The Relationship Knowledge, Learning, Innovation and Competitive Advantages
A Conceptual Model

The goal of this paper is to delineate a conceptual model about the relationship of knowledge and learning with innovations and competitive advantages. This model will be applied in a research assessing the direct and inverse causation amongst sources and consequences of innovation. Hence, a bibliographical research about the themes was carried out and an in depth study of the selected literature was undertaken. Specifically, we revise the proposed theoretical models; critically assess the suggested analytical models and conclude with an integrative model focusing on knowledge and learning for innovations and competitive advantage and on how higher rates of innovations and performance can be supported by differentiated knowledge sources and learning processes. The main research question: are the technological capabilities for innovate and competitive performance improved by differentiated knowledge sources and learning processes? In the derived research, we aim to study how Brazilian export companies evolve on knowledge and learning to innovate, how innovativeness is reflected on technological-innovative capabilities and how innovativeness reflects performances.

Keywords: Innovations, Knowledge, Learning, Competitiveness
Introduction

Researches about innovation in the economics and management fields have been proliferated in geometric proportions since Abramovitz (1956) and Solow (1957) seminal papers. Nevertheless, our understanding about the determinants and impacts of the innovative activity, despite the contradictory results, yet demands more studies.

The contradictions refer not only to different methodological approaches, but also to different perspectives about the study of innovations. In economics, according Schumpeterian definition (Schumpeter, 1936) innovation refers to new combinations of existent knowledge and organizational learning. For Kogut and Zander (1996) it is not only existent knowledge, but also created knowledge. Hence, knowledge and learning are two of the main mechanisms linked to innovations. According to Lundvall (1994) ‘knowledge is the most strategic resource and learning the most important process of the contemporary capitalism’.

For Garcia-Morales et al. (2008), based on Nonaka and Takeuchi (1995) and Senge et al., (1994), an organization should be understood as a ‘system based on knowledge, a system through which circulate information and basic knowledge (explicit and tacit), knowledge acquired from the outside (absorptive capacity), or existing knowledge in the organization (knowledge used and knowledge slack). This circulation of knowledge creates a knowledge flow that, through various processes of transformation (organizational learning), creates new knowledge which, when applied (innovation), generates essential competences for the firm’.

Innovation, in general, is influenced by several environmental and firms dimensions. But, it also produces impacts. Hence, the research about innovations encompasses not only the study of their sources, determinants, mechanisms or processes, but also their consequences.
Regarding impacts the assessment focus, in general, on firm economic performance, through the results in productivity, growth, employment and production. But, there is the approach to focus at the impact on firms’ competitive advantages. According Barney, (1991) innovate is one of the most important ways to achieve competitive advantages.

Hence, with this paper we intend to advance in the understanding of the causal relationship of firms’ knowledge sources and learning processes as bases for innovation and from that to competitive advantages. In the proposed model, we include not only the possible mutual interaction relationship amongst the constructs, with innovation as a mediating dimension, but also the possible factors moderating the relationships.

From that, the main question is: how knowledge and learning interact in firms to produce innovations and which is the role of them on firms’ competitive advantages? In other terms: are the rates of innovation improved by differentiated knowledge sources and learning processes and foster of competitive performance?

The general goal is to delineate a conceptual model about the relationship of knowledge and learning with innovations and competitive advantages. This model will be applied in a research assessing the mutual relationship amongst sources and consequences of innovation in export firms.

In methodological terms, it is characterized by a bibliographical research and an in-depth study of the literature about determinants, processes and effects of innovations. In this direction, we revise the actual trends in the field and critically assess the suggested analytical models. The proposed integration of the revised models in a synthesis not only will base future empirical research but also serve to managers and public policies makers in their work of assess the process of generation, adoption and technology transfer.

