

Innovation Capabilities of the Firm: The Brazilian Experience

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INNOVATION CAPABILITIES OF THE FIRM: THE BRAZILIAN EXPERIENCE

Abstract

The firm plays a central role in the economic system. It promotes technological change and innovation. While academic research on technological capabilities of the firm has led to a better understanding of the technical change process itself, there is no consensus on the ultimate definition of innovation capabilities. The purpose of this paper is to understand innovation capabilities as the firm's ability to transform technological, operational, managerial and transactional efforts into positive economic outcomes. For this we analyze four Brazilian cases in order to show that the firm's innovative performance is affected by four different types of internal capabilities: the technological, operational, managerial and transactional. Although the technological capability of a firm is an important component for the innovation process, it is insufficient to explain how a firm turns internal invention into market transactions, thus innovation. The results show that, to exist, all firms must develop in some degree all four capabilities described, but their innovative performance is based in the predominance of one of them.

Keywords:

Innovation capabilities; Brazil; innovative performance

1. INTRODUCTION

The firm is an economic agent that is organizationally designed to provide goods and services according to needs, desires and expectations of different consumers. Moreover, the firm is a knowledge-based structure that must be cost efficient in order to offer value, - better than that which any consumer could obtain from others.

To Penrose (1959, p.9) the firm “is the basic unit for the organization of production”. According to the transaction costs economics tradition, the firm can be viewed as an agent of transaction within a governance structure (Coase, 1937; Williamson, 1985). The Neo-Schumpeterian tradition, on the other hand, views the firm through its set of capabilities, which describe what the firm can do to survive over time. In this sense the firm is an agent of production, transaction and change, with specific knowledge and skills (Penrose, 1959; Richardson, 1972; Nelson and Winter, 1982).

These perspectives provide important insights into the nature and behavior of the firm and complement each other. Through a set of capabilities, the firm can produce something that will be transacted on the market at a competitive price.

In this context, innovation can be understood as the positive economic outcome that any firm obtains when successfully selling its products. If innovation is viewed as whatever the firm does to change in order to continuously sell its products, sources of innovation go beyond the introduction of new products based on the inclusion of new technology, new processes, new market ventures, etc.

The mainstream view considers that innovation is typically achieved by the firm possessing and developing technological capabilities. Although this is true, some questions remain: why aren't all firms that invest in technological capabilities considered innovative? Similarly: why aren't other firms that do not invest so much in their technological capabilities apparently more innovative?

The answer to these questions may be found by exploring different but complementary capabilities that can be identified in any firm. It is this set of capabilities that affects their innovative performance, allowing them to perpetuate over time. This means that an existing technological capability is not a sufficient condition for any firm to be considered innovative.

We argue that the innovativeness of a firm can be better understood in terms of four inter-related capabilities: besides the technological capability, one should also take into account the operational, the managerial and the transactional capabilities. Any existing firm must be, to some extent, able to: a) identify a market gap and develop the specific knowledge application (technology) to fill it; b) build an operational set of techniques and routines to produce the goods or service that will provide a recognizably valuable solution for this gap; c) guarantee that this operational set will efficiently produce the goods or service; and finally d) deliver it to market and achieve a successful business transaction. It is our belief that these four complementary capabilities are sine qua non

conditions for really understanding the innovation performance of any firm. Within this framework, the innovation can be seen embedding other capabilities that encompass the ability to absorb, adapt and transform a given technology into specific managerial, operational and transaction routines that can lead a firm to the achievement of Schumpeterian profits.

Advances that indicate innovation as a result of a range of complementary capabilities have been conducted (Teece, 1986; Burgelman, 1994; Cristensen, 1995; Chiesa et al., 1996; Guan and Ma, 2003; Yam, et al., 2011). However, further research is necessary to consolidate this theory.

The purpose of this paper is to understand the innovation performance of a firm in terms of four essential capabilities and ultimately, define innovation capabilities. Based on four cases involving Brazilian industrial firms, our assumption is that to obtain Schumpeterian extraordinary profits a firm needs this set of four inter-related capabilities, and be outstanding in at least one of them.

This paper is organized as follows: Section 2 explains the innovation capabilities of any firm through a four inter-related capabilities framework; in section 3 we explain the method used; section 4 presents four cases involving Brazilian firms and section 5 offers our conclusions.

2. THE INNOVATION CAPABILITIES

To exist and perform, every firm must have some specific capabilities. Different authors have studied capabilities using a variety of different labels, such as human resources (Penrose, 1959; Becker 1962; Barney, 1991), distinctive competencies (Selznick 1957; Snow and Hrebiniak, 1980; Hitt and Ireland, 1985), invisible assets (Itami and Roehl, 1987), core competences (Prahalad and Hamel, 1990), specific skills (Richardson, 1972) and routines (Nelson and Winter, 1982). Nevertheless, all these labels refer to essentially the same thing: specific capabilities that the firm creates and uses strategically in order to identify market gaps to be filled with new offerings of value.

