

## **Framework for Analysis of the Intensity and Impact of the Innovations in the Net of Value of the Focal Company**

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### **ABSTRACT**

The innovative process is complex and it is characterized by the discontinuity with what is established by means of new combinations that occur inside of the firm and by interactions that occur between the agents of the net of value. In this perspective, this essay has as objective to present one framework for analysis of the intensity and of the impact of the innovations to the long of the net of value of the enterprises. For the delineation of this framework we used as reference the Henderson and Clark's (1990), Afuah and Bahram's (1995) and Nalebuff and Brandenburger's (1996) frameworks. The Henderson and Clark's framework was applied for the authors for the analysis of the intensity of the innovations in product, but when are considered other types of innovation, as process, distribution and management the model generates difficulties in the application. Thus, the framework proposed aims at to adapt the model of these authors considering two types of innovation and four possible levels of intensity: incremental - Level I and II, that they correspond the incremental and architectural innovation and radical - Level I and II, that they correspond the innovations modular and radical of Henderson and Clark's framework (1990). This framework also considers that the innovations can generate impacts to long one of the net of value affecting the stakeholders (consumers, suppliers, competitors and complementors), of differentiated form. For this we used the Afuah and Bahram's framework. The challenge of this essay is to articulate the intensity and the impact of the innovations being aimed at to contribute for analysis of the intensity and of the impact of the innovations in organizations.

### **1 INTRODUCTION**

The actual context of the sped up changes in the markets, the new technologies, the new organizational forms, the diffusion of new knowledge and abilities have generated an organizational environment of high complexity and global competitiveness. Porter (1999) affirms that the competition has intensified of the drastic form throughout of the last two decades in practically all the parts of the world and, in face of this, the organizations, regions and countries need to understand and to adjust its strategies and process the new mechanisms of the competition. Studies have pointed that in reason of the competition the enterprises have searched to develop competitive advantages, whose sources are in quality, costs, flexibility, trustworthiness and innovativity (CORREA; GIANESI, 1994). Porter (1999, p. 13) affirms that the firms only get competitive advantage by means of the innovation. The organizations that possess the innovation as source of competitive advantage get one differentiate themselves of the competitors, at least until that them copy and commercialize the innovation. Different authors point that an organization must develop distinct types of innovations as competitive weapon called of the incremental and radical (ALBERNATHY; UTTERBACK, 1978; FREEMAN, 1988; GJERDE; SLOTNICK; SOBEL, 2000); incremental, architectural, modular and radical

(HENDERSON; CLARK, 1990); incremental and of the rupture (ZAHRA; ELLOR, 1993). In a strategical and relationary vision Jorde and Teece (1989) affirm that new products, processes of production, administrative practices and markets are efficiently competitive when the organization has a competitive and cooperative behavior with other organizations. The others studies point that the intensity of R&D, the level of the sophistication technological and the potential of innovation of the industry are positively correlated with the number of competitive and cooperative relationships (KHANNA, GULATI; NOHRIA, 1998; NARULA; HAGEDOORN, 1999; CHUNG, BAE; KIM, 2003; QUINTANA-GARCIA; BENALVIDES-VELASCO, 2003). The strategical perspectives have shown to the predominance of the cooperative R&D instead of the domestic R&D (MIOTTI, 2003; CHUNG, BAE; KIM, 2003).

A variety of reasons can be enumerated for the apparent growth of different types of innovations and relationships of the cooperation for the innovation, being distinguished: the competition based on technology, the fast technological changes, the necessity to undertake activities of the technological development, to share risks and costs of the innovation, to get economy of scale and complementaries resources and products, to acquire and to share knowledge and abilities, to spread the culture of the organizational learning and to fix in its core business (AFUAH; BAHRAM, 1995; KHANNA; GULATI; NOHRIA, 1998; NARULA; HAGEDOORN, 1999; HAGEDOORN, 2002; TETHER, 2002; MIOTTI, 2003; QUINTANA-GARCIA; BENALVIDES-VELASCO, 2003). For Takayama, Watanabe and Griffy-Brown (2002), the significance in the formation of relationships with the agents of the value net is that serve as competitive advantage for maintenance and creation of the core competences for the innovation, mainly, in the development of new products, processes of production, markets and organizational practices. In this direction it is considered that the innovative process is complex and not determinist, characterized for the discontinuity with what is established by means of new combinations inside of the firm and for the interactions that occur between the agents of the value net. From this statement this essay has as objective to propose a framework for analysis of the intensity of the innovations and its impacts in the net of value of the focal enterprise. For this, we used the Henderson and Clark's (1990) and Afuah and Bahram's (1995) frameworks, presented to the long one of the text.

