DISCLOSING THE DEVELOPMENT CAPABILITIES OF THE FIRM

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ABSTRACT

It is a fact that the product development is the industrial firm's survival. Even if the products developed are not so new, there is an internal ability to develop them. This ability encompasses a set of knowledge, skills and routines called development capability. Furthermore, the kind of product improvement achieved is a result of the development capability accessed. However, to reach innovation through new product development, it is necessary that it provides positive returns to the firm. Considering innovative performance as something new that provides economic return to the firm such as increasing profits, market share and sales, what is the role and types of development capabilities needed to achieve higher innovative performance? This research presents the Innovation Capabilities Model and a cluster analysis in order to realize three types of development capability configurations, based on a survey with 1107 firms cross-sectorial. Such as expected, the majority of the outcomes are product improvements. However, each type of development capability has been achieved through different firms' performance and one of them, the "developer cluster", is enhanced by having highest development capability. This kind of research helps to disclose the development capability configurations of the firm and aims to answer what is relevant to innovative performance. Yet, more in-depth research is needed to explore the underlying reasons for the relationship between the development capability configurations and its performances in order to describe types of new product development. This research seeks to expand the discussion on the capabilities needed for developing new product and, thus, to reach innovation.

Keywords: Innovation, Development Capability, New Products Development, NPD, Innovative Performance

INTRODUCTION

One of the most charming, secret and essential process in industrial firms is new product development. The survival of a business depends on it. In a traditional view, Research and Development (R&D) department embodied in its researchers is responsible for creating new products and fulfilling a market gap. Although the R&D team provides new products, in most cases, neither the outcome is novelty to the market, nor are its returns positive to the firm.

To provide some innovation through new product development, there is a set of knowledge, skills and routines that contribute for it. In this paper, we called this set as development capability. The development capability is an ability put in place in the firm, which allows it to develop new products and technologies. This capability includes researching routines, such as monitoring the latest technological trends and adapting existing technologies to the firm's own needs (Lall, 1992, Bell and Pavitt, 1993, Rush, Bessant and Hobday, 2007), and developing routines as prototyping products, designing its own products, using formal project management tools and launching the firm's own products (Cooper, 2001, Wheelwright and Clark, 1992, Trott, 2012).

However, each industrial sector and each market have their own requirements. In this sense, each firm decides which set of knowledge, skills and routines has to be accessed on each developing process. These decisions are surrounded by uncertainty (Freeman and Soete, 2000) and the result previously is unknown. Then, the return is unsure for the firm. The reason is based on the premise that the attempt to develop something new through the firm's capabilities is *ex-ante* while the return of the new product for the firm is *ex-post.* In a first moment, it seems that the firm's capabilities do not depend on the performance. Nevertheless, a success innovation in the sense of Schumpeterian innovation implies to relate each other, capabilities and its performances.

As innovative performance is the result of something new that provides economic return to the firm (Schumpeter, 1934) such as increasing profits, market share and sales, and the development capability is the ability which allows the firm to develop new products, this paper intends to relate the types of development capability achieved by firms and the innovative performance provided by each one of them. Although the literature covers mostly high-tech sectors, the most firms neither belongs to this sector, nor develops really new products. Even though the improvement in products appears as a result of the developing process in the majority of firms, there are more than one type of development capability to be accessed.

In sum, this research addresses this gap by presenting a conceptual model, the Innovation Capabilities Model, and focus on testing the development capability construct based on a survey with 1107 firms cross-sectorial. Also, we present a cluster analysis, the description of three types of development capability configurations and their innovative performances. In order to present the research, after this introductory section, we discuss the capabilities approach and the model used. After the theoretical part, we describe the research method and the sample profile. Following the research method, the survey results are shown and, in the final section, we discuss our findings and present the conclusions.

THE CAPABILITIES APPROACH

The attempt to understand the distinction between firms through capabilities promoted a plenty of theoretical perspectives. The traditional Lall's (1992) and Bell and Pavitt's (1993) models were, and

still are, widely used to explain the technological difference inter-firms. Contributing to this approach, authors such Cohen and Levinthal (1990), Zahra and George (2002) and Fosfuri and Tribó (2008) defend the idea to insert the new knowledge in order to improve the capabilities and thus define absorptive capacity as a firm ability of generating and absorbing new knowledge.

The firm expands its boundaries with this new knowledge for promoting changes into an organizational structure (Chandler, 1992) or using this knowledge to achieve market expansion through marketing capability (Kotabe et al., 2002). Finally, to maintain the virtuous cycle from change to innovation, the dynamic capabilities play a role in guaranteeing sustainable economic performance (Teece, Pisano and Shuen 1997, Eisenhardt and Martin, 2000).

By looking at these complementary concepts, any innovation depends on the capabilities of the firm to complete the full process from the conception of a technological solution to the market. Then, the capabilities approach helps to identify some key elements which deal with firm's innovation. In that sense, researchers such as Guan and Ma (2003), Yam et al. (2011), Rush, Bessant and Hobday (2007) and Zawislak et al. (2012, 2013) have discussed the definition of innovation capability as a construct that encompasses more than one capability and they have advanced in defining its key elements.