The study of these capabilities has also led to the development of different theoretical perspectives, such as technological capabilities (Lall, 1992), marketing capability (Kotabe, et al., 2002), absorptive capacity (Cohen and Levintal, 1990), organizational capabilities (Chandler, 1992), dynamic capabilities (Teece, Pisano and Shuen, 1997, Eisenhardt and Martin, 2000).

According to Dosi, Nelson and Winter (2000) the importance of understanding capabilities lies in the fact the term refers to the degree to which the firm “knows how” to do certain things, such as, producing cars or computers, or flying from one continent to another. Coined by Richardson (1972), who defined it as the knowledge, experience and skills of the firm, the term ‘capabilities’ has been related by various authors to the term ‘routines’ which is one of the central concepts of the evolutionary theory (Nelson and Winter, 1982; Grant, 1991; Chandler, 1992; Collis, 1994; Peng, Schroeder and Shah, 2007). Nonetheless, firms do not operate in perfectly stable environments to use

its routines in the most effective way. As the competitive environment evolves, firms must figure out new ways to use its current capabilities and routines or to create new ones through innovation. The dynamic capabilities approach elucidates for the need to create, build, modify, adapt, reconfigure and update resources and capabilities in order to respond to continuously changing environment and sustain competitive advantage (Teece, Pisano and Shuen, 1997; Eisenhardt and Martin, 2000; Winter, 2003; Wang and Ahmed, 2007, Teece, 2007).

These studies have been important for our understanding of the firm; however, there is no consensus regarding which capabilities ensure survival and superior performance or what are the specific building blocks of innovation. While academic research into the technological capabilities of firms has led to a better understanding of the process of technical change itself, there is no agreement on the ultimate definition of the innovation capabilities.

Lall (1992), for example, stressed the power of technological capability as the way firms absorb, process, create, change and generate feasible technical applications (new technology, new processes, new products, new routines) within the knowledge frontier. However, an important point seems to have been forgotten: how seldom all this technological effort really turns into positive performance and recognized economic outcome. In other words, if a firm has developed technological capability, it does not necessarily mean that it will consequently show innovation performance¹.

Any firm that aims to reach the market should have, not only a strong cost-efficient operation achieved through a technological learning process, but also effective managerial and transactional routines. According to Dosi (1988), innovative capability relates to different degrees of technology accumulation and different efficiencies in the innovative search process and in the promotion of different results. In other words, “technological change is understood as a continuous process to absorb or create technical knowledge, determined partly by external inputs and partly by past accumulation of skills and knowledge” (Lall, 1992 p. 166).

The innovation capabilities mean much more than that. Besides those capabilities necessary to deal with knowledge and technology, a successful firm requires the ability to place and sell products in the market.

The innovation capabilities can be understood as both the firm’s technological learning process, translated into the technological and operational capabilities, as well as its managerial and transactional routines, represented by the managerial and transactional capabilities. The integration between these capabilities effectively promotes innovation, which creates competitive advantages. Unlike previous studies on innovation capabilities, this work emphasizes that this ability is grounded in the integration of four fundamental capabilities (Burgelman, 1994; Cristensen, 1995; Chiesa et al., 1996; Guan and Ma, 2003; Yam, et al., 2011). The innovation capabilities are therefore necessarily

embedded in four different complementary capabilities: the technological, the operational, the managerial and the transactional (Figure 1).

Capabilities	Definition
Innovation Capabilities	The innovation capabilities are the ability to absorb, adapt and transform a given <u>technology</u> into specific <u>managerial</u> , <u>operational</u> and <u>transactional</u> routines that can lead a firm to achieve Schumpeterian profits, i.e., innovation
Technological capability	The ability that any firm has to interpret the current state of the art, absorb and eventually transform a given technology to create or change its operations capacity and any other capability aiming at reaching higher levels of technical-economic efficiency.
Operational capability	The ability to perform the given productive capacity through the collection of daily routines that are embedded in knowledge, skills and technical systems at a given time.
Managerial capability	Is the way a firm will transform the technological outcome into a coherent operational and transactional arrangement.
Transactional capability	Is what any firm actually does to reduce its marketing, outsourcing, bargaining, logistics, and delivering costs, in other words, transaction costs.

