

**INNOVATION CAPABILITY OF CLUSTERS: Understanding the innovation of geographic agglomerations.**

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## 1. Introduction

Innovation is increasingly regarded as a matter of survival and not merely a choice for firms (Freeman & Soete, 1997; Bessant, 2003; Chesbrough, 2003; Gnyawali & Srivastava, 2013). Thus, an alternative approach to stand out in this dynamic environment derives from interorganizational exchanges, as firms have knowledge gaps that can be supplied only through these interactions (Powell, 1990). In this context, clusters are strongly related to firms' innovative potential (Lai *et al.*, 2014).

Several studies show that companies belonging to these geographical agglomerations tend to be more innovative and to achieve superior economic performance in comparison with the isolated ones (Marshall, 1920; Saxenian, 1994; Audretsch and Feldman, 1996; Capello & Faggian, 2005; Bell, 2005; Giuliani, 2010). It is understood that many facets are considered in order to better understand the innovative potential of geographic agglomerations. However, justifications for the fact that some clusters are more innovative than others still is in debate, instigating further exploration of their capabilities.

In a cluster, although the companies belong to same sector and are grouped together, they have a heterogeneous and asymmetric distribution of knowledge (Giuliani, 2005). Thus, this disparity between clusters makes the study even more complex and challenging, requiring a research on reasons why some clusters stand out from others. In this regard, a question arises regarding which capabilities that make a cluster more innovative.

Capabilities depend on the set of tangible and intangible skills and resources (Zen & Fracasso, 2012) derived from the knowledge base (Giuliani, 2007). The knowledge and capacities required to develop and disseminate innovations are more easily acquired in agglomerations (Porter, 2000). The subject of innovation capacity is attracting interest from several researchers (Lawson & Samson, 2001, Guan & Ma, 2003, Yam *et al.*, 2011, Zawislak *et al.*, 2013), although the literature is still incipient about this topic. This gap is even greater in regard to the innovation capabilities of clusters. In this way, the present research specifically seeks to answer the following question: *how the innovation capability of cluster is developed?* Thus, the present research aims to understand the innovation capability of cluster. For this, was conducted an exploratory research with two clusters: emerging cluster of *Alto do Camaquã*, in Brazil and growing cluster of *Sisteron*, in France.

This article is divided, in addition to this introductory section, into four parts. Initially, the theoretical review used is presented: clusters, innovation capability and innovation capability of clusters. Subsequently, the methodological procedures used are presented. In the following step, data, analysis and results are discussed and, finally, the final remarks of the research.

## 2. Literature Review

This section presents a review of the literature on the research issue. Based on that, the following themes will be addressed: clusters, innovation capability and innovation capability of clusters.

### 2.1. Clusters

Clusters can be defined as geographic concentrations of interconnected companies and institutions in a particular field (Porter, 1990). The pioneering work on the subject is from Alfred Marshall (1920), who brought the concept of industrial district, an agglomeration of small businesses in the same locality. Marshall (1920) suggests that locations thick with similar activity generate valuable agglomeration economies for firms, namely better access to skilled labor (labor market pooling), specialized suppliers (shared inputs), and knowledge spillover from competing firms. As a result, firms' location choices may create competitive advantage by improving access to key resources.

The theme has grown in relevance, getting more prominence after realizing that the geographic agglomerates are generators positive externalities (Becattini, 1990; Porter, 1990). In addition, it is possible to perceive a strong relation between innovation and clusters, since the companies inserted in these clusters tend to be more innovative when compared to the isolated ones (Marshall, 1920, Audretsch & Feldman, 1996, Bell, 2005 and Giuliani, 2010). For researchers, knowledge and skills are more easily acquired and innovations are more efficiently developed and disseminated within clusters (Porter, 2000; Basant, 2003; Dahl & Pedersen, 2004).

Even with several works, there is still a lack of consensus on the reasons that make clusters environments more innovative. Lawson (1999) and Maskell & Malmberg (1999) argued that what determines innovation within a cluster is its location. However, more recent studies argue that it is not the location, but rather the network formed by the cluster (Owen-Smith & Powell, 2004; Singh, 2005; Whittington, Owen-Smith, Powell, 2009). Identifying how knowledge transfer flows in these networks is crucial to understanding how innovation happens (Giuliani, 2005). However, it should be noted that cluster does not influence in a homogeneous manner its firms (Zen, 2010).

