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Innovation Capabilities and the role of Strategic Intelligence

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Abstract

In rapidly changing environments, innovation allows firms to maintain their market competitiveness. A firm with well-developed innovation capabilities stands a better chance to sustain its competitiveness. Additionally, strategic intelligence practices will also contribute to positive results, as a firm's economic sustainability depends on installed processes to obtain informational elements coming from the external environment to support its decision-making process. In this way, innovation often benefits from intelligence processes, especially when it provides new knowledge, monitors technological trajectories, and expands understanding of the external environment. To survive in a competitive market a firm needs innovation capabilities and strategic intelligence practices, but how are they related? Firms that are proactive in terms of their strategic intelligence practices have more developed innovation capabilities when compared to those reactive ones? This study aims to identify whether firms with activities associated with the strategic intelligence process differ in terms of their innovation capability level, verifying differences when comparing reactive and proactive groups. We analyzed secondary data of 1,331 Brazilian manufacturing firms. From the analysis, we have identified that development, operations and management capabilities are higher in those firms where there are strategic intelligence practices in place.

Keywords: Strategic Intelligence, Innovation Capabilities, Decision-Making, Proactivity.

Innovation Capabilities and the role of Strategic Intelligence

1. Introduction

New products, new production methods, new forms of organization and new markets are different ways of perceiving innovation as a result of the change efforts made by companies. The neo-Schumpeterian tradition, even based on Schumpeter's main pillars (1911 and 1942), goes further. More than the 'novelty' itself, innovation must be perceived as a behavioral and evolutionary process (Nelson & Winter, 1982; Teece et al., 1997; Zawislak et al., 2012; Nelson et al., 2018). Data, information and knowledge must be intertwined with resources, routines and practices to give rise to different arrangements of intelligence, creativity and innovation capability. From the development of new products through commercializing them, including their operations and the firms' management (Alves et al., 2017), innovation capability is the "ability to absorb, adapt and transform a given technology into specific operational, managerial and transactional routines that can lead a firm to Schumpeterian profits, i.e., innovation" (Zawislak et al., 2012, p.23). In short, innovation depends on the behavior of companies, which can determine their attitude towards changes in the environment (Nieto et al, 2015). Studies have shown that proactive and reactive strategic behaviors have different effects on innovation (Fan et al, 2013). There are proactive companies, which anticipate the movements of the environment, define markets, face the future as something to be built; and there are reactive ones, more deterministic, followers, who see the future as something defined, to which they must adapt (Shankar, 2006; Chen et al., 2012). Environmental monitoring, early detection capabilities, and innovation capability were identified by Helfat and Raubitschek (2018) as three critical dynamic capabilities to the strategic organizational context. The first two are closely related to strategic intelligence activities. The principle of strategic intelligence is that firms' economic sustainability depends on installed processes to obtain informational elements coming from the external environment to support the firm's decision-making process (Aguilar, 1967; Ansoff, 1975; Mintzberg, 1994; Day & Schoemaker, 2006; Lesca & Lesca, 2014). By origin an activity associated with the proactive behavior of organizations and environmental attention activities which convert signals into strategy (Ramirez et al., 2011).

In consequence, innovation benefits from intelligence processes because it provides new knowledge, identifies new opportunities, monitors technological trajectories, and expands understanding of the external environment (Cainelli et al., 2019). As a matter of fact, it is our major assumption that, to survive in competitive markets, companies need both innovation capabilities and strategic intelligence practices. What, however, and to the best authors' knowledge, is not yet fully understood by the literature is how innovation capabilities are in fact related to strategic intelligence practices. How strategic intelligence practices play a role in innovation capabilities? Do proactive companies in terms of their strategic intelligence practices have more developed innovative capabilities than reactive ones? These questions led us to investigate whether strategic intelligence may have an influence on the level of innovation capabilities when comparing the reactive and proactive groups. Thus, this study aims to identify whether firms with activities associated with the strategic intelligence process differ in terms of their innovation capabilities' level, verifying differences when comparing reactive and proactive groups. For this purpose, we analyzed secondary data from 1,331 Brazilian manufacturing companies, based on the Innovation Capabilities Model (Zawislak et al., 2012).

In the following sections of the article, we present some of the theoretical foundations of innovation, innovation resources and capabilities, strategic intelligence and decision-making associated with firms' proactive and reactive behavior. In the methodological procedures, we explain how we use the independent sample t-test to analyze the data. Then, we discuss the results to finally present the conclusions of our study.