## 2 INNOVATION

The interest for the innovative change has been demonstrated, in the last years, for the works of Schumpeter (1982; 1985), Nelson and Winter (1982), Dosi (1982; 1988; 1991), Freeman (1987; 1988), Lundvall (1988; 1992), that they look for to explain it as a dynamic and complex process, intensified for the relations intra and interfirmas. These studies use the estimated theoreticians of the evolutionary and interactive boarding of innovation.

### 2.1 The Innovation in the Evolutionary Boarding

In the scope of the economy, to the long one of this century, much studies point of the nature, characteristics and sources of the innovation, with the objective to search better understanding of its paper in the economic development and the success of the enterprises. The evolutionary theory is studied by diverse authors and Schumpeter (1982; 1985) has being distinguished. These studies search to explain the functioning of the circular flow of economic development from the paper of the entrepreneur in the innovation process. The Schumpeter's contribution for the innovation process was pioneering, because with his studies science and technology that for the standards of the neoclassical theory presented as changeable exogenous of the economic system become endogenous, passing to be considered primordial elements of the process of capitalist accumulation. For Schumpeter (1985), the revolutionary change is the object of study of the economic development in the form of "creative destruction". Schumpeter (1985)

defines innovation as new combinations that are conceived through the introduction of new product, of new method of production, for the opening of new market, of the conquest of new raw material source and of the establishment of new organization. Nelson and Winter (1982) and Dosi (1991) are distinguished as illustrious representative neo-schumpeterianos. Nelson and Winter (1982) explain the bases of innovation through of routines, abilities and learning and Dosi (1991) attributes the development of the firm and its capacity to answer to the changes the four basic factors: learning and routine, path dependency, environment and selection and core competences. The author affirms that the innovations imply in new solutions techniques in products, processes and organizations, which are getting of the continuous process of mutations. Essentially, "innovation says respect to the search, discovery, experimentation, development, imitation and adoption of new products, new processes of production and new organizational forms"(DOSI, 1988, p. 222). In recent years, new studies has appeared in the innovation literature as " innovation interactive process", which describes the innovation as a process produced for interactions between structural influences and action of the individuals, that occur simultaneously. This perspective is presented in the item to follow.

## **2.2 The Interactive Process of Innovation**

The interactive vision of innovation is the base for many conceptual elaborations that consider the increase of the complexity, the importance of the external knowledge sources and the relations intra and interfirms for the success of the innovation. Some models are references in this area, as those that study the national system of innovation (FREEMAN, 1987; 1991; LUNDVALL, 1988; 1992), local systems of innovation (CASSIOLATO; LASTRES, 1999; 2004), productive chains, clusters, nets of companies. Lundvall (1992) considers that an innovation system is constituted by a set of agents and interactions between them for the production, diffusion and use of the new knowledge in determined geographic border. Developed for Lundvall (1992) and Freeman (1995), such concepts have been the base for studies that consider that the economic and social actors and the relations between them determine the capacity of learning, innovation and adaptation of a country the changes of the environment. This concept already comes being studied in local and regional levels. Edward (2000) affirms that in the "interactive process of innovation" is common in the field of the innovation and has been used to describe the innovative activities intra and interenterprises.

## **3 Models of Analysis of the Intensity of Innovations and its Relations with the Stakeholders**

Different authors (ALBERNATHY; UTTERBACK, 1978; FREEMAN, 1988; HENDERSON; CLARK, 1990) look for to define the types of innovations according to intensity with that they occur in the company. Of generic form, innovations can be classified as radical or incremental (ALBERNATHY; CLARK, 1985; FREEMAN, 1988; GJERDE; SLOTNICK; SOBEL, 2000). According Freemann (1988) radical innovation can be understood as the development and introduction of a new product, process or production entirely new. This type of innovations can represent a structural rupture with the technological standard already established, originating new industries, sectors and markets or to generate reduction of costs and increase of quality in existing products. The innovations still can be incremental character, for improvements in product, process or production inside of the enterprise without alteration in the industrial structure.