Although recent researches reinforce the idea that the local factor is not determinant in the innovation capacity of the cluster (Tallman *et al.*, 2004), it is impossible to deny its importance. The context surrounding the cluster and the company influences their capacities, even more when it comes to very different realities. In the last decades, this fact has been proven on the basis of studies carried out in developed and developing countries (Silvestre & Neto, 2014).

Another factor worth mentioning about the innovation capacity of the cluster concerns its stage of development. According to the stage of its life cycle, the cluster exhibits a set of characteristics that interfere in its innovation and its relations with the companies (Menzel & Fornahl, 2010). Presutti *et al* (2013) provide a model for different sectors, defining clusters as emerging (few interactions and innovations) or growing (different interactions and innovative recognition).

Finally, it was noticed that the clusters play an important socio-economic role due to the exchanges of knowledge and the high innovation potential of the firms inserted in these agglomerations. However, the reason it differentiates these firms from isolated ones is not yet a consensus. It was verified that there is heterogeneity in firms and clusters, which may be related to their context and stage of development. In this way, it becomes opportune to understand more about innovation capability, the theme of the next section.

## 2.2. Innovation capability

Although there is a consensus about the importance of innovation on the company's competitiveness (Dodgson & Rothwell, 1994; Cassiolato & Lastres, 2000; OCDE, 2005), the reason that leads some companies to innovate and others not is still discussed. In light of these questions, several studies converge towards the affirmation that firms have a set of

capabilities that make them innovative. Thus, innovation capability would be the ability of those companies to generate and manage the implementation of technological and/or organizational innovations, including the ability to relate to others in the value chain (Bell, 2006).

Capabilities emerge from a combination of assets, people, cultural values and operational processes in companies, which include the ability to know how to do at low cost (efficiency) and to know what to do (effectiveness) (Zen, 2007). For Teece, Pisano e Shuen (1997), the term “capability” emphasizes the fundamental role of strategic management to adapt, integrate and reconfigure organizational skills (external and internal), resources and functional competencies to meet the demands of a dynamic environment.

In the competitive context in which firms are inserted it is important that they develop certain capabilities to stand out from competitors. Such capabilities, as well as their combination, can provide the possibility of promoting innovations, be it product, process, market and management. Several authors performed studies to understand the innovation capabilities of firms (Lawson & Samson, 2001, Guan & Ma, 2003, Yam *et al.*, 2011, Zawislak *et al.*, 2013). These researchers have highlighted in their studies, different innovation capabilities of the firms.

Lawson and Samson (2001) define innovation capability as the firm's ability to uninterruptedly transform new ideas and knowledge into new products, new processes and systems that will benefit both the company and its stakeholders. On the other hand, Zawislak *et al.* (2013) understand that the sources of innovation come from four essential capabilities that form the innovation capability: technological capability, managerial capability, operational capability and transactional capability.

Yam *et al.* (2011) understand that there are seven capabilities that determine the success of a company: research and development (R&D) capability, resource allocation capability, learning capability, manufacturing capability, organizational capability, marketing capability and strategic planning capability. Similarly, Guan and Ma (2003) present seven main capacities to explain the companies' competitive success: learning capability; R&D capability; production capability; marketing capability; organizational capability; resource exploitation capability and strategic capability.

From the proposals presented by the authors it can be seen that there is still no consensus on the subject. It should also be noted that the studies presented focus on the firm's innovation capability, and there is no understanding of the innovation capability of clusters. Thus, the next section will address issues that touch on this topic.

### 2.3. Innovation capability of Clusters

The positive relationship between companies inserted in a cluster and their high capacity for innovation is attracting interest from several scholars, nonetheless, no consensus has yet been reached on why these firms are more innovative than isolated ones. Recent studies indicate that innovation does not occurs in an homogeneous way within these interactions, due to the different capabilities of the firms and clusters, their pool of resources and their trajectory (Giuliani, 2007; Pe'er & Keil, 2013; Lai *et al.*, 2014).