2. Background

Innovation is related to change and novelty (Schumpeter, 1942; Nelson & Winter, 1982; Dosi, 1988; Nelson et al., 2018). Especially in rapidly changing environments, the innovative transformation has a clear value in sustaining competitiveness (Amit & Schoemaker, 1993). To survive, a firm needs to be in constant change and innovation capabilities have the key role to lead that process (Cohen & Levinthal, 1990; Lall, 1992; Bell & Pavitt, 1995; Teece et al., 1997; Augier & Teece, 2007; Zawislak et al., 2012). Firms might have stronger or weaker levels of capabilities, which, in turn, makes them more or less capable to pursue innovative outcomes. It is our assumption that firms with developed strategic intelligence processes, focusing on early warnings and anticipation (Lesca & Lesca, 2014) of potential threats and opportunities, can react proactively in the field of decision-making and, thus, may present stronger levels of capabilities.

2.1 Innovation Capabilities

Any firm is a collection of resources (Penrose, 1959). From tangible, such as machinery and equipment, to intangible, such as human capital and knowledge, the arrangement of such resources results in the development of new products, processes, management and marketing solutions. It is the successful arrangement of resources that will reflect on any firm's economic performance (Wernerfelt, 1984). From this resource-based view, Nelson and Winter (1982) had enlarged the approach by considering that innovation will further depend on specific routines and skills. The combination of certain resources, the adapted routines and the special skills to run them all should allow any firm to be dynamic and to timely adapt to the constant market changes. This ensemble of resources, routines and skills summarizes the concept of capabilities.

In short, innovation might be understood as the result of a set of complementary capabilities (Wonglimpiyarat, 2010; Forsman, 2011). Capabilities were, first, considered as focused on the technological issues of the firms. Technological capabilities are the way to better understand how firms deal with technical progress and change (Lall, 1992; Bell & Pavitt, 1995; Helfat, 1997). Here, innovation is majorly considered as the result of investments in technological development (R&D activities), mainly new products and processes. In that sense, firms would be more or less innovative, depending on the complexity of their technological activities (Lall, 1992). Furthermore, from an organizational and business orientation, researchers tried to understand how firms built their strategies, made their decisions and allocated their resources in order to innovate (Prahalad & Hammel, 1990). In other words, they aimed to understand organizational change.

Teece et al. (1997, p. 516), by linking resource-based view with technological and organizational capabilities approaches, left the static environment approach to a changing one and defined dynamic capabilities as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments". According to Dosi and Marengo (2000), dynamic capabilities cannot simply be built by sole investment in research and development (R&D). As the competitive pace quickens, coordination between R&D and the firm's strategic business functions, as well as with suppliers and alliance partners, is increasingly essential to identify and link technological options to market

opportunities. This highlights the importance of coordination and transaction capabilities as complements to technological capability (Tello-Gamarra & Zawislak, 2013). If technological capabilities emphasize R&D and operations, dynamic capabilities highlight the importance of management and strategy (Dutrénit, 2000). These studies have been important to depict the innovative behavior of the firm (Nelson et al, 2018). However, there is still no unanimity on what are the capabilities that ensure survival and superior performance, nor a consensus on the ultimate definition of innovation capability as a meta-capability. Innovation capabilities include firms’ abilities, knowledge, skills, and routines to convert knowledge into technology and thus into a business (Zawislak et al., 2012). The different ways of building innovation capabilities are in the essence of the heterogeneity of firms (Reichert et al., 2016).

One of the first innovation capabilities models that tried to evaluate the firm in terms of both its technological developments as well as its organizational changes was Guan and Ma’s (2003). They say the firm is the result of seven capabilities. Further studies have tried to simplify the model without losing comprehensiveness (e.g. Francis & Bessant, 2005; Yang, Marlow & Lu, 2009; Zawislak et al., 2012). For Zawislak et al. (2012, p. 17), the innovation capabilities are “the technological learning process from the firms translated into the technological development and operations capabilities, as well as the managerial and transactional routines represented by the management and transaction capabilities”. In this article we use the model proposed by Zawislak et al. (2012, 2013) (Figure 1).