Abernathy and Clark (1985) divides innovations into two dimensions and draw a four-field diagram that they call "transilience map". The purpose of this model is to illustrate how different product innovations affect the competitive situation in a certain industry. In this framework they define four different innovation types: regular innovation, niche creation, architectural innovation and revolutionary innovation. Henderson and Clark (1990) extend the

model proposed for the author presenting four different types of innovation (Fig.1) - incremental, radical, architectural and modular. For the authors the distinction between radical and incremental innovation has produced important insights, but it is fundamentally incomplete. This allows us to distinguish four broad categories of product innovation:

- Incremental innovation: improvements at the component level only, while leaving the architecture unchanged. The incremental innovation refines and extends an established design. Improvement occurs in individual components, but the underlying core design concepts, and the links between them, remain the same.
- Radical innovation: radical innovation establishes a new dominant design and, hence, a new set of core design concepts embodied in components that are linked together in a new architecture;
- Modular innovation: innovation that changes only the core design concepts of a technology and innovation that changes only the relationships between them such as the replacement of analog with digital telephones. To the degree that one can simply replace an analog dialing device with a digital one, it is an innovation that changes a core design concept without changing the product's architecture.
- Architectural innovation: innovation that changes a product's architecture but leaves the components, and the core design concepts that they embody unchanged.

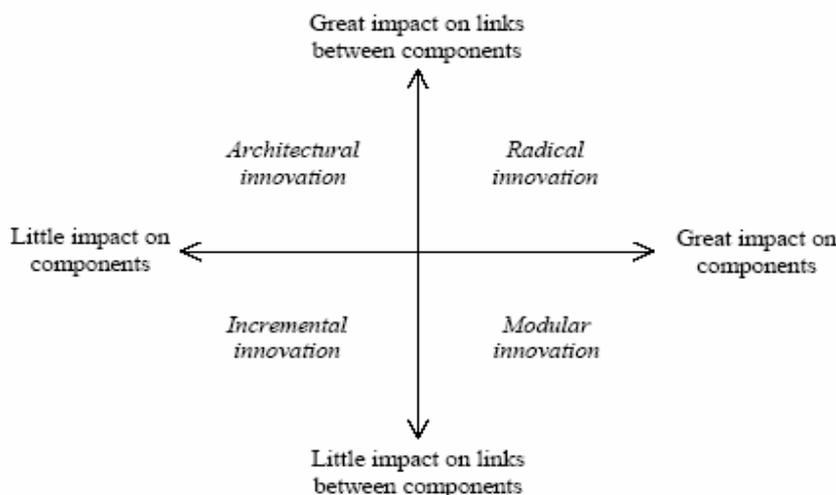


Figure 1 – Framework of the Innovation Types

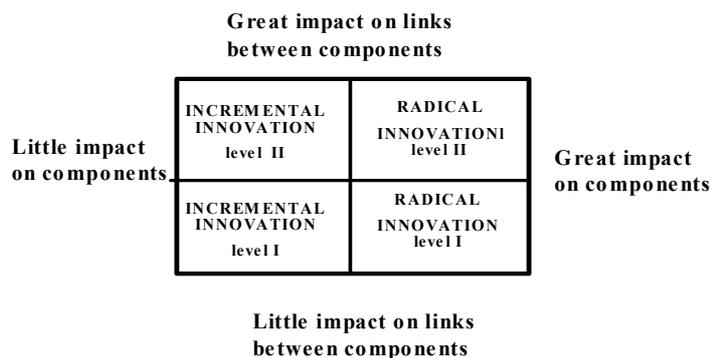
Source HENDERSON, R.M; CLARK, K. B. Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly*, v.35, p. 12, 1990, p.12.

Afuah and Bahram (1995) argue that it is necessary to see innovations from different perspectives, with regards to different actors. Some faces of an innovation in different periods of training of the chain of added value are called of "hipercubo of the innovation" (Fig. 2). The authors present a bidimensional version of hipercubo of the innovation leaving of the model of Henderson and Clark (1990). The vertical axle allows the innovations in radical (4), architectural (3), modular (2) incremental (1), and the horizontal axle allows the impact of these innovations in the different agents of the aggregate chain of value. Brandenburger and Nalebuff (1996) present a model to delineate the net of value of the company, in which he identifies the players in the business-oriented games and the interdependences between them. The value net is a form of looking at the environment business-oriented, recognizing that the organization operates in an

environment that has four groups of influence: suppliers, consumers, competitors and complementors. In the horizontal dimension they are the competitors and the complementadores. According to authors, the classic example of complement is the hardware and the software of computers. In the vertical dimension of the value net are the consumers and the suppliers of the organization. According to Brandenburger and Nalebuff (1996, p. 49), to the long one of the vertical dimension of the net of values it has a mixture of cooperation and competition.