Innovation capability is the answer that several researchers (Lawson & Samson, 2001, Guan & Ma, 2003, Yam *et al.*, 2011, Zawislak *et al.*, 2013) are using to the question: why some firms are more innovative than others? In this field of study, two main approaches are highlighted: technological and dynamic capabilities. Technological capability prioritizes changes in the company's technological bases to keep up some competitive advantages (Bell & Pavitt, 1995; Lall, 1992), while dynamic capabilities highlight the scenario of constant

changes in which firms must regularly reinvent themselves to maintain a competitive edge (Teece, Pisano & Shuen, 1997; Eisenhardt & Martin, 2000; Winter, 2003; Teece, 2007).

It is still incipient the number of studies in specialized literature on this subject, but it becomes even scarcer when related to clusters. Therefore, it is necessary to seek specific approaches geared towards the innovation capacities of clusters, in order to understand the particularities of these agglomerations. There are few studies on the innovation capabilities of clusters in recent years, and there are few approaches that provide more details on this subject (Damanpour & Wischnevsky, 2006; Wu, Gu & Zhang, 2008; Forsman, 2009; Lai *et al.*, 2014)

Regarding clusters, the innovation capability is closely related to the absorptive capacity (Cohen & Levinthal, 1990). Absorptive capacity is the ability to recognize the value of new information from external sources, with a view to assimilating and applying it, considering that the ability to evaluate and use external knowledge occurs by connecting it to the background knowledge (Zahra & George, 2002; Bueno & Meirelles, 2012). For that reason, one can notice the importance of the extra-cluster relationships in the search for a wide range of knowledge, so one can disseminate it within the cluster, promoting its absorption and stimulating its use by the firms.

Seen in these terms, it becomes crucial to identify the elements that make up the innovation capability of clusters. Based on this, the present study sought to understand the characteristics of clusters that stimulate innovation for the agglomeration and for the firms inserted in them, in order to identify its primordial elements. A firm that belongs to a geographic cluster profits from many different externalities, such as opportunities to improve knowledge, access to new markets, reduction in production and R&D costs, skilled labor and driving force training (Glaister & Buckley, 1996; Karaev *et al.*, 2007; Shapira, 2008), however, in order to harness these advantages provided by the cluster, a predisposition toward the innovation is necessary.

Initially, a factor of extreme relevance is the **context** in which the cluster operates. The resources and region's trajectory form the reputation that influences the company that is part of the cluster (Zen, 2010). **Collective strategy** is also crucial for innovative clusters. Herrmann *et al.* (2007) emphasize the importance of innovation-oriented culture, which includes customer orientation and technological innovation. In addition, there are **public policies** that the cluster can achieve from its mobilization. As a result of their positive externalities, governments implement policies focused on regional economic development and incentives plans for companies in agglomerations (Wegner *et al.*, 2004; Lai *et al.*, 2014). With public policies and collective strategy based on the local context, the cluster has inputs that facilitate the **commercialization** of products made internally, generating a significant benefit to the firms included in the agglomeration (Morosini, 2004).

For that to occur, concrete actions taken by the cluster are required in order to search for new processes and technologies that bring competitive advantage for the companies, an element that can be called **proactivity** of the cluster in relation to innovation. **External relationships** of the cluster play an essential role in absorb knowledge and, consequently, increase the innovative capacity of the geographic agglomeration. However, obtaining external knowledge it is not enough, thus the internal **transmission** of knowledge to acquire a superior innovation capacity is necessary. In order for this to happen, intracluster **collaboration** is essential. In addition to dissemination, mutual assistance and cooperative relationship between actors belonging to the same agglomeration have advantages that lead to a greater innovative capacity. Based on that, it is crucial to transform the knowledge acquired by the cluster into products or solutions for the companies involved. As such, the next elements are related to knowledge **assimilation, transformation and application** in commercial purposes and/or concrete benefits for the companies (Cohen & Levinthal, 1990; Wu, Gu & Zhang, 2008).

To operationalize all these elements, the importance of **governance** is highlighted in the specialized literature on clusters (Dyer & Singh, 1998). Cassiolato and Lastres (2003) point out that governance is an essential factor for innovation development. Together with governance, other relevant elements are the hallmarks of the cluster's innovative capacity: the availability of **infrastructure** and **financial** and **human resources**. For several authors, lower transaction costs, shared costs on infrastructure, and access to a skilled workforce are among the main benefits proposed by the cluster to companies (Marshall, 1920; Bathelt *et al.*, 2004; Maskel & Malmberg, 2007; Lai *et al.* 2014). From that, it was obtained a list with the elements that influence to develop the innovation capability of the cluster, as can be observed in Table 1.

