & Kulti, 2000). It would be important and serious in the case of asymmetric alliances. This is due to the unfavorable balance of power that reinforces attempts at opportunism. That is why it is necessary to exploit the profile of the partner, take care to consider the relationship between the parts of equal size and satisfy the requirements of trust, commitment and compatibility. These requirements help to avoid this kind of risk, because the major issue in an innovation network is to limit the relational risks inherent to these operations (Puthod & Thevenard - Puthod, 2006).

5. Conclusion and a proposal of a typology of growth

Based on the theory and practical experiments, we note that despite the constraints and risks, innovation networks lead to:

- a successful relationship between the changes in the organization of production and the functioning of markets (in the production level).
- a strengthening of existing technologies and a reconciliation of emerging technologies (in the technology level).
- an increase in turnover of partner companies (in the financial level).
- a learning development of new modes of organization, new knowledge and rapid circulation of information (in the managerial level)

Beside the advantages, several limitations may also affect the normal functioning of innovation networks: high costs, fragile relationships and uncertainty of results.

Given the foregoing, it can be noted that the issue of the use of innovation networks is between:

- ambitions to be reached, which are to maximize the rate of growth;
- constraints and risks to be avoided, having a report especially with the combined resources and psycho - sociological climate, to allow companies to suitably work together.

But between ambitions and constraints, there is also a degree of flexibility that is:

- firstly, to get as close as possible ambitions;
- secondly, to remove the maximum constraints and risks;
- finally, to make a mix and balance between the two extremes, to benefit from innovation, access to information and develop the knowledge we need.

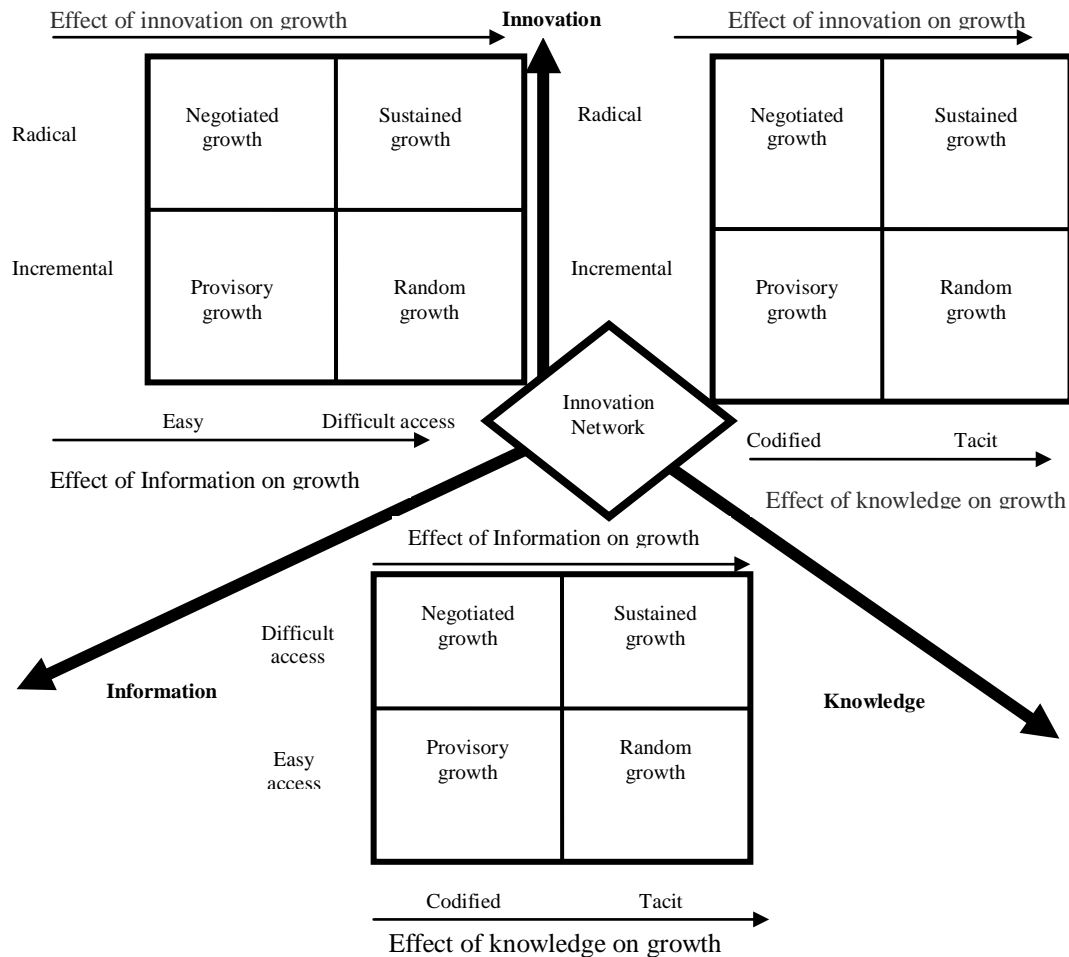
But this requires the satisfaction of a number of conditions relating to:

- the balanced sharing of power;
- the respect of the identity of the other;
- the existence of an environment based on trust, commitment and compatibility.

It seems that the operation of innovation networks revolves around three main areas: innovation, knowledge and information. Each axis oscillates between two extreme dimensions. Innovation (can be incremental or radical), information (can be, either with easy access, or with difficult access), and knowledge (can be either codified or tacit).

The combination pairs of these three axes should lead to four types of growth shown in figure 1. The sustained growth should be a goal sought by any manager/leader of SME, member of an innovation network. Given the above developments, we propose the following research proposal:

Research proposal: The effect of the axes of innovation network on the growth of the company



- Sustained growth is a persistent or constant growth.
- Provisory growth is growth that is waiting for other levers.
- Random growth is a growth subject to chance coincidence.
- Negotiated growth is a growth arranged by negotiation.

Under such circumstances, we hypothesize that:

Hypothesis 1: the variable "innovation network" is influential to varying degrees on the growth of a company. More specifically, it leads to a **provisory growth** through the following combinations:

- an incremental innovation and a codified knowledge;
- or an incremental innovation and an information with easy access;
- or an information with an easy access and codified knowledge.

Hypothesis 2: the variable "innovation network" is influential to varying degrees on the growth of a company. More specifically, it leads to a **negotiated growth** through the following combinations:

- a radical innovation and a codified knowledge;
- or a radical innovation and an information with easy access;
- or an information with difficult access and a codified knowledge.

Hypothesis 3: the variable "innovation network" is influential to varying degrees on the growth of a company. More specifically, it leads to a **random growth** through the following combinations:

- an incremental innovation and a tacit knowledge;
- or an incremental innovation and an information with a difficult access;
- or an information with an easy access and a tacit knowledge.

Hypothesis 4: the variable "innovation network" is influential to varying degrees on the growth of a company. More specifically, it leads to a **sustained growth** through the following combinations:

- a radical innovation and a tacit knowledge;
- or a radical innovation and an information with a difficult access;
- or an information with a difficult access and a tacit knowledge.

It appears that the control of sustained growth requires keeping a good balance between radical innovation, tacit knowledge and information with difficult access.

All in all, innovation, especially radical, can only lead to sustained growth. However, information and knowledge can lead to a negotiated or random, or provisory growth.

To see more clearly about the contribution of innovation networks to the growth of the companies, it seems useful to make the crossing between the axes of innovation networks and types of growth (Table 1).

Table 1: Contribution of innovation networks to business growth

		Axes of innovation networks		
		Innovation (especially radical)	Information	knowledge
Types of growth	Negotiated	-	+	+
	Provisory	-	+	+
	Sustained	+	-	-
	Random	-	+	+

Ultimately, achieving growth needs to manage the pairs (innovation, knowledge), (innovation, information), and (knowledge, information). This management should be reflected on the elements of achieving growth namely: the level of sustainable competitive position of the company, its ability to create value and its aptitude to satisfy the stake-holders, in order to increase the long-term competitiveness of the company and to improve its performance or promote growth.

It seems that this article has helped to clarify the contribution of innovation networks and to justify their issues, while proposing a typology of growth to inform managers/ leaders on opportunities for growth and how to reach the area of sustained growth. Thus, it is judicious to think about the spread of any form of association through a network, with the different sectors, in order to take up the challenges which facing. But, ultimately, what we expect to win in refining can be lost in the generalization.

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