#### 4 Framework Proposed for Analysis of the Intensity and of the Impacts of the Innovations in Net of Value of the Focal Enterprise

The Henderson and Clark's framework (1990) serves of base to classify the intensity of the innovations of the enterprise. The framework of the authors was applied in its research to analysis of the intensity of the innovation in product, it being characterized as incremental, architectural, modular and radical. This framework extend the focus for the analysis for the others types of innovations: product, process, marketing and organizational management. And we consider that the intensity of the innovation can be incremental and radical, but in two different levels in each one of the classifications - level I and level II. The incremental innovations - Level I and II innovations are similar to the incremental and architectural innovations and the radical innovations - level I and II are equivalent to the modular and radical innovations on framework proposed authors considered in this study (Fig. 2).

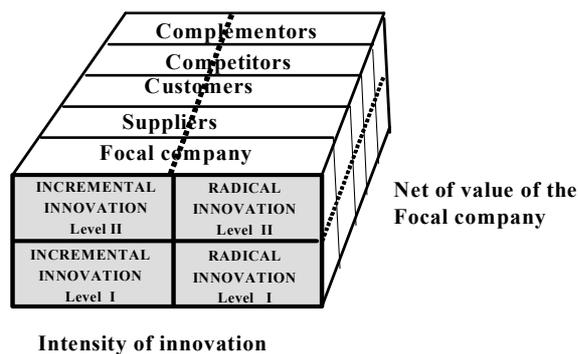


**Figure 2 - Intensity of the innovations in the company**

Source: adaptado de HENDERSON, R.M; CLARK, K. B. Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly*, n° 35, 1990, p.12.

In this direction, the intensities of the innovations are classified in this research of the following form: a) incremental innovation - Level I and II: they generate little impact on components and little impact on links between components. These innovations explore the established potential and frequently strengthening the dominant project, the capacity, technique and abilities; b) radical innovation - Level I and II: they generate great impact on components and great impact on links between components and great impact on links between components. These innovations are based on a new set of knowledge and technology and, frequently, stimulating alterations in the dominant project, the capacity technique and the existing abilities. The two different levels of intensity (Level I and Level II) in each one of the classifications serve to show that the innovations do not occur in two extremities, but that it has one continuum between the incremental and radical innovations.

The Afhua and Bahram's (1995) and Brandenburger and Nalebuff's frameworks (1996) serve of base for the analysis of the impacts of the innovation on the net of value of the focal enterprise proposal in this framework (Fig.3). The framework shows four groups of influence in net of value of the focal company: the competitors, the suppliers, the consumers and the complementors



**Figure 3 –Impact in the innovation in the net of value of the focal company**

Source: adapted de AFUAH, A. N; BAHRAM, N. The Hipercube of Innovation. **Research Policy**, v.24, 1995

In this direction, this framework for analysis of the intensity and impact of the innovations to the long one of the net of value of the focal enterprise considers:

- Intensity of the Innovation: four intensities are considered: Incremental - Level I, Incremental - Level II, Radical - Level I and Radical Level II;
- Impact of the Innovation in the net of value: four stakeholders are considered to evaluate the different impacts of the innovation: consumers, competitors, suppliers and complementors.

## FINAL CONSIDERAÇÕES

The models for analysis of the innovations are formulated and tested, normally, considering one variable of the innovation process. The framework considered allows a more systemic vision of the innovation inside the enterprise, in reason to consider different elements for the analysis of the intensity and the impact of the innovation in the value net. Thus, the innovation in the enterprise is considered a process that it integrates four different levels in the intensity of the innovations - incremental (Level I and Level II) and radical (Level I and Level II). Also it allows to evaluate the impact of the innovation in net of value of the focal company in four stakeholder: consumer, supplier, competitor and complementor. The adaptation of the two models of analysis of the innovation (HENDERSON; CLARK, 1990; AFUAH; BAHRAM, 1995) was proposed for the difficulty to apply in the practical reality when it is wanted to identify different types, intensities and impacts of the innovations. This framework has been applied in grapes and wines enterprises of the productive arrangement located in the Valley of the Vineyards, at Serra Gaúcha/RS/Brazil.

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