**Table 1:** Elements of the Innovation capability of the Cluster

Context
Collective Strategy
Public Policies
Commercialization
Proactivity
External Relations
Transmission
Collaboration
Knowledge Assimilation
Knowledge Transformation
Knowledge Application
Governance
Infrastructure
Financial Resources
Human Resources

**Source:** Elaborated by the authors

Finally, it is observed that these elements can be more or less developed according to the analyzed cluster, however, their existence must be kept. Thus, they will serve as a basis for the identification of the innovation capability of cluster and to verify how it is developed. In the methodological procedures section, the present research will be more detailed.

### 3. Methodological Procedures

The research was developed based on a qualitative exploratory approach. To carry out this research, two clusters insert in different contexts and at different stages of development were selected. The comparison aimed at understanding how to develop the innovation capability of clusters.

To select the cases, we sought clusters of a sector that had importance for the countries studied, that had an impact of the territory in its action and that the innovation had a direct influence on its competitive advantage. Thus, the agribusiness sector was selected because it has a high social and economic impact in Brazil and France, because it is dependent on its territory (region that it is inserted) and because it is considered a low tech sector, with low technological intensity, in this way, innovations tend to have an even greater impact on firms that generate value novelties. In agribusiness, sheep industry was selected as a result of the segment experiencing crises and, recently, seeking a differential in the agglomeration strategy. Thus, we had the two clusters: the growing cluster of Sisteron, in southern France, and the emerging cluster of Alto do Camaquã, in southern Brazil.

Data were collected, between 2015 and 2016, through desk research, based on data collected on the internet and provided by actors of the cluster (for example: strategic planning and reports on this sector), non-participant observation, in four sector's events and on-site visits to organizations belonging to the cluster, and 32 semi-structured interviews with sheep industry experts from Brazil and France, representatives of public and research institutions and rural producers of both countries, with approximately 45 minutes each.

The elaboration of the instrument for data collection established as dimensions the elements of innovative capacity within the cluster identified in the theoretical framework: context, collective strategy, public policies, marketing, proactivity, external relationships, transmission, collaboration, assimilation, transformation and application of knowledge, governance, infrastructure, financial and human resources. Data analysis was performed through the triangulation using different sources: desk research, observation and interviews.

The treatment of the data of this research was based on the content analysis according to Bardin (2006), from the transcription of the interviews registered with previous consent of the interviewees, as well as on a comparative analysis between data obtained through observation and data resulting from the documents. The categories of analysis used were based on the literature review, as already presented in Table 1.

#### 4. Discussion and Results

This section will present and compare the cases set out, and then will perform an analysis based on elements previously defined in the literature. Next, the construction of the model and the discussion of the results will be presented.

##### 4.1. Clusters Presentation and Comparison

The Sisteron cluster is located in southeastern France. The chain is highly organized, with about 270 producers, organizations and associations of commercial producers, several cooperatives (market leaders), slaughter and marketing companies and partner research and teaching institutions. Beginning in the 1930s, the region has been adopting a strategy based on differentiation, with geographical indication and private labels that strengthen the quality of the product and generate business value for all actors.

The Alto Camaquã cluster is located in southern Brazil. The region is responsible for a large part of Brazilian production, with about 3 million ovines. In 2008, the cluster began to be formally structured, aiming at the regional development with a territorial approach. By these means, several initiatives involving government, cooperatives, associations, research and teaching institutions and companies from the sector, develop collective strategies in order to consolidate this cluster, securing the benefits for those involved and the region.

The first difference observed between the two clusters refers to the period when they were organized and recognized. Although in both cases the regions already had a long-standing tradition in this activity, they organized themselves afterwards, with the French cluster being recognized in 2003 and the Brazilian one in 2015. The organizational model was also distinct, greatly depending on the institutional framework and the local culture. In Sisteron, an organization called CESAR coordinates the interactions between actors and takes on a more political role, while the association, Bergers du Soleil, works more strongly with producers and the operation of the cluster. In Alto do Camaquã, there is a cluster manager company, ADAC (Association for the Sustainable Development of Alto Camaquã), that takes up not only the political role, but also the operational role, as producers are divided into 24 associations, which greatly decentralizes all actions. In addition, the network of cluster's

partner institutions actively cooperates, although some activities are not established yet, thus complicating the understanding of each one's responsibilities.