Figure 1 – Definition of the capabilities

2.1. Technological Capability

Since the early 1980's, technological capabilities have been defined by both: “the ability or proficiency to make effective use of technological knowledge” (Westphal, Kim and Dahlman, 1985 p.171; Kim, 1999) and as “the capabilities needed to generate and manage technical change” (Bell and Pavitt, 1995). According to Dutrénit (2000), technological capabilities are inherent not in the knowledge that a firm possesses, but in the way that this knowledge is used and in the proficiency of its use in production, investment and innovation. “If a firm is unable by itself to decide on its investment plans or selection of equipment processes, or to reach minimum levels of operating efficiency, quality control [...] it is unlikely to be able to compete effectively in open markets” (Lall, 1992 p.168). However, “the technological capabilities needed to generate and manage technical change include skills, knowledge, and experience that often (but not always) differ substantially from those needed to operate existing technical systems” (Bell and Pavitt, 1995 p.78).

This is why, for the purpose of this paper, we distinguish between the technological capability necessary to make effective use of the technology and the technological capability used to manage and generate technological change. The former will be called operational capability (see section 2.3), while the latter, the technological capability itself.

Technological capability allows the firm to choose and to use technology for strategic purposes (Rush et al., 2007), to create new methods, processes and techniques (Afuah, 2002), and, primarily, to offer new products (Zhou and Wu, 2010 p.557). The basic assumption is that technological capability

results from the learning process through which firms internalize new knowledge to produce technological change and, consequently, new processes and products. It involves changing the production function rather than moving along the production function (Lall, 1992). This learning process can involve acquisition, imitation, adaptation, modification and/or the development of a new set of knowledge and technical systems for internal use. The result of this process should be goods and services with new technical standards for the firm.

Once a firm has mastered a technology, they should put it to work. This has implications for the capability to efficiently operate the technology in order to produce tradable goods and services.

2.2.Operational Capability

“Every organization, no matter what sector, has an operations function (even if it is not called by this name) because every organization produces some mix of goods and services” (Slack and Lewis, 2008, p.1). As previously argued, there is a need to differentiate the ability to change and develop technology, which is the technological capability, from the ability to use technology, which is the operational capability. Activities such as quality control, preventative maintenance, work flow and inventory control, mentioned by Lall (1992, p.167) as part of the technological capabilities, actually fall under the operational capability category. Thus, it can be described as what the firm really does given what it really knows.

Beyond the mere production of goods and services, operational capability should be concerned with the alignment of the production strategy with the firm’s competitive strategy and goals (Skinner, 1969), how the firm occupies the given production capacity in order to achieve the highest productive output in a given period of time. Operational capability results from the selection of competitive priorities in order to take advantage of low cost, quality, delivery time, responsiveness, flexibility (Skinner, 1974, Hayes and Pisano, 1994), degree of product or service standardization, size of product mix carried within the firm, volumes required (Ward, et al. 1998, Hayes et al. 2005) as well as production lead-time and the ability to concretely attend the technological innovation required by the market (Hayes et al., 2005).

Hence, the major point of a firm having technological and operational capabilities is to provide innovative solutions for the market. However, in order to ‘get things done’, the firm needs a certain ability to coordinate efforts (or governance) that we call managerial capability.

2.3.Managerial Capability

The emergence of large-scale business enterprises at the beginning of the twentieth century, led to a growing interest in the roles and functions of managers (Fayol, 1949; Mintzberg, 1973; Barnard, 1966; Chandler, 1977). With the application of scientific knowledge to production systems, vertical

integration of whole supply chains and the active ‘visible hand’ of management, firms were able to plan and co-ordinate transactions more efficiently than if they were carried out through the ‘invisible hand’ of the market (Taylor, 1911; Schumpeter, 1942; Williamson, 1985; Chandler, 1977).

The main advantage of the formal managerial organization is the ability to combine the productive capabilities of human and physical resources. It can contribute to the firm’s capacity to achieve higher levels of resource utilization and the ability to anticipate shortages (Lazonick, 1992). Overall, the purpose of managerial capability is to maintain a smooth flow of information and outputs to achieve higher rates of efficiency².

“Managerial services, therefore, have economic value by virtue of organizing and controlling resources in systematic and cohesive ways and are constitutive of firms” (Whitley, 1989). However, it does not follow the same pattern as operational routines (Stamp, 1981; Whitley, 1989). If capabilities can be explained by a set of routines embedded in applied knowledge (technology), managerial capability requires a more generalist repertoire to take action through choice and decision where technology fails to be perfectly routinised. In order to cope with various and often unpredictable circumstances, managerial capability needs a wide range of skills that should be applied flexibly in problem solving (Langlois, 2003). Similarly to Mayer and Salomon’s (2006) concept of capability, management capability reduces the costs imposed by uncertainty. However, it is not limited to this. They are dynamic and evolving, ideally concerned with the maintenance of administrative structures but also with the improvement of resource coordination and use, thus combining continuity with innovation (Whitley, 1989).