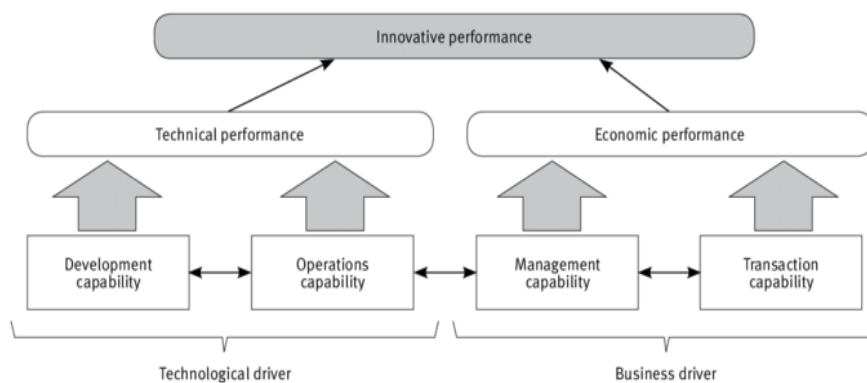


Figure 1: Innovation capabilities of the firm (Source: Adapted from Zawislak et al., 2012, 2013)

The choice of the Zawislak model (2012, 2013) was based on three aspects. First, the chosen model avoids technological bias by presenting a balanced view of the firm: the coexistence of a technological driver with a business driver. Second, the building blocks of the model are derived from the Schumpeterian theoretical definition of innovation (i.e. development, operations, management and transaction capabilities). And third, without losing theoretical robustness, the model is easy to apply to different sectors. Therefore, as suggested by Zawislak et al. (2012, 2013), the four-fold capabilities model covers the key aspects underlying any firm’s existence. In short, the firm is hereinafter viewed as a technological set of products and processes that works under a specific business model and a management arrangement, to trade and profit from the market. Those are its capabilities to combine resources, routines and skills in order to reach successful competitive performance.

Although there are differences in the approaches that involve the concept of innovation, the importance of an institutionalized process that seeks information from the external environment in order to increase organizational innovation performance is recognized (Borges et al., 2019; Cainelli et al., 2019). According to Tsoukas and Shepherd (2004), creating and maintaining a high-quality, coherent and functional prospective view can

generate useful insights for innovation. Janissek-Muniz (2016) reinforces that, just as threats arise due to the instability of the environment, opportunities can also emerge from it, offering the organizations that monitor it the possibility of innovating their business by collecting, interpreting and using relevant information. This process is recognized as a set of strategic intelligence activities, systematized in the firm that learns from the environment and transforms information, knowledge and technology into an organizational endeavor and successful business. This is innovation.

2.2 Strategic Intelligence

Strategic Intelligence is understood as a process of transforming information from the firm's relevant environment into strategies. The identification and use of strategic intelligence can potentially increase competitiveness, using pertinent information to support the decision-making process in organizations (Svensson et al, 2011; Nadarajah et al, 2014). Strategic intelligence consists in processes that help monitoring events in the external environment of the organization, identifying potential risks or opportunities (Dou et al, 2019). The major importance of this process is to feed decision-making, allowing to establish proactive actions to respond to environmental changes in an early movement (Alhamadi, 2020). A broad definition of strategic intelligence involves a set of necessary skills to conduct strategic actions. Strategic intelligence allows the company to perceive, analyze, interpret and generate information based on signals from the business environment (Mandel & Barnes, 2014). Based on learning from monitoring the environment, through processes of transforming data into knowledge, it sustains strategic decision-making for competitiveness. It is the relationship between different information in a continuous way to develop strategies through intellectual resources around information processing (Rossel, 2012; Lesca & Lesca, 2014; Muhlroth & Grottko, 2018; Miller et al, 2018; Joseph & Gaba, 2019).

When analyzing information through a systematic process, they enable their positioning and future planning, anticipating decisions in the face of changes in the business environment (Dou et al., 2019). Strategic intelligence generates advantages by providing better, fact-based decision-making, in addition to improve the monitoring of its internal performance, although there is the challenge of measuring results considered intangible (Pellissier & Kruger, 2011). The role of strategic intelligence is to reduce the degree of uncertainty existing at any time to adopt a specific strategic decision (Seitovirta, 2011; Marín, 2020).