According to Zawislak et al. (2012, 2013, 2014) for the firm exists, it must be able: to identify a gap on market and develop a new solution by applying specific knowledge (technology development); to build and improve a set of technical and operational routines to produce goods and services (operations); to ensure operational efficiency and coordination of the firm (management); and finally, to negotiate and to provide a value solution for the market (transaction), thus obtaining the return to the firm. Based on the capabilities approach, Zawislak et al. (2012, 2013, 2014) developed the Innovation Capabilities Model.

The Innovation Capabilities Model

The Innovation Capabilities Model depicts four firm's basic function and covers the majority of aspects that can be found in the literature previously presented. The premise here is that to innovate, the firm seems to have two main drivers.

According to Zawislak et al. (2014), the first one is a *technological driver* (development and operations capabilities). Every firm is born out of some sort of knowledge base either by acquiring it from outside or developing it internally. This happens in the development capability. Then, this knowledge has to be translated into a specific operation with processes and routines (Nelson and Winter, 1982). Secondly, every firm should have a *business driver* (management and transaction capabilities). Besides developing and operating functions, the firm needs to manage resources internally in order to be efficient and coherent with its goals. And, to complete de cycle of offering a new solution to the market, firms have to negotiate and to transact goods and services with some other economic agent such as suppliers, retails and customers.

Summing up, every firm has some level of all these four capabilities: development, operations, management and transaction and all of them are suitable to be innovative. To better understand, the model is shown in Figure 1.

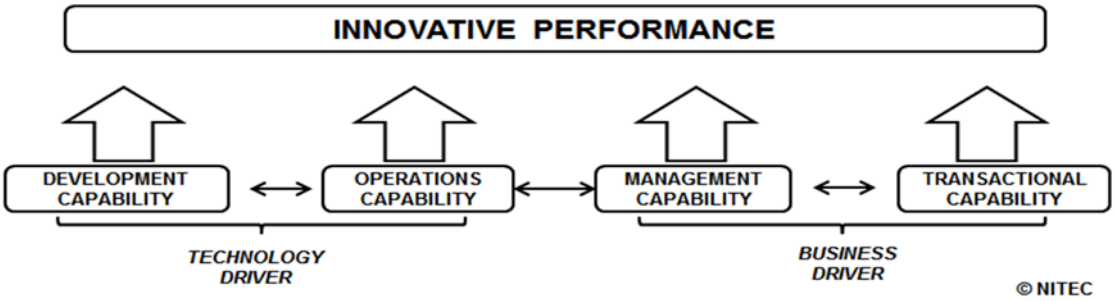

Figure 1: Innovation Capabilities Model, Source: Adapted from Zawislak et al (2013; 2014)

According to capabilities approaches previously discussed on innovation literature, the technological driver follows the technological capabilities approach (Lall 1992; Bell and Pavitt 1995; Iammarino, Padilla-Pérez and Von Tunzelmann, 2008) which emphasizes the need of firms to develop capabilities not only to use technology but also to generate and manage technical change. Furthermore, the firm also needs to guarantee that things, technological or not, will 'get done'. In order to do this efficiently, firms should also have some ability to coordinate internal and external resources and that is what the business driver deals with. It follows two traditional approaches, the management capability (Langlois, 2003) and the transaction costs (Coase, 1937; Williamson, 1985).

Even though this model encompasses four capabilities to explain firm's innovation, each capability is feasible to explain its own type of innovation. In the case of new products, the development capability is the ability in focus. However, most of the studies that related capabilities to product innovation categorized product innovation solely as new product or product improvement. It is important to highlight that incremental innovation is based on a degree of novelty in products and consequently it represents several returns to the firm. In terms of capabilities, a range of products improvement is the result of different development capability accessed. Then, the focus of this research is disclosing the Development Capability.

The Development Capability (DC)

The concept of the development capability is based on the ability that any firm has to interpret the current state of the art, absorb it and eventually transform a given technology to create or change its own capability for aiming at reaching higher levels of technical efficiency through developing new products or services. As mentioned before, the development capability is the set of knowledge, skills and routines needed to allow the firm develops new products.

First of all, the product development involves the firm's previous decisions. Before starting the process, any request either internal (by the firm itself) or external (by customers) can be the trigger to new product development. In the case of internal trigger, the firm should be considered more proactive than in the case of external trigger. In the last one, it seems to be more reactive. However, the deliberate firm's development strategy can move towards the decision to develop products (Rush et al., 2007). In that sense, for example, there are firms whose strategy is to follow the leader. In other words, the firm's new product development strategy and the triggers are related to each other.

Furthermore, according to Rush et al. (2007) and Zhou and Wu (2010), when firms are aware of monitoring the latest technological trends in the sector which they belong to, this action has expanded the possibilities of using and changing the firms' current technology. As a result, this

search routine reflects on products developed because the firm has absorbed and internalized the new knowledge to complete the process. In order to absorb and internalize new knowledge, the learning process should be involved (Cohen and Levinthal, 1990; Zahra and George, 2002; Jantunen, 2005; Todorova and Dursin, 2007; Zhou and Wu, 2010).