Managerial capability, however, will vary according to the degree of asset specificity of the technology involved and the costs of organizing the aforementioned arrangement. For each level of asset specificity, the firm should build its own management system and be capable of changing it over time. As Coase (1937) and Penrose (1959) previously stressed, every firm has its limits. To go beyond those limits, requires not only that technology be enhanced, but managerial routines should be expanded to deal with additional operations and transactions. By surpassing its limits through management novelty, a firm is certainly innovating.

As with management systems, the firm should implement the production system which is best adapted to its products, its capacity, and ultimately, its customers. These decisions will influence the way a firm operates to satisfy its customers’ expectations. These technological, operational and managerial activities, however, must be sustained by the firm’s capability to really deliver better utility to the market: the transactional capability.

2.4. Transactional Capability

As Coase (1937) predicted, the firm will grow to the point where the cost of internalizing an additional operation is equivalent to the cost of transacting it in the market (Langlois, 2003). This means that once a firm has developed a technological solution, it needs to be able to do whatever it takes to favor its transaction and sales. Since every firm uses, manages and operates a given technology with the explicit goal of obtaining positive economic returns, it should have a specific capability to actually trade its products. From outsourcing to delivery, and including attendance, negotiation, contracting, marketing, branding, logistics, every firm has a pack of specific skills, routines and systems to trade. We refer to all these together as transactional capability³.

Although attempts are being made to establish a concept of transactional capability (e.g. Argyres, 1996; Madhok, 1996; Langlois and Foss, 1999; Williamson 1999; Mayer and Salomon 2006, Argyres and Mayer 2007), there is still much to be done. This approach has its limitations (Ghoshal and Moran, 1996; Langlois, 1992), such as the way it deals with the learning, knowledge and general capabilities of the firm (Hodgson, 1998). Others have focused on highlighting the points of agreement between governance structures and capabilities (Argyres, 1996; Madhok, 1996; Hodgson, 1998; Langlois and Foss, 1999; Argyres and Liebeskind 1999; Williamson 1999; Poppo and Zenger, 2002; Mayer and Argyres, 2004; Leiblein and Miller, 2003; Jacobides and Winter 2005; Mayer and Salomon, 2006; Argyres and Mayer 2007).

Like any other, the transactional capability needs to be created, developed and modified, where learning plays a key role. For example, learning to contract (Mayer and Argyres, 2004) develops the ability to design contracts (Argyres and Mayers, 2007). Likewise, learning to deal, to brand, to deliver and so on, also require ability enhancement. Alternatively, if the firm's advantage can be achieved using its technological capability (to create new products), operational capability (to produce these products more efficiently) and managerial capability (to maintain all areas of the firm tuned and running), the development of its transactional capability will then help to expand this advantage. Transactional innovation is thus another innovative issue.

2.5. The Innovation Capabilities Framework

As mentioned above, innovation can emerge from one of its complementary capabilities. Although technological innovation is the most visible type of innovation, not all firms innovate technologically. For example, companies in commodity markets are supposed to follow technical constraints, such as production process and product mix. However, if they are trading, it is because they present some other advantage than new technology. It can be assumed that this advantage, whenever it is not technological, originates from the operational, managerial or transactional capabilities, and it can be respectively translated into productivity, efficiency or market gains.

Our framework states that every firm starts by having a special advantage, be it technological knowledge, marketing information, geographical location or institutional support. Any of those advantages can supposedly be translated into a recognized value in the market. If all firms exist in order to transact something special, it is because each one has some kind of applied 'know-how'. From this point of view, the technological and transactional capabilities constitute the very essence of the firm. No matter what happens, any firm will always try to find a new special knowledge (e.g. technological, marketing, locational, and institutional) that can be applied as an effective solution to an existing and identified market gap.

The problem is that the potential techno-transactional solution must be operationally arranged and efficiently managed to guarantee the delivery of the expected outcome. It is, however, the different linkages between the different capabilities that will give rise to a set of entrepreneurial and coordination functions within the innovative firm.

Technology management is a vital function that connects the technological and managerial capabilities. Even though a new piece of technology may be an "extraordinary invention", it is always affected by inefficiency. The management of technological development is the very first step that any firm has to take in order to obtain real operational alternatives.

Technological capability leads to 'development' as the result of the learning process during which firms internalize new knowledge to produce technological change and, consequently, new processes and products. However, this process requires efficient search routines and the ability to change in order to create and re-create operations. This is the major role of the entrepreneurial function: to bring technological solutions into operational light (presented here as a specific process and its resulting products).

Once the firm constitutes its management system by using established technology, routines and procedures, and so stabilizing operations, it thus combines the managerial and the operational capabilities. This is related to the planning and control efforts which guarantee the daily operations.