2.2.1 Strategic Intelligence as a Proactive Decision-Making Process

Strategic intelligence, by its nature, is a proactive process, giving to the company that adopts it a proactive feature (Lesca, 2003). In the decision-making process, decision-makers generally use arbitrariness based on their experience and intuition, rather than using a technique that can be improved with a systematic intelligence process (Simon, 1972; Corso et al., 2014; Borges et al., 2019). This is the difference between an individual approach, in which the proactive behavior comes from one professional, from a systematized process, that characterizes the company as a whole (Borges & Janissek Muniz, 2017). Glueck and Jauch (1984, *apud* Larson et al, 1986) define a proactive strategy as one in which strategists act before they are forced to react to environmental threats or opportunities.

In a systematized intelligence process (Cainelli & Janissek-Muniz, 2019), proactivity is favored, as it allows the decision to be based on information resulting from this process. In a decision-making process, proactivity is initially understood as a thought process (Weick, 1983), and the relationship between strategic intelligence and decision-making occurs, therefore, in the aspect of reducing uncertainty (Fleischer & Bensoussan, 2003). By accepting

to work with degrees of uncertainty (Moreno et al, 2016), the decision-maker benefits from the use of prospective information, also known as weak signals (Aguilar, 1967; Lesca, 2003). To expand the use of this type of information, so that decision-making becomes more proactive, the need for strategic intelligence is recognized (Corso et al, 2014). Once analyzed through strategic intelligence processes, signals can become relevant for decision-making and innovation (Bessant & Tidd, 2009). Through these processes, proactive firms can anticipate environment movements, define markets, and face the future as something to be built (Chen et al., 2012; Shankar, 2006), which have positive effects on innovation (Fan et al., 2013).

2.2.2 Strategic Intelligence and Innovation

The need for firms to innovate arouses interest in the use of strategic intelligence and the development of studies to identify how intelligence processes act in the innovation process of organizations (Sarpong & Meissner, 2018; Cainelli et al., 2019). In other words, when developing the innovation process, companies should look for signs that allow the generation of innovation, which can be improved through intelligence processes. Information-based activities enable a wide scan, especially in areas where uncertainty and change are perceived in high levels, such as technology, consumer preferences and environmental impact (Borjesson et al., 2006). The recognition that the environment is a vital source of information for developing new ideas enables companies to identify future opportunities in time, and be proactive to detect threats or problems, aiming at the implementation of structural or strategic changes to their products and services through strategic monitoring (Augier et al., 2018).

The ability to innovate appears as one of the topics that have attracted the most attention in research related to intelligence. Studies emphasize the importance of strategic intelligence for innovation, suggesting a positive relationship between both (Ramirez et al., 2011; Rohrbeck & Gemünden, 2011; Ruff, 2015). The intelligence literature generally identifies positive relationships of this process that may influence the development of new products and/or technological advancements (Ramirez et al, 2011; Vishnevskiy et al., 2015). Although there is a consensus that continuous performance of strategic intelligence mechanisms improve the firm's innovative performance (Vecchiato & Roveda, 2010), there is also skepticism about how it affects it. Duan and Cao (2015) point out that using the strategic value of this process in decision-making remains as a challenge in current innovation practices. Vecchiato and Roveda (2010) also argue that the formulation of an optimal innovation strategy is the function derived from an effective intelligence process. According to Jahn and Koller (2018), engaging in strategic intelligence processes can be beneficial for any company's future-readiness. Thus, it works as a facilitator for innovative thinking.

As strategic intelligence and innovation both facilitate novelty in future market environments, strategic intelligence can be utilized to generate anticipatory intelligence for gaining insight on future customer needs (Ruff, 2006; Jahn & Koller, 2018). In addition, Capatina et al. (2016) point out that strategic intelligence is at the service of innovation as it helps to find alternative solutions to emerging challenges in the environment and helps to find the blind spots in the innovation process. They also argue that innovation benefits from the intelligence process when it provides access to new knowledge, identifies opportunities for diversification of the innovations themselves, monitors technological trajectories, explores different business models and expands understanding of the external environment. In sum, the systematic practice of strategic intelligence enables the reorganization of information in order to generate meaningful, future-oriented knowledge capable of developing narratives of how it can unfold and how to position innovations in these scenarios (Adegbile et al., 2017).