Another difference is that in France, the cluster has an established chain, in other words, production, slaughter, processing, distribution and marketing processes are well defined. Based on these steps, institutional actors operate according to their knowledge. In Brazil, there is not yet a complete chain organization. There was an attempt to set up partnerships for slaughtering, distribution and marketing, which failed due to a lack of a basic structure. Therefore, the cluster has sought to systematize a support process for producers and establish new partnerships to control this chain, such as the relationship established with the Producers' Center and the Municipal Cold Storage.

Those contrasting scenarios are evidenced by the very nature of the cluster's organization. While in Sisteron the intention was to improve the existing structure in order to generate more value for those involved, in Alto do Camaquã, the initial aim was valorizing the local characteristics and developing the region that was still unfamiliar with new technologies and processes. Thus, the path taken by the Brazilian cluster is even more exceptional, as it begins dealing with the producer's low self-esteem. Moreover, in the French case, producers from that region have sheep farming as the sole economic activity of the property, considering it as a source of income and livelihood. In the Brazilian case, sheep production is usually considered a secondary activity, not receiving the necessary attention for its development, since it is not perceived as a profitable source.

#### 4.2. Analysis of the Clusters

In the case of the **context**, both cases show a propensity towards activity and geographical similarities. However, the French cluster presents the *transhumance*<sup>1</sup> tradition and a high cost of production, while the Brazilian one evidences the need to preserve the biome, social issues and chain disorganization. Regarding the **collective strategy**, although both have built a collective brand, Sisteron already has labels and indications of origin, while Alto Camaquã aims at promoting the alignment between actors and at increasing self-esteem. On the **public policies** issue, producers from the growing cluster have access to benefits because they are included in the agglomeration. In the emerging cluster, governance is seeking policies for the sector, such as *Rota do Cordeiro*, to bring improvements to the region. Within the **commercialization** area, demand is perceived in both locations, but the French cluster operates on the basis of value generation for those involved, while the Brazilian cluster consolidates and seeks for alternatives to start selling the products.

Regarding **proactivity** for innovation, one can observe that French actors have more assets, highlighting that the cooperative that encourages innovation is one of its values. In the case of Brazilian actors, due to the fact that it has an active network of partners, the search for innovation appears more passive. This is likewise reflected in the **external relationships**, which turn out to be indirect, in other words, they are established through the institutions or the existing recognition. On the other hand, in Sisteron, there is a greater commitment with actors from outside the region and the country, which may be undertaken by those belonging to the cluster, or simply because of the larger stock offer and exposure generated by the organization of the sector in the country. In relation to **knowledge transmission**, the two clusters have a very similar scenario, with decentralization of responsibilities, thanks to the presence of different actors in regular meetings. Regarding **collaboration**, this similarity between clusters was not observed, since even though there is resistance in both cases, France is more favorably inclined towards exchange than Brazil.

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<sup>1</sup>Flock displacement In winter due to climatic conditions.



A common concern is **assimilation, transformation and application of the knowledge** acquired by the properties, which in both situations were brought by practical meetings and solutions. It is important to mention the Brazilian initiative of UEPAs, which took place within the properties and was suspended, but will be resumed later on. Moreover, the follow-up plan of these organizations is already implemented in the French scenario, and will also soon be available in Brazil. In relation to **governance**, the two clusters have a strong organization, but in different ways. In Sisteron, with the presence of CESAR and the support of the cooperative, in Alto do Camaquã, with ADAC, 24 associations and institutional actors that meet and give their opinions on a regular basis.