To achieve the goal, the remaining of the paper is structured as follows: first it is assessed the literature about knowledge and learning as mechanisms of innovation at firm level; in the second section the relationship between innovation and competitiveness is
evaluated; the third section presents an analysis of the literature about the relationship knowledge, learning, innovations and competitive advantages, and, the following section presents the devised conceptual model for the analysis of the relationship between knowledge and learning with innovations and performance. Then, the paper is finished with the concluding remarks.

1. Knowledge and Learning as Determinants of Innovations at Firm Level

This section presents the result of an in depth analysis of the literature about knowledge and learning as internal determinants of innovations. These sources have been acknowledged as main aspects of innovation development.

This acknowledgment reflects proposals, pioneered by Penrose (1959), that resources and capabilities are the basis for innovations. In these proposals, a set of in-house resources and capabilities, broadly defined to incorporate inelastic productive resources, is claimed to give rise to intra-industry heterogeneity and idiosyncratic (firm-specific) sources of competitive advantage.

The resource-based theory foundation is that firms are heterogeneous with respect to their resources and capabilities. These resources and capabilities are the basis of the growth of a firm. Teece et al. (1997), however, show that resources and capabilities are different concepts. Resources refer to firm-specific assets, tangible and intangible, such as physical, financial, human and organizational (Barney, 1996). Examples of resources are production plants, property, organizational routines, workers’ skills, reputation, structure, and brand name. Capabilities involve the use and adaptation of a set of resources based on accumulated organizational or collective experience, to fulfill the objectives of the firm and provide it with a competitive advantage. Resources and capabilities provide competitive advantage when they are difficult to imitate, replicate, or substitute. While resources can be tradable in (nearly perfect) factor markets, capabilities cannot, since they are firm-specific, i.e. created inside firms over time. Hence, authors as Mahoney and Pandian (1992)
emphasize which firms’ asymmetries are not defined by the ownership of resources, but by the way that they use these resources (capabilities).

The “dynamic capabilities approach” (Teece et al., 1990, p.11), is built upon this resource-based theory. It stresses that one should not just view a firm as a bundle of resources, but note also the ‘mechanisms by which the firms learn and accumulate new skills and capabilities, and the forces that limit the ratio and direction of this process’. In this sense, Teece et al. (1997:516) define ‘dynamic capabilities as the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments’.

According Verona and Ravasi (2003) the dynamic capabilities are defined by the knowledge creation and absorption and by knowledge integration and knowledge reconfiguration which, in turn, are based on a coherent mix of resources. Organizational learning processes are key determinants of capabilities and the degree of innovation reflects the extent of new knowledge embedded in an innovation (Weerawardena, 2003).

As a result, the dynamic capability approach has broadened the analytical frameworks of the theory of the firm and strategic management, providing a richer framework for analyzing innovation within firms.

Amongst the mechanisms of capabilities two have received a detached assessment: knowledge sources and learning processes.

According Nonaka and Takeuchi (1995) knowledge, tacit and explicit, is the epistemological dimension of learning. The process of knowledge and organizational learning creation works through different stages of socialization (tacit to tacit), externalization (tacit to explicit), combination (explicit to explicit) and internalization (explicit to tacit). The process presents a rectangular form in the sense that carrying out the internalization; the process restarts beginning from a higher level of knowledge which ends with the cognitive evolution and knowledge accumulation.
The majority of studies assessing the relationship between knowledge and continuous innovation emphasizes, according Verona and Ravasi (2003), in a specific knowledge-related process. However, according the authors, continuous innovation requires, simultaneously, the presence of three fundamental knowledge processes at the organizational level: knowledge creation and absorption, knowledge integration and knowledge reconfiguration (Figure 1).

![Figure 1. Unbundling dynamic capabilities](source: Verona and Ravasi (2003))

The processes mean (Verona and Ravasi, 2003:579):

- Knowledge creation and absorption reflects a long-term commitment to the investment in basic science, its potential technological and market applications and the creation of a world-wide reputation in the scientific field in order also to absorb knowledge from outside.