The learning process can encompass acquisition, imitation, adaptation, modification and/or the development of a new set of knowledge and technical systems for internal use (Lall, 1992, Bell and Pavitt, 1995, Bessant and Rush, 1995, Jantunen, 2005, Kim and Nelson, 2005, Iammarino, Padilla-Pérez and Von Tunzelmann, 2008, Zawislak et al. 2013). In consequence, the technological development results in new products and process settled in new technical standards for the firm. Moreover, the learning process assumes to have external sources of new knowledge. These external sources vary in content, closeness and openness. In that sense, the most difficult relationship for the firm is with external sources based on research such as universities and research institutes (ICT's). However, in fact, they are important in generating the frontier of new knowledge available.

Although the search routines are very important, the development routines put in place, physically, the product. To do so, the firm needs abilities that encompass the products designing, prototyping, testing and launching and also some product management methods (Cooper, 2001, Wheelwright and Clark, 1992, Trott, 2012, OCDE, 2013). The Stage-Gate and Innovation Funnel are examples of the tools that could be used by firms.

The possibility of the firm whether to use or not development and management tools would be explained by the sector requirements. The sectorial pattern (the standards) is the reference followed by firms and it has been defined by the current technology, the level of investments and general rules. According to Pavitt (1984), there are four types of sectorial patterns based on the percentage of R&D investments (High, Medium-High, Medium-Low and Low Technological Intensity sectors). Although this typology has been widely used, it has been criticized by some scholars as Furtado and Carvalho (2005) mainly because the typology is unusual for developing countries. Therefore, if a country invests more in low-tech industries than other countries, those must behave much more as high-tech, because of their internal and external competitive advantages enhanced by these investments (Reichert and Zawislak, 2014). Even though there is no consensus on the typology, the sectorial patterns affects the innovative performance of the firm, so it must be monitored in any research as also firm's size (by revenue).

Innovative Performance (IP)

In fact a more strict view of innovation is the one firstly proposed by Joseph Schumpeter (1934) to whom innovation must necessarily lead to extraordinary profits to the innovator. Because of the firms' complexity and dynamics, this strict view poses some difficulties on gathering the necessary data to tell precisely whether or not any extraordinary profit is a result of specific changes done by the firm. For this reason, it is proposed by this paper that a measure of innovation should take into consideration the general economic performance of the firm.

In order to improve economic performance, the increase in sales and the increase in profits have been considered by many scholars as Yam et al. (2004). Chandler (1990) contributes by undertaking that the firms competes on market by market share. However, it is important to check if the firm has focus on development products in order to be sure that the development capability contributes significantly for the economic performance.

As Hagedoorn and Cloodt (2003) advocate the use of multiple indicators to measure performance, this research measures innovative performance by firm's increasing in sales, profits and market share (Francis and Bessant, 2005, OCDE, 2005). These measures have been representing the firm's economic performance in several innovation studies.

RESEARCH METHOD

The purpose of the present study is to identify key elements within development capability through comparing their impacts on firm's innovative performance. This study is part of four years research project called "*The Paths of Innovation in the Brazilian Industry*". This project has drawn a map of the innovation patterns that can be found across different firms in Brazil.

The Research Instrument

In order to get the questionnaire used in this project, we have followed the procedure suggested by Churchill (1979) for developing better measures. This stage sought to explain which components are important for innovation in each capability of the firm by doing a pilot study and two pretests survey with Brazilian industrial companies.

Along with the theoretical discussion stage, over 70 companies of different sizes and sectors were visited and interviewed by students and scholars in a prior exploratory phase of the project following a semi-structured questionnaire to collect data. This exploratory phase was used in order to test the theoretical model coherence and its capacity of capturing all the relevant information about the phenomena across the various firms.

After the exploratory phase, it was possible to design the questions. To check the construct validity, the questionnaire was submitted to an individual appraisal for three managers of different companies to check for content such as language comprehension and coherence of the questions. The preliminary questionnaire resultant has been pretested to purify the measures.

The final full questionnaire has been applied in three blocks, using five points interval scale. In block one there are questions related to each of the four capabilities; in block two there are questions about innovative performance; and the block three encompasses general enquires. In the first block there are four parts related to one of the four capabilities each: management (MC) following by transaction (TC), operations (OC) and development capability (DC). This block should capture the existence of routines and specificities of each firm's capabilities by using interval scale (one to five) to measure the degree of agreement. The second block measures innovative performance by using also the same interval scale (one to five) to check the degree to which firms agreed with increasing in its economic indicators in the last year. The Appendix A shows the constructs used in final survey and their respective number of variables contained in each.

Survey Procedures

All interviews were done by phone by professional interviewers using the Center for Studies and Research on Administration (CEPA) at Federal University of Rio Grande do Sul. Since this research have been drawn a holistic view of the many areas of firms, interviewers were trained to find an interviewee that had a reasonable knowledge of the firm being researched. Interviews were conducted either with the firm's owner, president, directors or with higher managers.

This research has tested the development capability construct based on a cross-sectorial survey. The database used a cadaster of the Industry Association of Rio Grande do Sul (FIERGS cadaster), which includes industry classification by CNAE[1] and size by number of employees. From 10 to 99 employees, firms were considered small. From 100 to 499 employees firms were considered medium, firm with more than 500 employees were considered large. The database was randomized before starting the pretests.

From 6143 companies listed in industry association of Rio Grande do Sul (FIERGS) cadaster up to 10 employees, 1543 companies have answered the questionnaire, which corresponding a response rate of 25.12%. However, for any reasons, such as incomplete answers, 1331 questionnaires were valid.