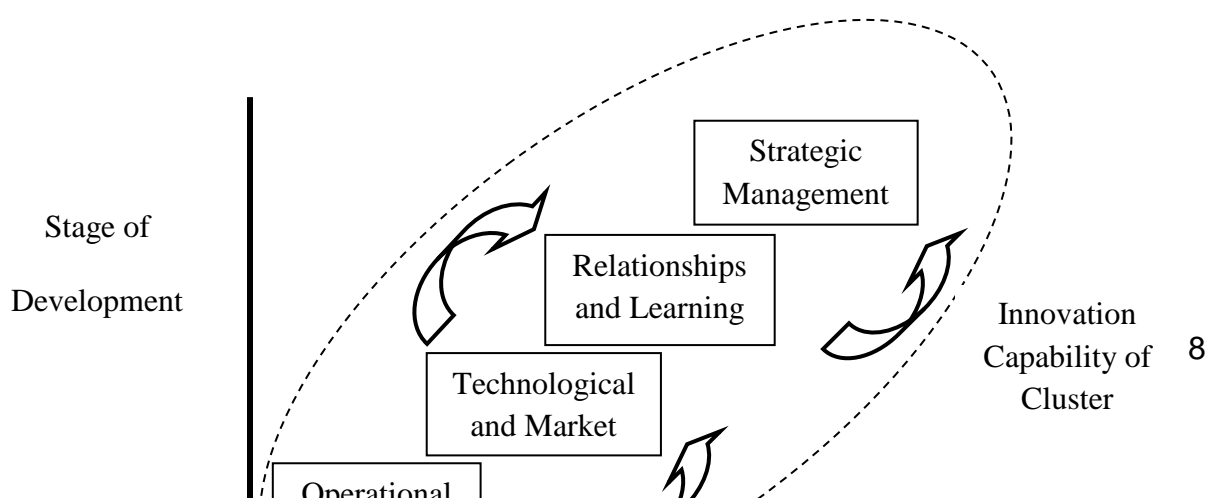
In the French cluster, the **infrastructure** is superior to that of the Brazilian one, because the headquarters of the cooperative is designed as multidisciplinary area with a meeting room, store and machinery, besides the cold storage and CESAR headquarters, while in Brazil, the headquarters are itinerant and the relationship with the cold storage is being set up, having only what is offered by institutional partners. Finally, when comparing **financial and human resources**, it is possible to observe a similarity in the youth rural exodus and the availability of people (linked to institutional actors) to perform the activities and the unevenness in relation to the provision of financial benefits, which, in Sisteron, there is a supply of resources and credit availability, contrarily to what is observed in Alto do Camaquã.

#### 4.3. Construction of a Model of Innovation Capability of Clusters

The basic idea is that companies belonging to clusters tend to be more innovative than the isolated ones (GIULIANI, 2010), however, it is understood that a set of skills that provide such an innovation to these organizations is still a matter for debate. There is no consensus on what cluster innovation capability really is. Thus, as in companies, many authors point out that the cluster's innovation capability is a set of capabilities (Zawislak *et al*, 2013). On that logic, complementing the existing models disseminated by Damanpour and Wischnevsky (2006), Wu, Gu and Zhang (2008), Forsman (2011), Lai *et al.*(2014) and Silvestre & Neto (2014), which are more connected to the absorptive capacity (Cohen & Levinthal, 1990) and taking into account the research carried out in the clusters of Sisteron and Alto do Camaquã, the present study intended to identify a model of innovation capability for clusters.

It is understood that the innovation capability of a cluster is a set of skills that enables the company in it to renew itself, restore something, or introduce a new feature that has a perceived value (Tidd, Bessant, Pavitt, 2008). Therefore, the aim is to determine which are the capabilities, that together, provide such benefits to organizations/agglomeration. Thus, elements identified in the literature review and validated in the field research were used in this research. Subsequently, these elements were grouped in capabilities that, together, depict the innovation capability of cluster. Figure 1 below shows the model developed for the innovation capability of cluster.

**Figure 1:** Model of innovation capability of cluster



**Source:** Elaborated by the authors

According to what was observed in the analyzed clusters and the specialized literature, **strategic management** would be a necessary tool to adjust and promote novelties with value creation (innovation). This capability is related to the ability to understand the **context** in which the cluster is inserted, seeking a **collective strategy**, capable of involving and engaging different people and organizations, aligning local skills and values. Therefore, it is necessary to centralize through an established **governance**, able to manage the cluster as a whole, in order to achieve the established objectives. Following this line, the identity of the agglomerate is established, enabling the search, access and construction of **public policies** for the region.

To promote the convergence between local actors aligned with collective goals, the cluster must have the **ability to develop relationships and to learn**. The main goal of this ability is to encourage **proactivity** in organizations that search for innovations, which in many cases is related to the opportunity to conduct **relations outside the cluster** in order to acquire new knowledge. However, such encouragement must also be in line with a concern about **knowledge transfer** to other cluster members, ensuring a culture of exchange and **collaboration**, since those are the primary factors for innovation.