- Knowledge integration refers to the capacity to shape and manage a context that stimulates latent and dispersed knowledge resources, so that they can jointly contribute to developing and launching new products.
Knowledge reconfiguration regards the creation of an ‘open’ structure that makes it possible to redefine role systems and relational patterns in a flexible way in order to make it easier to recombine resources continuously; this process of recombination allows the company to keep the new product pipeline filled.

The processes above show that the sources of knowledge can be internal or external. The latter is analyzed by Zahra and George (2002) through the concept of absorptive capacity defined as a set of capabilities by which firms acquire, assimilate, transform, and exploit knowledge to produce and maintain firms’ capabilities.

Acquisition refers to the capability to identify relevant external knowledge, acquiring those which are critical to the firms functioning. Assimilation refers to the routines and processes that allow analyzing, interpreting and understanding the information obtained from outside sources. Transformation refers to the abilities to adapt routines aiming to combine external knowledge with internal knowledge. Exploitation refers to an ability to transform the new knowledge into a commercial product to achieve competitive advantage (Zahra and George, 2002).

Cohen and Levinthal (1990) probably were the first to show that absorptive capacity of a firm is critical to its innovative activities, since knowledge is only absorbed if the firms meet the capabilities to internalize it. In this direction, Chen et al. (2009) suggest that absorptive capacity comes to be one of the most important determinants of the firm’s innovation performance through the development of ability to acquire, assimilate, and profitably utilize new knowledge. For them, when firms have greater absorptive capacity, it would increase their performances of innovation.

In turn, knowledge is the main input of the learning process. As stated above knowledge is the epistemological dimension of learning. According to Tran (2008:290) “the firm possess knowledge, resources, and skills but learning is the tool that enables the firm to make use of these assets in productive ways” (p.290). Slater and Narver (1995) suggest that
firms satisfy the competitive advantage requirements when present a learning structure focused on the idea of continuous improvement. Zollo and Winter (2002) stress that dynamic capabilities result from learning. Tran (2008:295) proposes that “innovation and organizational learning are intimately linked. In an ideal world, they create virtuous circles where earning leads to new innovations which lead to new levels of learning” (p.295). In general, researchers have concluded that organizational learning is associated with the development of new knowledge.

According to Weerawardena (2003), learning processes should focus on the acquisition of managerial competencies that permit the organization stay ahead of competitors. This requires the definition of organizational learning.

Organizational learning refers to the process by which new knowledge and information are applied with the goal of improve routines and performance (Fiol & Lyles, 1985; Huber, 1991; Simon, 1991). Based on Sinkula (1994), Huber (1991) and Slater and Narver (1995), Weerawardena (2003) defines organizational learning as the development of new knowledge or insights that have the potential to influence behavior, which can be distinguished from individual learning in an organization. Bell (1984) defines learning as the various processes by which additional technical skills and knowledge are acquired by individuals and, through them, by the organization. This process encompasses groups’ interpretation, interaction, and integration of individual knowledge, which result is superior to the sum of the parts (Tran, 2008). Also, in this case “the output is greater than the sum of the parts” formed by knowledge from internal sources (exploitation), and knowledge from external sources (exploration). According to Crossan, Lane and White (1999) exploration involves creating new knowledge and exploitation involves using existing knowledge. To Easterby-Smith and Prieto (2008), the two “forms of knowledge can originate from outside the organization, as with ‘absorptive capacity’ (Zahra and George, 2002), or from inside the organization through various mechanisms of intra-organizational knowledge sharing (Tsai,
According Tran (2008), “this information becomes the firm’s knowledge base and is embedded in the information systems routines, procedures, and history that make up the organization’s memory so that the knowledge remains even when members exit”.

Figueiredo (2003) breaks down organizational learning in two related processes: knowledge acquisition and knowledge conversion. He states that the first is linked to the individual level and the second to the organizational level. Both are divided in two distinct subprocesses, generating four learning processes: external and internal knowledge acquisition; and knowledge socialization and codification.