The full questionnaire has been used in order to run the multivariate analysis. Every statistical test was first run by using all variables contained in each construct. After running the factor analysis, the variables were grouped together in order to check the theoretical constructs. Yet, the number of variables was reduced in each group. The same statistics was run with the reduced number of variables to check the improvements and the factorial analysis has confirmed each theoretical construct.

After the constructs confirmation, the development capability was clustering in order to relate types of development capability to their performances. Every test was done by using the IBM SPSS Software for Windows, version 20.

Cluster Analysis[2] Procedures

For this study on innovation, the firms that declare “did nothing to innovate last year (2013)” were eliminated of the cluster analysis. The new sample was 1107 firms that have been done something to innovate in 2013. From 1107 firms, 1103 had valid questionnaires.

Using the filtered sample of 1103 firms, the cluster analysis was done. We have chosen three qualifying variables related to the development such as the triggers, the staff dedicated and the companies’ focus on development. The two prior are simple choice ended questions and the last one is interval scale (one to five). The questions used in Cluster Analysis can be seen in Appendix B.

For the Cluster Analysis, we used the IBM SPSS Software for Windows, version 20. The cluster analysis has split the firms in a balance three groups (421 firms, 342 firms and 340 firms) with fair quality. Following, we present the profile of each development cluster.

Cluster Profiles

The cluster profiles have disclosed three types of new products development based on the answers given by each group. Moreover, as mentioned before, they were formed by three qualifying variables. The main characteristics and the number of cases in each cluster can be seen in Figure 2.

[1] National Classification of Economic Activities - CNAE

[2] The cluster analysis is a multivariate method to treat a huge number of data and the main goal is to agglomerate similar companies by using more than two variables (Hair et al., 2005, Malhotra, 2006). The cluster analysis is not the same than an industrial cluster. This last one is considering a group of firms from the same or related industries located geographically near to each other (Bell, 2005).

	Cluster 1	Cluster 2	Cluster 3
DC9 – What triggers the development?	Improvements to existing products	Improvements to existing products	Customer requests
DC10 – How does the development process occur?	By non-specialized staff during the course of routine company activities	Constantly, by specialized staff exclusively dedicated to that task	Informally while resolving routine problems
IP45 – The company's income is the result of developing new products.	2.34	4.29	3.96
Number of Cases in each	421	342	340

Figure 2: Clusters Profile based on three qualifying variables

Considering the new products development triggers, both cluster 1 and 2 have taken the risks and started the process to improve their own products. Differently, the cluster 3 adopts a reactive strategy by initiating the development process only when a customer request a product.

When firms answered how the development occurs, cluster 1 and 2 have disclosed their differences. While cluster 2 is more formalized by having specialized and dedicated staff, the cluster 1 has a non-specialized staff. Other main difference between these clusters (1 and 2) is the continuity of the development task. While in cluster 2 the development is constantly doing by the staff, in cluster 1 the staff is interrupted by ordinary activities of the firm. In that sense, the cluster 3 presents the most informal development and they do this while solving problems.

Regarding the firm's focus on development, we used the affirmative if the company's income depends on developing new products. The cluster 2 reveals the highest average (4.29), following by cluster 3 (3.96) and the last one is the cluster 1 (2.34). Summing up these results for each cluster, it is possible to define clusters profiles.

As we expected, the cluster 2 is the most focused on development and also the one that has most staff dedicated to it. However, the development is the improvements in existing products. Even though this cluster does not develop new products, in the sense of really new, we called this cluster as "the developer". The cluster 3 is the most informal process, but the second one in focus on development in order to get the customers' requests. Then, we called this cluster as "the solver" customer needs. Finally, the cluster 1 is the biggest cluster with the lowest average on development and we called this cluster as "the non-specialized".

These three several cluster profiles have been disclosing three types of development capabilities with their respective innovative performances. The results can be seen in the next section.

RESULTS

The research reveals the types of development capabilities, the relevant routines for developing products and also the innovative performance related to each development capability. Furthermore, the influence whether or not of the sectorial patterns and the size (by revenue) was appointed as well.

Development Capabilities

The Development Capability was measured through multi-item scale. Originally, this capability embraced seven items (from DC2 to DC8). However, after factorial analysis, the development capability remained with six items (DC7 has been removed; Final Cronbach's alpha: 0.845). Despite this, for this paper, we decided to keep the question DC7 only to analyze the role of this question in our sample. The main reason is that, for all clusters, this question shows the lowest mean and represents a small interaction between firms and Science and Technology Institutions. The variables included in the development capability and the descriptive statistics are shown in Table 1.