For such processes to take place, a skill that is capable of promoting the **assimilation** of knowledge by the cluster towards the companies becomes fundamental. Hence, they can **transform** the knowledge obtained and **apply** it in a new tool that creates value and, thus, perceive and deliver this value to the market through a **commercialization** process. In this way, it is up to the cluster to have a **technological and market development capability** providing strong encouragement and the accomplishment of this innovation process.

In that case, the cluster must have an **operational management capability**. As a result, it is possible to guarantee what is necessary for the actors and the knowledge absorbed and generated by the cluster. For a proper operation, the cluster is expected to provide a suitable **infrastructure** for the generation of innovations. Allied to this process, this ability tends to offer or indicate **financial and human resources**, which may be cluster actions or positive externalities caused by it.

In order to facilitate the display and understanding of the innovation capability of cluster analyzed, a chart with the identified capabilities related to previously established elements was elaborated. As shown in Table 2:

**Table 2:** Innovation capability of cluster and its elements

	Strategic Management	Context
		Collective Strategy

<b>Innovative Capacity of the Cluster</b>		Governance
		Public Policies
	Relationships and Learning	Proactivity
		External relationships
		Transmission
		Collaboration
	Technological and Market Development	Assimilation
		Transformation
		Application
		Commercialization
	Operational Management	Infrastructure
		Financial Resources
Human Resources		

**Source:** Elaborated by the author

On that basis, there is a model of innovation capability of cluster. This model seeks to join the elements pointed out by specialized literature with the capabilities perceived in the field research. It is worth mentioning that capability that were identified are present in all clusters, and may vary in intensity according to their stage of development. From this set of capabilities, benefits are provided in order to stimulate innovation.

#### 4.4. Discussion of results

The term capabilities was coined by Richardson (1972), which he defined as the firm's knowledge, experience and skills. In terms of innovation capabilities, the main studies related to the subject are related to technological capability (Lall, 1992), dynamic capability (Tece, Pisano & Shuen, 1997, Eisenhardt & Martin, 2000) and absorptive capability (Cohen & Levinthal, 1990).

Although the subject has attracted the interests of many authors (Lawson & Samson, 2001, Guan & Ma, 2003, Yam et al., 2011, Zawislak et al, 2013), the discussion about innovation capability is incipient. This gap is even greater in regard to the innovation capability of cluster. In addition, existing models disseminated by Damanpour and Wischnevsky (2006), Wu, Gu and Zhang (2008), Forsman (2011), Lai *et al.* (2014) and Silvestre & Neto (2014), are connected to the absorbing capacity (Cohen & Levinthal, 1990), failing to explain the phenomenon in its entirety.

Innovation capability of cluster has to take into account the particularities of these geographic agglomerations. Thus, elements such as local context, collective strategy and governance must be involved in this capability. The models proposed are restricted to the flow of knowledge among the participants. It is perceived that this moment is only one of the stages promoted by the innovation capability. The ability of the cluster to innovate involves from its strategic management to the operationalization of the innovation itself.

It is understood that the set of capabilities (strategic management, relationships and learning, technological and marketing development and operational management) is able to promote innovation for the clusters and for the firms in it, explaining the reason why they are strongly related to the innovation. The union of the four capabilities allows the cluster to offer novelties with value from conception to operation and commercialization.

The proposed cluster innovation capability model presented in Figure 1 is a dynamic model as capabilities vary in their intensities according to the development stage of the

cluster and its maturity time. According to the stage of its development, the cluster presents a set of characteristics that interfere in its innovation and its relations with the firms and with the region in which it is inserted (Menzel & Fornahl, 2010). Thus, it was identified that the innovation capability of the cluster is not the same since its emergence, it is being built as the cluster develops.

Menzel and Fornahl (2010) point out that the emergency phase is difficult to detect because the cluster is not really a cluster, however, it is at this stage that the bases and the growth processes are formed. An emergency cluster is characterized by few companies and synergies (Menzel & Fornahl, 2010). Thus, at this stage, the cluster needs strategic management in order to develop the construction of a common purpose, which allows the insertion of organizations in the agglomeration.