Similarly, Weerawardena (2003) proposes organizational learning as comprising of four learning activities: knowledge acquisition (the development or creation of skills, insights, relationships), knowledge sharing (the dissemination to others of what has been acquired by some), knowledge utilization (integration of the learning so that it is assimilated, broadly available, and can also be generalized to new situations) and unlearning (the review and renewal of existing knowledge and communication of changes within the firm).

Figueiredo (2003) stresses three key features of the intra-firm learning processes: variety, intensity, and functioning. Variety refers to the ‘absence or presence of different kinds of learning process within firm’ (p.615); intensity means ‘the extent to which continuous efforts to create, upgrade, use, improve, and/or strengthen learning processes actually take place within the firm’ (p.616); and, functioning is understood as ‘the way learning processes are built and work over time within the firm’ (p.616).

Since “innovation implies the generation, acceptance, and implementation of new ideas, processes, products, or services”, It is obvious, to Calantone et al. (2002), “that a learning orientation is closely related to organizational innovation”.

According to Stata (1989) given the accumulated levels of learning from past experience and the technological advances, the degree of product and process innovations
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reaches high levels in the firms. At this point, lies in the management of innovations the new way to gather or develop innovative capacities.

Tran (2008) claims that the kind of innovation requires different learning processes. Hence, incremental innovations are based on existent knowledge and radical innovations demand new capabilities directed to new technologies, markets and strategies.

2. Innovations and Firms’ Competitive Advantages

According to Tran (2008, p.290) ‘innovation is the creative and commercial embodiment of organizational learning’.

Studies assessing innovation and organizational performance relationship found, in general, that higher degree of innovations is associated with higher degree of performance. As Morgan and Berthon (2008) stated, firms need to undertake a continuous innovation process to achieve the highest and continuous levels of performance. To Freitas and Von Tunzelmann (2008), Ramsey et al. (2008), amongst others, the competitive advantage of firms reflects their capability to respond, timely and adequately, to external challenges through the development of new capabilities and innovations. Competitive advantage reflects an advantageous and sustainable position in an industry obtained by a firm. In this sense, Nelson (1991) claims that the sustainability of competitive advantage will depend on the extent to which the firm is able to develop capabilities for innovation.

To Chen et al. (2009) innovation is a key source of competitive advantage in the era of knowledge economy, since through the created differentiation allow firms to sustain their advantages better.

The sustained competitive advantage (SCA), according to Weerawardena (2003:415), unveils the ‘extent to which the firm’s innovations and distinctive capabilities resist erosion by competitors’ efforts’. It is a relative concept in the meaning of stay ahead of competition. Also, SCA has been defined by the greater or lower firms’ success in the
achievement of financial and non-financial (quality, reputation, growth) goals. Although financial performance prevails as indicators of SCA, Weerawardena (2003) advocates for the need to incorporate well-founded and realistic indicators of the construct. In this direction, he follows Day and Wensley (1988) applying indicators such as: whether the firm has gained superior financial and market advantages (Day and Wensley, 1988) and whether it is possible for competitors to duplicate the firm’s competitive strategy (Barney, 1991; Grant, 1991) and distinctive capabilities on which advantages have been founded (Grant, 1991; Hall, 1993) (Weerawardena, 2003:413).

Easterby-Smith and Prieto (2008), based on the literature, suggest that SCA in organizations derive from their operational capabilities embedding knowledge processes and resources in the form of differential and complementary technological and marketing competences. However, they quote evidences that this relationship can vary in the presence of several factors, including resource conditions (Holsapple and Joshi, 2000), firm conditions (Holsapple and Joshi, 2000; Zollo and Winter, 2002) and environmental conditions (Benner and Tushman, 2003; Massey, Montoya-Weiss and O’Driscoll, 2002; Zollo and Winter, 2002).