Despite many approaches already devoted to innovation capabilities, from the point of view of strategic intelligence, it seems that the innovation-information relationship is not yet much addressed (Goria, 2018). It seems important to be able to point to the information and knowledge requested or produced during an innovation process to help understand how they are interpreted and used. To be effective, the intelligence process must be considered from a strategic and informational standpoint when the innovation process must result in the production of something with a competitive advantage, be it technological or organizational. The thing is to provide relevant information, ideas and prototypes at a time that allows action and, if possible, resulting in innovation processes (Goria, 2018; Jahn & Koller, 2019).

Innovation has been found as a result of many processes, including intelligence activities and innovation capabilities. Intelligence is an important factor in generating larger profitability and market valuation growth (Hojland & Rohrbeck's, 2017), i.e., innovation, however, the reach of this effect has not been measured yet in terms of innovation capabilities. Meanwhile, different combinations of innovation capabilities also reflect different levels of innovative performance (Reichert et al., 2016). In this sense, both activities are intertwined, but the details of these relations still need to be explored. Thus, considering that companies with proactive processes may create positive effects on innovation (Fan et al., 2013), there is still the need to understand if the proactiveness of the intelligence processes relates to the level of the companies' innovation capabilities - as opposed to any intelligence process, even reactive, being able to generate innovative outcomes.

3. Methodological Procedures

This study uses secondary data from 1,331 manufacturing firms in Brazil, collected through a survey by NITEC Innovation Research Center (for further details, see Reichert et al., 2016; Alves et al., 2017). The study aimed at identifying the innovation capabilities arrangements that lead firms to achieve superior performance. The survey was based on the Innovation Capability Model (Zawislak et al., 2012), gathering information on four innovation capabilities: development, operations, management and transaction. The survey collected additional information about the manufacturing firms, including the question used in the present study as a proxy for strategic intelligence. The intention of the present study is not to discuss the components of each innovation capability (development, operations, transaction and management), since it is a validated model in previous studies (Zawislak et al., 2012; Zawislak et al., 2013; Reichert et al., 2016; Alves et al., 2017).

The present study does not concern the formulation of an innovation capabilities model *per se*, but rather, the understanding of the relationship between the levels of firms' innovation capabilities and firms' strategic intelligence. It is also not the main intention of this paper to propose changes to the innovation capabilities model, but to use the database applied to the innovation capabilities model to identify different groups of firms in terms of the association of these capabilities and strategic intelligence (i.e., reactive and proactive). It is our proposition that companies that are proactive in terms of their strategic intelligence practices have more developed innovative capabilities than reactive ones.

The question used to represent strategic intelligence concerns the strategic decision-making process of these firms and was chosen because it represents the essence of strategic intelligence, namely information collected in the environment from players relevant to the business, which justifies the use of the question for this study, as follows. "*The decision-making process is based on: (a) tradition; (b) recent performance history; (c) information from clients; (d) information from competitors; (e) information from suppliers and; (f) new*

knowledge developed internally”. From it, we divided the sample into two groups: firms that have some strategic intelligence procedures in place, which will allow them to have a proactive approach in their decision-making processes, herein called *Proactive Firms* [marked alternatives (c), (d), (e) ou (f)]; and firms that do not have strategic intelligence procedures in place, resulting in a reactive approach to their decision-making processes, herein called *Reactive Firms* [marked alternatives (a) or (b)].

It is our expectation that, when strategic intelligence processes are present in firms, they have a proactive role in their development, operations, management and transaction capabilities. When these procedures are absent, their role is reactive. A proactive role should require higher levels of innovation capabilities to deal with information, decision processes and, hence, to innovate. Alternatively, a reactive role will require basic levels of capabilities to deal with processes on the operational level. The measures related to innovation capabilities are presented in Table 1.

Innovation Capability & Items	
Development Capability (DC): <ul style="list-style-type: none"> ● Product Prototyping ● Product Launching ● Product Design ● Technology Monitoring ● Technology Adaptation ● Formal Project Management 	Management Capability (MC): <ul style="list-style-type: none"> ● Financial Management ● Updated Management Tools and Techniques ● Formal Strategy ● HR Training
Operations Capability (OC): <ul style="list-style-type: none"> ● On-time Delivery ● Rework ● Product Return ● Production Planning ● Installed Capacity Flexibility 	Transaction Capability (TC): <ul style="list-style-type: none"> ● Prices Definition ● Customer Negotiations ● Supplier Negotiations ● Suppliers Selection ● Market Monitoring

Table 1: Items of each Innovation Capability (Alves et al., 2017)

For each item there was a statement to which respondents rated their level of agreement using a five-point Likert scale ranging from ‘strongly disagree’ (1) to ‘strongly agree’ (5). We then calculated the mean value of each capability for each firm. To verify if there is a significant difference in the mean values between both groups, Reactive and Proactive, we performed an independent sample t-test, which is used to test the hypothesis that the variable means associated with two independent groups are equal (Hair et al., 2005). The t-test compared the means for each innovation capability in each group (reactive/proactive).