Table 1: Descriptive Statistics of Development Capability for each Cluster

	The Non-Specialized			**The Developer**			**The Solver**		
	Cluster 1			*Cluster 2*			*Cluster 3*		
DC – Questions	N	*Mean*	S.D.	N	*Mean*	S.D.	N	*Mean*	S.D.
DC2 – Designs its own products based	420	*3.35**	1.187	342	*4.03*	.991	339	*3.96*	.787
DC3 – Monitors the latest tendencies in technology in the sector	417	*3.52**	.928	338	*4.17*	.756	339	*4.15*	.870
DC4 – Uses formal product management methods (Stage-Gate, PMBOK, innovational funnel, etc.)	418	*2.79**	1.046	341	*3.53**	.998	338	*3.92**	.962
DC5 – Adapts the technology in use to its own needs	416	*3.56**	.890	341	*4.11**	.700	331	*3.94**	.764
DC6 – Prototypes its own products	420	*3.25**	1.409	339	*4.21**	.990	339	*3.83**	.980
DC7 – Develops products in partnerships with Science and Technology Institutions	417	*2.42**	1.133	338	*2.82**	1.332	338	*2.62**	1.387
DC8 – Launches its own products	420	*3.34**	1.369	341	*4.20*	1.155	337	*4.04*	1.186
Overall N (listwise)	403	3.17		328	3.84		322	3.78	

*The mean difference is significant at the 0.05 level, according to ANOVA test in Appendix C.

The variables included in development capability represent search routines (DC3, DC5 and DC7) and development routines (DC2, DC4, DC6 and DC8). The developer cluster has the majority of high score

average. The highest average of this cluster is related to prototype products (4.21) and the second one is related to launch products (4.20). The result highlights the importance of developing routines.

The developer cluster lowest score average is the lowest score for every clusters and it is the partnerships with Science and Technology Institutes (2.82). This lowest score explains why the sample achieved only improvements in their products, even in developer cluster. Considering some technological sectors such as IT and Pharmaceutical, to keep updated with the technological knowledge is necessary in order to develop disruptive products. In these latest cases, the external sources of knowledge and the partnerships with then are very important.

Although the solver is the most informal development process, this cluster presented the highest average in using products management methods (3.92). In other words, this cluster uses more tools to organize the process of solving problems when they develop the customer's needs than the other clusters. It seems to be important to put in place the ideas and follow a flux during the development.

Finally, the non-specialized cluster has the lowest score when compared with the other two clusters in every variable. However, regarding the interval scale from one to five, this cluster maintains its scores around three, the average. The result suggests that even this cluster with lowest score keeps a minimum of routines to improve products.

Innovative Performance (IP)

The Innovative Performance was measured through multi-item scale. Originally, this performance embraced seven items (from IP42 to IP48). After factorial analysis, the innovative performance remained with three items in the same factor (from IP42 to IP44; Final Cronbach's alpha= 0.843). They represent the growth of an economic factor. The variables included in the innovative performance and the descriptive statistics are shown in Table 2.

Table 2: Descriptive Statistics of Innovative Performance for each Cluster

	The Non-Specialized			**The Developer**			**The Solver**		
	Cluster 1			*Cluster 2*			*Cluster 3*		
IP – Questions	N	*Mean*	S.D.	N	*Mean*	S.D.	N	*Mean*	S.D.
IP42 – The net profit has grown continuously over the last 3 years.	420	*3.10*	.976	341	*3.79*	.948	339	*3.57*	.783
IP43 – The company's market share has continuously grown over the last 3 years.	419	*3.35*	.893	341	*3.89*	.823	340	*3.76*	.857
IP44 – The company's revenue has continuously grown over the last 3 years.	419	*3.23*	.876	342	*3.86*	.847	339	*3.64*	.810
Overall N (listwise)	410	3.22		336	3.84		337	3.65	

After the factorial analysis, the IP45 to IP48 represent a second performance factor related to income. Therefore, the item IP45 has been used to perform the cluster analysis as a qualifying variable.

As mentioned before, the developer cluster has the highest score in development capability and, as possible to see in Table 2, also the highest score average in each innovative performance variable. The developer cluster highest average is related to continuously growing in market share (3.89) following by growing in revenue (3.86).

The solver and the non-specialized clusters show higher scores in growing market share (3.76 and 3.35, respectively) than in revenue (3.64 and 3.23, respectively), even lower than developer cluster. These scores exposes the importance for companies more in growing market share than in growing profits.

In terms of score differences among the clusters when comparing the innovative performance and development capability averages, the innovative performance (3.22; 3.84; 3.65) represents less differences than the development capabilities (3.17; 3.84; 3.78). It seems that the boost in economic performance does not follow a linear function with the development capability accessed by the firm.

Regarding a second performance factor related to income, when companies were asked about pricing practices in order to increase the income, the solver cluster had the higher score (3.63). It means that this cluster has been using pricing practices to boost its performance. In order to confirm if the firms in each cluster belong to similar sectors, the influence of the technological intensity was compared between them.

Sectorial Pattern – The influence

As this research tested the development capability construct based on a cross-sectorial survey, the influence of sectorial pattern according to Pavitt (1984) classification and the OCDE (2005) recommendation was compared between the clusters. The results are shown in Table 3.

Table 3: Descriptive Statistics of Technological Intensity for each Cluster

	The Non-Specialized		**The Developer**		**The Solver**	
	Cluster 1		*Cluster 2*		*Cluster 3*	
Technological Intensity	Frequency	Valid Percent	Frequency	Valid Percent	Frequency	Valid Percent
Low-Tech	186	44.29%	177	52.06%	157	46.59%
Medium-Low Tech	125	29.76%	82	24.12%	93	27.60%
Medium-High Tech	107	25.48%	74	21.76%	85	25.22%
High-Tech	2	0.48%	7	2.06%	2	0.59%
Overall N	420	100.00%	340	100.00%	337	100.00%

According to the results, the clusters solver and non-specialized had similar frequency distribution among various technology intensity sectors. However, the developer cluster differs from the other two clusters by having more companies in high-tech and low-tech sectors. Based on traditional literature on technological capabilities, the greatest percentage of high-tech firms in developer cluster could explain the highest development capability and innovative performance as well.