Weerawardena (2003) confirmed the conclusions of the study carried out by the Australian Manufacturing Council about innovation in that country manufacture industry registering that firms utilize both technological innovations (product and process) and non-technological ones (marketing methods and organization systems) in the search for competitiveness in global markets. Following Han et al. (1998), He suggests that innovation is the missed link in the relationship between marketing learning activity and firm performance.

Weerawardena (2003) detaches that several sources provides evidences that innovations lead to sustained competitive advantages, measured as firm superior performance (Hyvarinen, 1990; Rothwell, 1992; Lengnick-Hall, 1992) and entry and

Morgan and Berthon (2008) argue that both exploratory and exploitation innovation strategies, and in particular an equilibrium between the two, are one of the main sources of a sustainable organizational performance. They found empirical base for the proposal which organizations with ambidextrous innovative strategy achieve a superior business performance. Subramanian and Nilakanta (1996), in turn, found that both technical and administrative innovativeness cause a higher organizational performance.


According Knight and Cavusgil (2004) organizational capabilities are the main sources of firms’ performance. Hence, firms develop knowledge and capacities that make them innovative, which in consequence, leverage their performance up.

As Nelson and Winter (1982) stressed the superior ability showed by some firms to innovate and, consequently, create new knowledge, motivates the development of organizational capacities, comprising of internalized routines and core capabilities. These capacities are linked with superior performance in firms, especially in competitive or challenging environments. For them, an established innovative behavior makes firms more capable, which in turn is linked to performance. Hence, the relationship firms’ capacities and innovation, in a dynamic way, is bidirectional and mediated by environmental aspects.

As Morgan and Berthon (2008), based on several other previous studies, stressed: although the literature of business performance detach the need to align strategy to environmental changes, this alignment should not be seen in a deterministic way since the organizations also use their internal resources and capabilities to change the environment, through innovation.
Yeung et al. (2007) state that in a knowledge-based economy, organizational learning and innovation are the most critical intangible assets that a firm can apply to achieve a superior organizational performance. According to Tran (2008), firms’ innovative asymmetries are related to the learning culture predominant in these firms. For him, the product (innovation) of the process (learning) can be very different depending on the intensity of work and resources utilized.

Calantone et al. (2002) proposed a framework (Figure 2) to test the relationship amongst learning orientation meaning the organization-wide activity of creating and using knowledge to enhance competitive; innovativeness meaning organization’s willingness to change; and, firm performance regarding financial goals. Learning orientation was measured by four dimensions: commitment to learning, shared vision, open-mindedness, and intraorganizational knowledge sharing. The first three dimensions were measured by four questions and the fourth one was measured by five questions formulated in a seven-point Likert-type scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Innovation was measured by six questions also formulated in a seven-point Likert-type scale and firm performance was measured by three objective measures (ROI, ROA, and ROS), and one subjective (overall profitability). Their model (Figure 2) was extracted from the organizational learning and new products development literature and hypothesizes that learning orientation is an antecedent (determinant) of innovativeness, which in turn impacts firm performance. However, organization age moderates the relationship between learning orientation and innovation, and also of learning with firm performance. Specifically, the following hypotheses were formulated: 1: The higher the level of learning orientation, the greater the degree of firm innovativeness; 2: The higher the level of learning orientation, the greater the firm’s performance; 3: The higher the firm’s innovativeness, the greater the firm’s performance; Hypothesis 4: The older the organization, the stronger the relationship
between learning orientation and firm innovativeness; 5: The older the organization, the stronger the relationship between learning orientation and firm performance.

The analysis of results confirmed the theoretical hypotheses showing that learning orientation is related to innovativeness and also to firm performance. The relationship of learning and innovation is mediated by age; while it does not moderate the influence of learning on performance. Hence, learning is important not only to old organizations but also to young ones. The main conclusion is that learning and innovation are different constructs since the first emphasizes the importance of knowledge absorption, while the second emphasizes the organizational will to change.