4. Result Analysis

In order to identify if there are differences in the mean of each innovation capability when comparing firms with strategic intelligence procedures in place (proactive firms in terms of their decision-making process) with those without strategic intelligence procedures (the reactive ones), we present results for the independent sample t-test. The Proactive firms are represented by ‘P’ and the Reactive, by ‘R’. Table 2 brings the results of the group statistics.

Group Statistics					
Decision		N	Mean	Std. Deviation	Std. Error Mean
Mean_DC	P	443	3,7750	,79766	,03790
	R	876	3,6120	,85433	,02887
Mean_OC	P	442	4,1151	,52448	,02495

	R	876	3,9386	,55988	,01892
Mean_MC	P	443	3,7648	,63514	,03018
	R	876	3,6836	,62924	,02126
Mean_TC	P	443	3,4807	,76289	,03625
	R	876	3,4593	,70448	,02380

Table 2: T-test Group Statistics

It is noteworthy that, for all four capabilities, Proactive firms have higher means than Reactive ones. Results show, however, that while the TC shows no significant difference in means between both groups (Reactive and Proactive), the other three innovation capabilities, DC, OC and MC, do. In the three instances, the innovation capabilities means are higher for the Proactive firms. The higher mean, for both groups, is on OC. Of course, manufacturing companies naturally tend to be process oriented. However, in that case, this is probably much more related to the fact that the profile of most of the Brazilian manufacturing companies is operations based (Alves et al, 2017). This is even reinforced by the Brazilian historical strategic focus on investing in process technology rather than on product development (Tironi, 2011). Brazilian data on innovation expenditures are much more related to the acquisition of machinery and equipment than on the launching of new products (IBGE, 2016). The second higher mean, however, differs from one group to another, reinforcing our assumption. For Proactive firms, DC is more important, while, for Reactive ones, MC is more relevant. One should state that proactive firms are willing to search for new ventures and to develop new products while reactive firms would strategically be much more concerned with efficiency and cost. Table 3 brings the results of the Independent Sample test.

Independent Sample Test										
		Levene's		T-test for equality of means						
		F	Sig.	t	df	Sig. (2 tailed)	Mean difference	Std. Error	95% Confidence	
									Lower	Upper
Mean_	Equal variances assumed	4,916	,027	3,345	1317	,001	,16299	,04872	,06741	,25858
DC	Equal variances not assumed			3,421	943,232	,001	,16299	,04764	,06950	,25648
Mean_	Equal variances assumed	,850	,357	5,518	1316	,000	,17650	,03199	,11374	,23925
OC	Equal variances not assumed			5,637	937,686	,000	,17650	,03131	,11506	,23794
Mean_	Equal variances assumed	,514	,474	2,206	1317	,028	,08119	,03680	,00899	,15338
MC	Equal variances not assumed			2,199	880,136	,028	,08119	,03691	,00874	,15363
Mean_	Equal variances assumed	4,475	,035	,507	1317	,612	,02142	,04224	-,06146	,10429
TC	Equal variances not assumed			,494	827,658	,622	,02142	,04336	-,06370	,10653

Table 3: T-test - Independent Sample Test

Proactive firms perform, more frequently and in a more systematic way, activities related to searching for new technologies, developing prototypes of new products, incorporating new methods of production or management systems and techniques. Such elements are directly related to strategic intelligence activities, providing a proactive stance for these firms. Proactive firms are aware of the steps their clients and competitors are taking and, from that, bring new ideas to their own firm with the aim to produce novelties, which will, in turn, allow them to maintain their market competitiveness.