However, in order to explain why the highest percentages of low-tech firms contribute with the developer cluster results, we suggest that it can be because of a special feature that occurs in Brazilian Industry. Even though some sectors are considered low-tech by Pavitt (1984) typology and OCDE (2005), such as food, in Brazil they demonstrate a behavior as high-tech.

In addition to the sectorial pattern, the influence of the size by revenue was compared between the clusters in order to identify any influence.

Size by Revenue – The influence

Regarding the firms' size, there is plenty literature about the constraints and barriers to innovate by small and medium enterprises (SME's). Total sample includes 96.67% of SME's that is an important feature in Brazilian Industry. This information helps to understand differences when the influence of size (by revenue) was compared between the clusters. The results are shown in Table 4.

Table 4: Descriptive Statistics of Size by Revenue for each Cluster

Revenue*	**Perceptual of firms by Cluster**			**Total**
	The Non-Specialized	The Developer	The Solver	
	Cluster 1	*Cluster 2*	*Cluster 3*	
Micro Size (Less or equal as R$ 2,4 millions)	20.89%	12.48%	20.70%	54.07%
Small Size (Above than R$ 2,4 millions and less than R$ 16 millions)	13.22%	13.59%	7.49%	34.29%
Medium Size (Above than R$ 16 millions and less than R$ 90 millions)	2.96%	3.60%	1.76%	8.32%
Medium-Large Size (Above than R$ 90 millions and less or equal as R$ 300 millions)	0.83%	0.74%	0.92%	2.,50%
Large Size (Above than R$ 300 millions)	0.28%	0.28%	0.28%	0.83%
Total (1082 valid**)	38.17%	30.68%	31.15%	100.0%

*This configuration is based on The Brazilian Development Bank - BNDES's size classification. (BNDES, 2014)
**This number differs from the total of firms, because some of them did not reveal their revenue.

Despite the fact that the frequency distribution of the size by revenue among clusters is quite similar; the developer cluster, which is the highest innovative performance, presented the less percentage in micro-size enterprises than the other two clusters. In addition, the non-specialized and the solver clusters have similar percentage of micro-size enterprises, but the solver showed less percentage of small-size enterprises when comparing with other two clusters. In the meantime, the frequency distribution between clusters in medium-large and large size enterprises are quite similar. Then, it means that the number of large companies does not influence the clusters' results, but the fact that there are fewer micro or small size companies.

DISCUSSION

As discussed before, according to the Innovation Capability Model, the development capabilities are composed by knowledge, skills and routines related to innovative performance. Neither will all firms perform each one of the development routines, nor will all firms perform them in the same way or intensity. These differences are related to various innovative performances. In that sense, this research has disclosed that there is one cluster that is more focused on product development and, thus, is also more innovative.

Considering the clusters' profiles as the way on how the firms are structured and which is the strategy adopted to interact in the market, these features allowed to disclosure three types of development capability accessed during the process. A formalized department with specialized staff to develop new products and the focus on it provide better solutions in terms of development capability and also a highest return for the firm in innovative performance. These are the characteristics of the developer cluster. In terms of development capability, the developer cluster achieved highest scores in developing routines such as prototyping and launching products. The result is in agreement with previous studies in which the development routines put in place, physically, the product and are abilities needed to develop better products (Cooper, 2001, Wheelwright and Clark, 1992, Trott, 2012, OCDE, 2013).

As seen before, every firm needs a product to be offered on market, even if this product is developed by a customer request. In this case, the external trigger, the customer request, guarantees the firm’s demand and it avoids the uncertainty. According to Freeman and Soete (2000), the lower level of uncertainty may achieve solely implements in existing products. However, this situation is not a problem for the solver cluster customer who will have exactly the product requested and it would benefit the firm with a positive income.

The solver cluster adopted a reactive strategy and did not take risks. Although the solver presents the most informal development process and without specialized people, this cluster presented the highest average in using tools to organize the process of solving problems when they develop the customer’s needs. Indeed, it is important to highlight that these tools are widely spread on industry.

Even with all opening information nowadays, there are a huge number of firms that pretend to develop products. They have a staff to develop products, but the staff is interrupted by ordinary activities of the firm. Although they follow their internal trigger in order to improve products, a lack of continuity of the development task affects the results in a negative way. This is the case of the non-specialized cluster. When the non-specialized cluster is compared to the other two, the lowest score has been revealed in every routine. However, while it has had the lowest score, the non-specialized cluster has kept a minimum of routines needed to improve its products.

Regarding the new knowledge and state-of-art, the lowest score average of the three clusters in partnerships with Science and Technology Institutes explains why the sample achieves only improvements in their products and reveals the weakness of the Brazilian companies, even the developer cluster. This result demonstrates that the Brazilian companies fail in interacting with sources of research knowledge and, probably, in the learning process as well.