Chen et al. (2009) theoretical reasoning and hypotheses are resumed in the full research model in Figure 3.
The empirical results presented by Chen et al. 2009 showed ‘that relationship learning and absorptive capacity had positive effects on innovation performance, and innovation performance had a positive effect on competitive advantage’. It was confirmed that ‘the more the investments in relationship learning and absorptive capacity, the better is the innovation performance. Besides, the more investments in innovation performance, the better is the competitive advantage’. Hence, innovation performance mediates the relationship learning and knowledge with competitive advantages.

In this direction, Easterby-Smith and Prieto (2008) propose that learning is a central dimension linking the concepts of knowledge management and dynamic capabilities and that this relationships impacts corporate performance (Figure 4).
Garcia-Morales et. al. (2008) analyzed the direct and indirect influence of knowledge and innovation as mediating variables on the relation between transformational leadership and performance, and found out that knowledge slack improves the knowledge absorptive capacity. In turn, the higher absorptive capacity facilitates the acquisition, transfer and use of tacit knowledge, which in conjoint, improves the organization’s average performance, whether appropriately managed (leadership).

As above, innovation mediates the influence of external variables and firms variables on competitive performance. Also, there are a large number of studies empirically confirming that these relationships are moderated by contextual variables. Amongst these variables is outstanding the influence of environmental dynamism and competition (Levinthal and March 1993).

In terms of the relationship innovation and firm performance to be moderated by external factors, Jansen et al. (2006) realized that exploratory innovations present better performance in dynamic environments, while exploitation innovations are superior in
competitive environments. From that the authors suggest that ambidextrous organizations coordinate well the two kinds of innovations, adapted to multiple environmental conditions. Also, Knight e Cavusgil (2004) realized that exploratory innovations flourish more in dynamic environments, while exploitation innovations are linked to competitive environments. From this result, they suggest that ambidextrous organizations coordinate well the development of the two kinds of innovations, responding adequately to multiple environmental conditions.

Similarly, Yeung et al. (2007) have not confirmed the relationships amongst learning, innovativeness, and performance in firms pursuing a low-cost strategy or producing mature products. Hence, the relationship is also context-specific. Antonelli (1993), for example, shows that imitators in general achieve a greater payback than the innovators (pioneers) in the telecommunications sector.

4. Knowledge, Learning, Innovations and Competitive Advantages: The Model

The revised works about sources and impacts of innovations show that these relationships are subject to internal and external determinants and to the institutional environments.

Hence, the proposed model, in Figure 5, shows relationships including firm specific factors and environmental dimensions as determinants of innovation; this as determinant of performance; the “feedbacks” and moderator variables.

The model selected the firm specific factors, learning and knowledge, and hypothesizes their influences on the competitive advantage through the full mediator, innovativeness. So, learning processes and knowledge sources are the two antecedents of

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1 From the literature, Jansen et al. (2006) define exploratory innovations as those which require new knowledge. Conversely, exploitation innovations are those incremental linked to the actual need of customers and markets.
the research framework in the study and the consequent is competitive advantage, while the full mediator is innovativeness.

According this model the rate of innovation is a function of differentiated knowledge sources and learning processes. The sort of effect depends of the dimensions, subject to the moderate effect of organization age. In turn, innovation affects firm competitive advantages in differentiated ways and this relationship is also moderated by the competitive environment.

The bidirectional arrows to and from knowledge sources and learning processes indicate that there is mutual interaction between them. The former is the input and output of the latter.

Hence, the future work shall respond the following questions:

First, are learning processes and knowledge sources positively associated with innovative performance?

Second, is innovative performance positively associated with competitive advantage?

Third, are the relationships above moderated by firm and contextual variables?
5. Concluding Remarks

This paper, after in-depth evaluation of the literature about some sources and impacts of innovation, delineate a multidimensional model of the relationship amongst knowledge and learning with competitive advantages, including moderated variables.

From the scientific-academic point of view, the model fills in an important gap in studies about the determinants and results of innovation.
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