Although a technology must in fact be operational, it is the transactional capability that is responsible for connecting the firm to the market. This capability provides guidance through different commercial functions, such as marketing and logistics (operational-transactional linkage) and, of course, sales (managerial-transactional linkage). It describes the coordination function responsible for choosing the mode of organization (e.g. management system, production system, and commercial system) to be used and managed internally with the aim of reducing production and transaction costs. Therefore, the coordination function is the link between managerial capability and transactional capability in which the rules regarding procedures, routines and decision-making are intended to guarantee profitable sales.

Therefore, the firm’s innovation capabilities refer to its ability to deliver new valuable solutions through its proficiency in at least one of the four inter-related capabilities, which are linked by the different organizational functions (i.e. management of technology, entrepreneurship, organization, operations management, business co-ordination, logistics and marketing, and sales) (Figure 2).

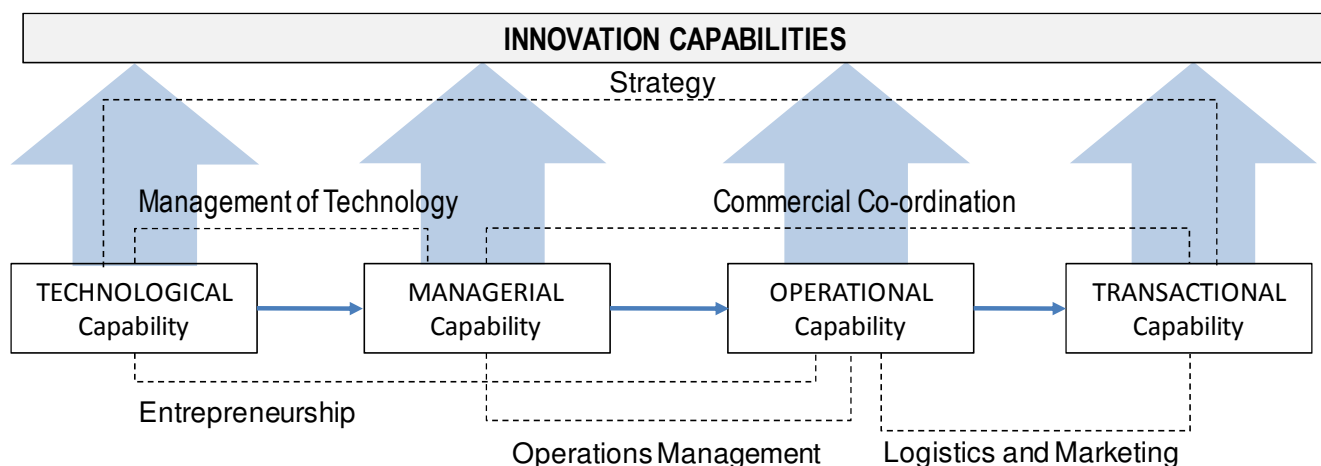


Figure 2 - The Innovation Capabilities Model of the Firm.

The integration of these capabilities is what ‘gives life’ to the firm. Without the transactional capability, there would be a gap between producing technical change and achieving positive performance in the market. Although the technological capability of a firm is an important component of the innovation process, it does not in itself explain how any firm turns internal invention into market transaction and innovation.

3. RESEARCH METHOD

The aim of this research is to advance the construction of an emerging concept by examining evidence obtained from selected case studies. For this purpose, it was decided to use the multiple case study method. While the random selection of cases is recommended in non-exploratory quantitative research, in qualitative research based on multiple cases it is neither necessary nor preferable (Eisenhardt, 1989). According to Rowley (2002) and Yin (2003), cases must be carefully selected so that they can produce similar (literal replication), contrary or completely opposite results, but for predictable reasons (theoretical replication). Given our proposal, we found the ideal number to be one case for each of the complementary capabilities.

The survey was conducted in the Brazilian state of Rio Grande do Sul (RS), which, in 2009, accounted for 6.46% of Brazilian GDP (Conceição, et al., 2010). Due to its tradition and importance, the cases were selected from the industrial sector.

First, we selected 26 companies which we believed represent the combination of different industrial branches of the state. We then tested the framework by interviewing managers and directors of the 10 companies that agreed to participate. Finally, after analysis and discussions of these 10 cases, we chose the four most representative firms for each one of the capabilities to build our multiple case study. The selected cases are from the following industries: beverages, electrical and electronics, leather and footwear, and metal products.

3.1.Data collection and analysis

Data was collected in four stages. Firstly, information was collected from secondary sources (the firms' websites, articles, annual reports, etc.) before the visits. Secondly, in-depth interviews were carried out with people with extensive knowledge of their business, such as the owner himself, directors and/or managers. Thirdly, we visited the firms' facilities to see in loco the four capabilities. While visiting the facilities, we collected further information on issues that were not previously fully covered. Shortly after interviewing and visiting the firm's premises, as part of the fourth stage, we wrote a report following the same structure used in the research instrument.