Failure in learning process undertakes the acquisition, imitation, adaptation, modification and/or the development of a new set of knowledge and technical systems for internal use (Lall, 1992, Bell and Pavitt, 1995, Bessant and Rush, 1995, Jantunen, 2005, Kim and Nelson, 2005, Iammarino, Padilla-Pérez and Von Tunzelmann, 2008, Zawislak et al. 2013). The learning process assumes a greater

interaction with external sources of new knowledge, mainly with sources whose goal is to generate the knowledge available such as universities and research institutes (ICT's).

In that sense of internalize knowledge, the traditional technological capability approach (Lall, 1992, Bell and Pavitt, 1993) emphasizes the need of firms to improve capabilities not only by adapting technology, but also by generating and managing their technical change. When firms are aware of monitoring the latest technological trends in the sector they belong to, this action expands the possibilities of using and changing the firms' current technology (Rush et al., 2007, Zhou and Wu, 2010). They do this by their absorptive capacity (Cohen and Levinthal, 1990, Zahra and George, 2002, Jantunen, 2005 and Fosfuri and Tribó, 2008). The positive results of this process are expressed in the novelty of their products.

In terms of innovative performance, the research reveals that growing in market share is more important than in profits. Although the developer cluster had the highest score average in each innovative performance variable, the solver and the non-specialized clusters had higher scores as well. Moreover, the solver cluster has revealed that it has been using pricing practices to boost its performance.

Regarding of the score differences among the clusters when comparing the innovative performance and development capability averages, there is less difference between innovative performance averages than development capabilities averages. It seems that the increase in performance and in development capability did not follow a proportional relationship. In other words, if a firm improves its development capabilities in one score, your innovative performance would not be boosted in the same proportion.

The influence of sectorial pattern (Pavitt, 1984) has exposed part of the best performance of the developer cluster. According to traditional literature in technological capabilities, the high-tech sectors are the reference in defining the current technology, the level of investments and general rules. As the developer cluster had the most percentage of high-tech sectors, the highest development capability and highest innovative performance also belong to this cluster. However, this cluster had the most percentage of low-tech firms too and in low-tech sector, we expected lower average in development capabilities.

As the result of the developer cluster is the opposite, highest average, it has disclosed a special feature in Brazilian Industry that some sectors, such as food, are considered by Pavitt (1984) and OCDE (2005) low-tech, but they are in fact medium or high technological intensity in Brazil. Furtado and Carvalho (2005) highlighted that this typology is unusual for developing countries. This has been enhanced by the results of the developer cluster that shows a higher performance, and its profile about sectorial pattern frequency presents more low and high-tech firms than the others two clusters. In that sense, in order to gain competitive advantage, the firms seek to get out of their sectorial pattern, so the traditional sectors as low-tech firms demonstrate a behavior as high-tech, which corroborates with Reichert and Zawislak (2014) remarks.

The size shows an important profile of Brazilian companies that there are almost only SME's. Considering the results of this research in terms of companies' size, it seems more important for economic returns not only have many micro size companies, but also have many large companies contribute in a better performance. This is the case of developer cluster and its innovative

performance. The constraints and barriers of the micro size companies influence the creation of goods with high added value and influence the growth of economy and the country competitiveness.

CONCLUSION

This research has advanced in innovation capabilities by presenting a conceptual model, the Innovation Capabilities Model, and testing the development capability construct based on a cross-sectorial survey. By performing the cluster analysis was possible to disclose three types of development capabilities and relate them to the innovative performance.

The qualifying variables to create the cluster profiles revealed three ways on how the firms are structured to develop products and these features really disclosed their development capabilities accessed during the process and, consequently, the innovative performance achieved. Even if the products developed were not so new, there was an internal ability to develop them.

Although the outcome is product improvement, the firms' higher performance in developer cluster was enhanced by having highest development capability. In fact, they develop products and in such a way as to guarantee they remain in the market. To rise for more innovative products, a better improvement in internal knowledge is necessary. For some sectors, it is crucial to gain market share or even to maintain it.

The results of this research have also revealed two better development remarks. Or the firm has specialized development team or the firm is able to provide solutions for its customers' needs. These two remarks are the cases of the developer cluster and the solver cluster, respectively. Both clusters have in common the will of being assertive. The case of non-specialized cluster was the worst development situation. Firms in this cluster pretend to have a development department that is not enough to develop new products. This is because they are muddled by the ordinary routines of the company, which have been a hard stuff and reflect in the development capability and innovative performance lowest scores.

For further study, more in-depth research is needed to explore the underlying reasons for the relationship between the development capability configurations and its performances in order to describe types of new product development. This research seeks to expand the discussion about the capabilities needed for new product development and for innovation.

ACKNOWLEDGEMENTS

The present study was carried out with the financial support of the Brazilian Government research funding agencies Research Foundation the State of Rio Grande do Sul (FAPERGS) and the Brazilian National Council for Scientific and Technological Development (CNPq).

APPENDIX A (RESEARCH INSTRUMENT)

To what extent do you agree with the statements below, 1 means Totally Disagree and 5 Completely Agree.