While reactive firms adopt a more deterministic stance, with the behavior of followers, needing to see to believe, in a role of conformism, the proactive ones have a more forward-looking stance, which means that they define the future, anticipate opportunities and threats, open and build their paths, defining the market rules, being more innovative and, by their choices, influencing the environment movements and defining markets. Specifically, the proactive role is traditionally associated with strategic intelligence practices in organizations (Lesca & Lesca, 2014), having positive effects on innovation (Fan et al., 2013).

These findings reinforce the association between proactive companies and strategic intelligence activities, highlighting the importance of these activities in organizations that wish to adopt a more proactive attitude, aiming at increasing their innovative capacity and more assertive decision-making. Interestingly, TC does not show significant difference between the groups of firms. One would expect that being attentive to the market would allow them to be more proactive. One reasonable explanation is that when an idea is already in the market, it is not new anymore; so strategic intelligence may not play a crucial role in capturing that.

4. Conclusion

The aim of this study was to identify whether firms with activities associated with the strategic intelligence process differ in terms of their innovation capabilities level, verifying differences when comparing reactive and proactive groups. Using an established database with secondary data from 1,331 manufacturing companies in Brazil, collected through a survey by the NITEC Innovation Research Center, we explored relationships that may be associated with strategic intelligence activities.

Within the major objective, we identified that there are two roles of strategic intelligence in terms of innovation capabilities, namely proactive and reactive, which are associated with the innovation capabilities and the use of intelligence by organizations. Both roles depend on the innovative behavior of companies, which determine their attitude towards changes in the environment. While reactive firms adopt a more deterministic stance, proactive ones have a more prospective stance, anticipating opportunities and threats, and by their choices, influence movements and define markets. This is in line with Lesca & Lesca (2014), who argue that proactive behavior is one of the requirements to execute strategic intelligence in organizations, which takes, according to Fan et al. (2013), positive effects on the capacity for innovation.

We also identified that three capabilities of the model (Zawislak et al., 2012) had higher averages in the proactive group, namely Development, Operations and Management innovation capabilities. In the three instances, the innovation capabilities means are higher for the proactive firms than the reactive ones, which allows us to indicate, through the larger averages, that the level of capabilities of those companies are more developed. On the other hand, TC does not present significant differences between the proactive and reactive ones. We identified that in the TC there was no difference in means and this is probably due to the fact that the market brings what is already “in place” and not showing weak signs, for example. One reasonable explanation for that is that when an idea is already in the market, it is not new anymore, so strategic intelligence does not play a crucial role in capturing that.

Based on the results of this study, there is an association between innovation and strategic intelligence, according to Konnola et al (2007) who state that the anticipation of alternative futures is a fundamental practice in the initial stages of the innovation process. In this sense, there is adherence to the results found also with Heiko et al (2010) who highlights that strategic intelligence enables a way to orient business towards the future and, when associated with innovation, enhancing ways of understanding new demands. In short, it is possible to state that strategic intelligence processes and innovation capabilities of firms are related. They are not only related, but they also differ in level - the higher the proactiveness of intelligence processes, the higher the level of innovation capabilities. These findings should guide decision-makers to implement strategic intelligence processes in their companies. Once they know that innovation capabilities have an impact on firms' innovative performance and that the level of proactiveness of their strategic intelligence processes also

influences that outcome, they are able to develop the most adequate process to their firms. Decision-makers should then take into account that implementing a strategic intelligence process just for the sake of it may not generate the expected results, instead, they must guarantee they will be really acting in anticipation of the market to be able to produce disruptive outcomes, i.e. innovation.

One limitation of our study is the fact that we took secondary data from an innovation survey that had a different purpose than our study. The original survey intended to map the innovation capabilities that lead firms to an innovative outcome, while this one evaluated the level of innovative capabilities for two groups of firms that differ in terms of their strategic intelligence processes. As a suggestion for future research, we could bring together both objectives and detail the differences between proactive and reactive firms, by identifying the innovation capabilities arrangement for each group. Additionally, we could include specific questions for strategic intelligence in the original questionnaire and perform a new survey that would allow primary data to be analyzed. Another limitation of our study is related to the performance of the firms. We have evaluated only the level of their innovation capabilities, but in a future study, it would be interesting to evaluate the differences between proactive and reactive firms in terms of their economic and innovative performance. Besides, we have tested the level of innovation capabilities for proactive and reactive firms uniquely from manufacturing industries and, in that sense, we believe that a broader approach (including services) could enhance our analysis.

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