The analysis of the cases is based on the innovation capabilities framework and the empirical data previously sorted and filtered in the reports. To maintain confidentiality, the firms are referred to according to their specific industrial sectors: electronics firm, footwear firm, metalworking firm, and beverages firm. In each of the cases described below, the four capabilities present in all the firms are described, but in each case the firm has a predominant capability.

4. BRAZILIAN CASES

4.1.Metalworking Company – Technological Capability Predominance

The Metalworking Co., established in 1955, produces cans and lids for different applications, such as packaging for cosmetics, food and beverages, paint and chemicals. Later, the firm expanded its facilities and bought a lithography company. In 1972, it moved to new premises and started a new cycle of expansion. Since then the company has extended its factories and bought several companies.

The firm's managerial capability is based on a Japanese style that guides the firm's techniques routines. Its operational capability is based on a standardized pull production system, where the clients' orders trigger internal just-in-time production. For some customers, the company established an external Kanban system. The transactional capability is responsible for identifying the customer

needs which are brought to R&D staff so that they create new solutions for them. This capability is structured so as to strengthen the firm's innovative approach by building a reputation as an innovative company.

One of the most visible characteristics of the company is its constant concern with innovation. The company seeks to create an "innovation environment", where everyone sees development and continuous improvement with the involvement of employees, who are called 'inventors'. Its innovations have occurred both in the manufacturing of new products and in its management techniques. For both, the firm has established in-house R&D department. In addition, it has constant partnerships with several research centers and participates in some innovation groups in renowned universities. This activity is consistent with the main goal of its innovation strategy, such as registering six new patents a year. Metalworking Co. Focuses its efforts has its efforts on developing a technological capability that allows the firm to constantly reach its innovative potential. The success of this strategy is reflected in the various awards it has received for its innovative products. For all these reasons, the technological capability is the most important in this firm.

4.2. Electronics Company – Operational Capability Predominance

The firm assembles electronic circuits for commercial, industrial and construction business automation, as well as providing different kinds of circuit boards to energy and cell phone companies. It began operating in 1986 and currently has three facilities in major cities in Brazil. Each of these facilities has its own inventory, assembly, surface-mount and through-assembly technology units, where the final products are produced, tested and dispatched. This means that each facility is sufficiently flexible and has sufficient capacity to ensure its production processes.

Although the firm does not develop new products, and has no R&D department, it still has the technological capability to propose prototype improvements. Regarding managerial capability, the firm focuses on coordinating the work in the facility and guaranteeing that all products are delivered as requested in terms of quality and time. Since its major customer is also one of its owners, the strategic and organizational outlines of the firm depend on decisions made by that owner/customer. This fact also limits its transactional capability, as the Electronics Co. does not need to develop new capabilities in order to reduce its transactional costs. Most of the commercial decisions are made in absentia of the firm's business goals.

During the interviews and the visit, it became apparent that one of the firm's strengths is its ability to produce small batches of high quality products. This firm is strongly characterized by its operational capability to produce high quality with flexibility. This production process flexibility allows the firm to compete where companies, whose focus is on large batches, are not able to operate at a low cost. To strengthen this capability, in 2003, the company formed a strategic alliance with a

global conglomerate of companies. This alliance was formed to ensure technology transfer, best production techniques and practices, economies of scale in component acquisitions, and increase their customer base. Given these factors, we consider this firm's operational capability to be predominant.

4.3. Footwear Company – Managerial Capability Predominance

The firm was established in 1964 in order to fill a gap in the market for beach hats. In the 1970's and 1980's it bought other apparel companies and expanded its facilities. In 1991 and 1993 it established two children's brands. As from 2000, the firm decided to focus on producing children's apparel, and then on opening franchises for its two premium brands. By that time it had built a children's footwear manufacturing facility in Rio Grande do Sul.

Regarding its technological capability, Footwear Co., like most footwear companies working under a brand regime, needs not only to be aware of fashion, components and shoe production trends around the world, but also to be flexible enough to bring its own changes to every new collection. The collections are changed twice a year (summer and winter), but within each one there may be two or three sub-collections. The main changes to the products depend on the theme they are working with and not on new technology in the shoes themselves. There is no formal R&D department as such.

It organizes its production volume on a weekly forecast, performs regular quality control checks throughout the production line and on all final products, and has a labor-intensive production system.

In relation to its transactional capability, the firm sells its products (mono or multibrand) directly to retail stores, to its own stores or to its franchisees through sales representatives. It is a very traditional commercial structure.

This firm's managerial is outstanding because it is able to organize multibrand production, integrate the other capabilities, manage different types of sales to different customers and develop and offer good to premium quality products to the market. This flexible management system allows the firm to be sufficiently agile in all departments.