DEVELOPMENT CAPABILTIY (DC)	DC2	Designs its own products based
	DC3	Monitors the latest tendencies in technology in the sector
	DC4	Uses formal product management methods (Stage-Gate, PMBOK, innovation funnel, etc.)
	DC5	Adapts the technology in use to its own needs
	DC6	Prototypes its own products
	DC7	Develops products in partnerships with Science and Technology Institutions
	DC8	Launches its own products
OPERATIONS CAPABILITY (OC)	OC11	Formalizes the PPC procedures
	OC12	Keeps statistical control of the process
	OC12.1	Uses leading edge technology in the sector
	OC12.2	Maintains adequate stock levels of materials for the process
	OC13	Carries out the productive process as programmed
	OC14	Establishes a productive routine that does not generate rework
	OC15	Delivers the product promptly
	OC16	Manages to expand the installed capacity whenever necessary
	OC16.1	Manages to ensure the process does not lead to products being returned
MANAGEMENT CAPABILITY (MC)	MC20	Formally defines its strategic aims annually
	MC21	Uses technology to integrate all its sectors
	MC22	Standardizes and documents the work procedures
	MC23	Updates its management tools and techniques
	MC24	Maintains the personnel adequately trained for the company functions (training).
	MC25	Uses modern financial management practices.

	MC27	Includes social and environmental responsibilities on its strategic agenda
TRANSACTION CAPABILTY (TC)	TC32	Conducts formal research to monitor the market
	TC33	Imposes its negotiating terms on its suppliers
	TC34	Imposes its prices on the market
	TC35	Imposes its negotiating terms on its customers
	TC36	Conducts research to measure its customers' satisfaction
	TC37	Uses formal criteria to select its suppliers
INNOVATION PERFORMANCE (IP)	IP42	The net profit has grown continuously over the last 3 years
	IP43	The company's market share has continuously grown over the last 3 years
	IP44	The company's revenue has continuously grown over the last 3 years

APPENDIX B

DEVELOPMENT CAPABILTIY (DC) - Simple choice

DC9 - What triggers the development?

DC10 - How does the development process occur?

INNOVATION PERFORMANCE (IP related to income) (1 to 5)

IP45 - The company's income is the result of developing new products.

APPENDIX C

Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Conf. Interval	
						L.B.	U.P.
DC2	The Non-Specialized	The Developer	-.677*	.074	.000	-.82	-.53
		The Solver	-.609*	.074	.000	-.75	-.46
	The Developer	The Non-Specialized	.677*	.074	.000	.53	.82
		The Solver	.067	.077	.386	-.08	.22
	The Solver	The Non-Specialized	.609*	.074	.000	.46	.75

		The Developer	-.067	.077	.386	-.22	.08
DC3	The Non-Specialized	The Developer	-.651*	.062	.000	-.77	-.52
		The Solver	-.630*	.062	.000	-.75	-.50
	The Developer	The Non-Specialized	.651*	.062	.000	.52	.77
		The Solver	.021	.066	.749	-.10	.15
	The Solver	The Non-Specialized	.630*	.062	.000	.50	.75
		The Developer	-.021	.066	.749	-.15	.10
DC4	The Non-Specialized	The Developer	-.736*	.073	.000	-.88	-.59
		The Solver	-1.128*	.073	.000	-1.27	-.98
	The Developer	The Non-Specialized	.736*	.073	.000	.59	.88
		The Solver	-.392*	.077	.000	-.54	-.24
	The Solver	The Non-Specialized	1.128*	.073	.000	.98	1.27
		The Developer	0.392*	.077	.000	.24	.54
DC5	The Non-Specialized	The Developer	-.559*	.058	.000	-.67	-.44
		The Solver	-.384*	.058	.000	-.49	-.26
	The Developer	The Non-Specialized	.559*	.058	.000	.44	.67
		The Solver	.174*	.061	.005	.05	.29
	The Solver	The Non-Specialized	.384*	.058	.000	.27	.50
		The Developer	-.174*	.061	.005	-.30	-.05
DC6	The Non-Specialized	The Developer	-.954*	.085	.000	-1.12	-.79
		The Solver	-.582*	.085	.000	-.75	-.41

	The Developer	The Non-Specialized	.954*	.085	.000	.79	1.12
		The Solver	.371*	.089	.000	.20	.55
	The Solver	The Non-Specialized	.582*	.085	.000	.41	.75
		The Developer	-.371*	.089	.000	-.55	-.20
DC7	The Non-Specialized	The Developer	-.399*	.093	.000	-.58	-.21
		The Solver	-.195*	.093	.037	-.38	-.01
	The Developer	The Non-Specialized	.399*	.093	.000	.21	.58
		The Solver	.204*	.098	.038	.01	.39
	The Solver	The Non-Specialized	.195*	.093	.037	.01	.37
		The Developer	-.204*	.098	.038	-.39	-.01
DC8	The Non-Specialized	The Developer	-.860*	.091	.000	-1.04	-.68
		The Solver	-.702*	.091	.000	-.88	-.52
	The Developer	The Non-Specialized	.860*	.091	.000	.68	1.04
		The Solver	.157	.096	.100	-.03	.34
	The Solver	The Non-Specialized	.702*	.091	.000	.52	.88
		The Developer	-.157	.096	.100	-.34	.03

*The mean difference is significant at the 0.05 level. (L.B. = Lower Bound; U.P. = Upper Bound)

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