After a strategic management developed, the cluster is able to attract participants. In this way, partnerships and learning relationships are formed to stimulate the innovative potential of organizations. In the case of clusters, geographical proximity provides a knowledge-exchange relationship and the creation of alliances and partnerships (Wu, Gu & Zhang, 2008) that are distinct from isolated organizations. Moreover, the importance of open innovation for exchanging knowledge and experience among those involved is emphasized (Chesbrough, 2012).

From these interactions, knowledge begins to be constructed and to become innovation. This process of assimilation, transformation and application of knowledge can be linked to the absorptive capacity and to the models presented by Damanpour and Wischnevsky (2006), Wu, Gu and Zhang (2008), Forsman (2011), Lai et al.

Finally, at a stage of growing development, the cluster needs to operationalize this innovation in order to reach the market. Thus, a series of resources and infrastructure need to be developed and offered to the participants. According to Giuliani (2005) from infrastructure such as education and scientific and technological institutions can be encouraged and strengthened the agglomeration.

## 5. Conclusion

Increasingly, innovation has been fundamental for organizations (Gnyawali & Srivastava, 2013), with interorganizational relationships being one of the ways to reach it. In view of these relationships, the clusters stand out, geographic concentrations of organizations of the same area of activity (Porter, 1990). According to several studies, firms that are inserted in clusters tend to be more innovative than isolated firms (Marshall, 1920; Saxenian, 1994; Audretsch & Feldman, 1996; Capello & Faggian, 2005; Bell, 2005; Giuliani 2010) why this occurs is still discussed. One of the points raised is that the relations are heterogeneous and vary according to the capacities of firms and clusters. Linked to this, the clusters still vary according to their stage of development and their region of origin.

In this way, this research aims answer the question *how the innovation capability of cluster is developed?* To carry out this survey, two clusters insert in different contexts and at different stages of development were selected: the growing cluster of Sisteron, in southern France, and the emerging cluster of Alto do Camaquã, in southern Brazil.

In the analysis of the innovation capability of cluster, the literature are still very incipient and associated only to knowledge transfer. Thus, the most relevant elements that represent the main characteristics and interferences from clusters in relation to the innovations proposed to the firms were defined: context, collective strategy, public policy, commercialization, pro-activity, external relations, transmission collaboration, assimilation, transformation and application of knowledge, governance, infrastructure, financial resources and human resources.

According to what was observed in the analyzed clusters and the specialized literature, the present study identified the set of capabilities that form the innovation capability of cluster. Thus, the Strategic Management, Relationship and Learning, Technological and Marketing Development and Operational Management capabilities are the components of the cluster's innovation capability. They are linked to the elements described in the literature and generate benefits for the agglomeration and for the organizations capable of promoting innovation.

The proposed model, in a simple and objective way, facilitates the comprehension on the innovation capability of clusters. By these means, it is possible to systemically understand how these agglomerations innovate, since, in literature, the proposed models are restricted to knowledge transfer and do not consider aspects related to the strategic and operational management of the cluster.

The propose model differs from the others because it takes into account the particularities of the geographic agglomerations, involving different elements. In addition, it is a dynamic model because it shows that the capabilities vary according to the development stage of the cluster. With this, the study intends that the specialized literature sees more broadly and dynamically the innovation in the geographic agglomerations.

One of the main contributions of the present research is the exploration of the subject of innovation capability of clusters, which is still very incipient in specialized literature. Thus, the research proposes a model composed of four capabilities (strategic management, relationships and learning, technological and market development and operational management) that intends to explain what makes these agglomerations potential tools for innovation.

The relevance of the research is confirmed since the geographic agglomerations have been frequent public policies of development of the regions. In addition, there is a continuous search for innovation. In short, it is therefore expected that the design of the proposed model helps managers (both agglomerations and organizations) to understand the importance and influence of each element listed for cluster innovation. In addition, by characterizing the relationship between firms and clusters at different stages of development, it is expected that these managers will be able to identify the situation being experienced and operate in search of a greater capacity for innovation. Finally, it is intended to stimulate public policies geared towards the development of the innovative capacity of clusters, maximizing their innovations.

The present research had as limitation the focus on only one sector (agribusiness), the restriction of a cluster by stage of development. Thus, we suggest new studies with clusters from other sectors, analysis with a higher number of firms, comparison between firms participating in the collective strategy and not, and also quantitative research in order to validate the proposed model. It would be interesting to understand how firms benefit from this cluster innovation capability throughout the development stages.

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