Moreover, as a proof of this special ability, the firm has recently changed its management driver and system, from an operations-based to a product-based model. If our research had taken place a few years ago, we would probably have found the operational capability was predominant in this firm. This ability to manage all areas in such efficient ways makes it an innovative firm, which is proven by its financial performance. It has not only become financially independent from the head quarters, but it has also achieved above-average growth within the group.

4.4. Beverage Company – Transactional Capability Predominance

This firm produces soft drinks, juices and mineral water. Since its establishment in 1924 in Rio Grande do Sul, the firm has managed to grow in a market dominated by recognized global brands. The company operates only in this state, where it holds a 12% market share in soft drinks.

Regarding its technological capability, the firm rarely practices R&D activities and does not have personnel permanently allocated for this task. The development of new products is encouraged by the suppliers who often introduce new compounds that are analyzed by the firm. Therefore, in the last ten years, the firm has launched three new product lines including mineral water and juices. The technology used is standardized and well established in the sector. Regarding its managerial capability, the firm is considering making some changes to its management processes to gain efficiency. The firm is still partially run by family members and needs to professionalize. At the time of the visit, it came to our knowledge that the company was initiating a new strategic planning process. In relation to its operational capability, it operates in a classic forecast and push production system. During the visit we were informed that the production area had been considered a priority for many years, however, the commercial area (transactional capability), covering distribution and sales, is now considered central to the firm's development.

Thus, we can clearly identify that the transactional capability is the firm's predominant capability. Of the firm's 650 employees, 450 work in sales, distribution, outsourcing and purchasing. This is even more significant since the firm is not a global player. As a commercial strategy, the firm focuses on regional niches and on a strong sales force. It manages its suppliers through contracts (considered a differential when compared to smaller manufacturers). To ensure its sales, the company has large inventories and on time delivery, which really gives the Beverage Co. a commercial advantage over its competitors, the global players. The Beverage Co. also holds several marketing promotions, and focuses on a broad distribution system. Although the transactional capability is predominant, there is a strong link with the managerial capability, which results in a solid business coordination pattern.

4.5. The Cross-Analysis

The cross-analysis of the four cases allows us to make some general and specific considerations (Figure 3).

By observing performance in the four companies, we conclude that the predominant capability will determine the ongoing strategy of the firm and its innovativeness. Moreover, the way the firm presents itself to the market is clearly defined by that special capability.

Brazilian Cases Innovation Capabilities	Metal Company	Footwear Company	Electronic Company	Beverage Company
Technological Capability	R&D focused in new products and new technologies through partnerships with Universities and Research Centres. Resources are allocated in new projects. Focus on new projects and has a goal of 6 new patents/year.	Uneventful development of new products through internal decisions about fashion trends. Resources allocated in new projects are divided in 2 sectors: Research and Engineering. Much effort on routine projects.	Product follows customers specifications. Resources are not allocated in new projects, but the production resources are specialised. Eventually makes prototypes and suggests improvements in customers' projects.	R&D focused on new products through the introduction of new compounds by the suppliers. New projects do not have specific resources allocated. New projects follows market trends, but it is difficult for them to internalize new products in production lines.
	Highlight: Constant concern with innovation. Focus in Research and Development. Effort to register patents.			
Managerial Capability	Uses Japanese management techniques. Pursue continuous improvement. Flexibility to solve problems in accordance to the involvement of all employees.	Uses many key performance measures Has been awarded for quality and productivity (PGQP). Reference in managing labor-intensive production, in introducing 4 to 6 new collections/year along with a good financial performance.	Corporate system aggregates Marketing, Sales and Managerial departments. Hires external consultants to help solving problems in this area.	Business managed by family members. Considers necessary to professionalize the management to gain process efficiency.
		Highlight: Franchising system is integrated with the production system through IT. The research sector frequently visits the franchisees to obtain product information.		
Operational Capability	Pull production system based on Japanese manufacturing techniques (Kanban system). Flexibility to produce different metal packages. Automated operations.	Push production system based on franchisee's sales. Some flexibility to produce specialties in children shoes. Labor-intensive system and few automated operations.	Pull production system based on customer's needs. Flexibility to produce specialties (around 200 different products/month in electronic boards. Automated operations.	Push production system. Flexibility to produce new products in soft drinks, juice and water lines. Automated operations.
			Highlight: Seriously seeks to follow the best production practices. High performance in small batches production.	
Transactional Capability	Negotiates in international fairs with global players. Sells technology to other companies.	In attendance in 8 countries. In Brazil: 164 franchisees and more than 15,000 points of sale. Negotiates with retail stores and franchisees. Manages own stores.	In attendance in 11 countries in 5 continents. Strategic Alliance with a global conglomerate of companies.	In attendance 55,000 points of sale in RS through 5 distribution centres. Manages suppliers through contracts.
				Highlight: Focus in local market. Logistics system provides the best route to deliver the products in each local market. 69% employees working in the salesforce.
Innovative Performance	Has been awarded for innovative products (market recognition). International patents registered.	The shoes unit has achieved financial independence from the head quarters.	Recognised by producing small batches of products of high quality.	12% market share in RS against global players.

Figure 3 - The Innovation Capabilities Analysis.

In the Metalworking Co., the R&D structure existing in all its three facilities allows the firm to provide customers with a special development capacity based upon its technological capability. This is, on the one hand, is boosted by updated scientific and technological information based on relations with universities and technological research centers, and on the other, by its organizational culture focused on encouraging innovation among all ranks of employees. All employees are called “inventors”. The visible results are, other than its organic growth, a strong reputation for patenting and innovation prize winning. This is why, in the Metalworking Co., the management of technology function is of a major importance.

The Footwear Co., instead of changing its techno-transactional structure to cope with recent movements in the Brazilian market, has changed its management system. The business unit abandoned the production oriented model in favor a product-oriented model. The consequence was a typical innovative outcome in which managerial capability led to increased profits. The other capabilities gained in terms of accuracy and cost reduction through the internal integration and flexibilization of different management functions. The innovativeness of the Footwear Co. is discussed internally throughout the whole corporation, since this business unit has been growing around 20% each year for the last three years, while for the rest of the group growth has been 5%.

Electronics Co. is a typical example of a production oriented strategy based firm, with the operational capability predominating. Within the firm, every effort is made to guarantee its productive capacity in terms of the high flexibility and high quality perceived by the customers. Even the operations management structure is located inside the manufacturing plant. The major goal of the firm is to maintain its uniqueness in terms of specialty production. They even produce one-off products; something big Asian producers are still far from achieving. To be unique is to be innovative.

The Beverage Co. is a typical example of transactional capability predominance. One can easily appreciate this just by taking a close look at its internal division of labor: 75% of the labor force is allocated to commercial functions. Management and other capabilities are there just to assure that the production capacity will generate enough products to fulfill inventories and thus, to give the company the on-time-delivery ability to be on the market before and faster than traditional global players. Whatever customers need in terms of commercial services and negotiation, they consider feasible. This is why marketing, advertising, logistics and distribution are the major functions that give the firm 12% of regional market.

Finally, with this one-specific-capability predominance each firm acquires its uniqueness vis a vis the competition and the consumers. The innovation performance of each firm, however, relies on different but complementary capabilities and its spill-overs. It should also be stated that innovation has come about due to market recognition. So, if the firm is recognized for its products, its quality, its

production capacity, its management efficiency or its special attendance function, what really matters is its capability to perform as if it has always something new, unique or technologically innovative to offer. No matter which path the firm chooses, it appears to the consumer as if it were always thinking of offering exclusiveness.

The innovative company, whether it is based on technological, operational, managerial or transactional capability, is always perceived by the market as an agent of customization.

5. CONCLUSION

In this paper we have proposed a new approach to examining the technological and the innovation capabilities of the firm. The development of the innovation capabilities model of the firm, which involves the four inter-related capability framework, raises some analytical issues.

First, every firm has all the capabilities. Second, one of them predominates over the others and this gives the firm its innovativeness. Third, for a firm to perpetuate in the market, it is necessary to change its technological, managerial, operational or transactional knowledge over time. Finally, for a firm to innovate, its capabilities need to be specific and integrated so it can generate Schumpeterian profits. For this reason, we have defined the boundaries of these capabilities.

The innovation capabilities are the ability to absorb, adapt and transform a given technology into specific managerial, operational and transactional routines that can lead a firm to achieve Schumpeterian profits, i.e., innovation.

Technological capability is what the firm does to change what it knows, in other words, internalize new knowledge. The firm's development is based on this process of technological change, which can be seen in terms of new products, efficient manufacturing, cost reduction and higher standards of quality among others. It is the ability to employ, at a given time, a given productive capacity by using a changed set of routines embedded in knowledge, skills and technical systems. The managerial capability is the mechanism by which the firm transforms the technological outcome into an efficient operational process. To complete the innovation process, transactional capability is necessary to take the technical, operation and managerial efforts to the market, through products.

Notes:

¹ The definition of innovation is quite confusing. One may hold the Schumpeterian point of view of a successful business venture that necessarily provides the entrepreneur with extraordinary profits. Another may adopt a more technical definition, such as those that advocate that any novelty that is brought to the market should be considered an innovation. In this paper, we follow the Schumpeterian tradition.

² Somehow, one may consider management as the former neoclassical definition of the firm: to ensure the best resource arrangement given the technology and its production function.

³ This concept was somehow used by Teece (1986, 2006) and Teece et al. (1994). However, they do not indicate the characteristics, scope and the necessity of this capability in order to understand the nature of the firm.

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