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Knowledge Integration and Open Innovation in the Brazilian Cosmetics Industry

Kleber Luís Celadon¹

Abstract

This article is based on a thesis that examined open innovation in the Brazilian cosmetics sector and its relationship with knowledge integration, comparing less open and more open firms. The ability to integrate knowledge is related to competitive advantage, and this study sheds light onto OI at each different firm. The main findings show that, different levels of openness in innovation, demand firm-specific mechanism for KI. Also, openness increases complexity in management. The understanding of how firms select their knowledge for appropriation and differentiation is also considered. The Brazilian cosmetics market was chosen because it occupies the 3rd position in the world's ranking and this industry is under researched. A cross-case comparison is used.

Keywords: open innovation; knowledge integration; cosmetics; cross-case comparison.

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Introduction

Making use of external and internal ideas to advance knowledge is claimed to bring more competitiveness for companies in general. The inflow and outflow of knowledge, which are part of this process, involve practices that should encourage participants to explore a wide range of innovation opportunities through multiple channels (West & Gallagher, 2006). Several authors (Acha, 2006; Celadon, 2007; H. Chesbrough, 2003b; W. Cohen & Levinthal, 1990; Easterby-Smith & Prieto, 2008; Howells, 1996; I. a. T. Nonaka, H., 1995; Polanyi, 1958) affirm that innovation processes can no longer be limited to local or internal know-how, but needs to focus more on professionals that can maximize the effectiveness of innovation, as well as finding alternate sources such as markets or spillovers. An example of that in the cosmetics sector is the search for special and unique knowledge (i.e. fragrance experts) that sometimes is available in another country. Also, emerging markets can be explored according to changes in socio-economic conjectures. This implies interaction and integration of knowledge, suggesting a relationship with another concept, that is, Knowledge Integration, which has been explained as a learning process within organizations and, therefore, has been seen as a critical process for understanding firm's competitiveness. It depends on people's attitudes towards learning, it varies in scope (the greater the harder for competitor to replicate) and it can be more or less flexible in relation to the capacity an organization has to build one innovation initiative on the top of another (R. M. Grant, 1996a; Huang & Newell, 2003).

Both Open Innovation and Knowledge Integration have complementarities, as well as overlapping dimensions, and have not been compared in previous studies. So, these concepts can be also antagonistic, and an investigation is necessary to study this relationship, taking into consideration that strategic shaping might influence organizational forms and practices (Penrose, 1959), as well as the important dimensions of innovation such as offerings, presence, customers and processes (Sawhney, Wolcott, & Arroniz, 2006), preferably in low-medium technology industries which are under researched to present. The economic context suggests firms are encouraged to implement open innovation mechanisms and knowledge integration to be successful. So, this research aims to study how firms deal with these concepts in practice. Brazil's economy is still largely support by low and medium-to-low technology firms. Therefore, studying these types of firms, and not only high-tech firms, is essential to this country's future economic wellbeing.

A cross-comparison has been carried out on a specific sector, the cosmetics, toiletry and perfumery sector, and referred to only as the cosmetics sector/industry from this point onwards.

Research questions

This research addresses two main propositions:

1. Knowledge integration is both an activity and a capability for industrial innovation and competitiveness, because it is responsible for optimizing knowledge exchanged from professionals of different backgrounds, and making use of this knowledge to create value for the organizations. As the cosmetics industry involves a substantial level of knowledge exchange, explicit and tacit, integrating mechanisms are most important to maintain the effectiveness of innovation policies.

2. Open innovation is likely to be an important influence on knowledge integration because the use of outside resources is likely to increase the levels of complexity for innovation. It also involves even more different people (cultures and managerial models) as much as different perceptions from professionals involved, meaning a greater challenge to management.

These propositions suggest the following research question: Under different conditions of openness, how do the mechanisms and practices of knowledge integration differ, and how does this influence innovation?

Methodology

The relationship between the two concepts is directly related, that is, the more intensity employed in one concept, the more will be needed in the other one. OI practices imply higher complexity in KI.

The Relationship Between The Two Concepts

Open Innovation and Knowledge Integration

	OPEN INNOVATION	KNOWLEDGE INTEGRATION
1	Exploitative (Murmann) x Explorative (XR)	Combination of skills of individuals to generate knowledge
Literature Review	(Brady & Davies, 2004; H. Chesbrough, 2003b)	(Okhuysen & Eisenhardt, 2002; Tell, 2011)
Synthesis	OI proposes that firms should exploit existing knowledge while explore knowledge available globally. This demands a combination of skills of individuals for both actions in order to optimize its results.	
2	Focus on Internal Knowledge (IN) x Combination of Int+Ext Knowledge (CB)	Integration of new and existing knowledge
Literature Review	(H. a. V. Chesbrough, Wim and West, Joel, 2006c; Henry William Chesbrough, 2003a; Gassmann, 2006; Gassmann & Enkel, 2004)	(Blackler, 2002; Hislop, Newell, Scarbrough, & Swan, 2000; I. a. T. Nonaka, H., 1995; Yang, 2005)
Synthesis	Even though semantics can differ in the two proposals, the main idea here is to combine and integrate knowledge (internal and external)	
3	Less (LE) or More (MO) Market oriented decision making processes	Integration of existing (market) knowledge
Literature Review	(Clark & Wheelwright, 1993; Hislop, et al., 2000; Shibata, Tse, Vertinsky, & Wehrung, 1991; Tushman & Scanlan, 1981)	(Amin & Cohendet, 2004; Bengtsson, Niss, & von Haartman, 2008; Chiva, 2005; Criscuolo & Nesta, 2008; DeFillippi, 2006; Dosi, Faillo, & Marengo, 2008; Dougherty, 1992; Easterby-Smith & Prieto, 2008; Howells, 1996; I. a. T. Nonaka, David, 2001; I. a. T. Nonaka, H., 1995; Polanyi, 1958; Tell, 2011)
Synthesis	These are two complementary ideas which are interdependent. If, for example, decision is more oriented on market, integration is also oriented to market and vice-versa.	
4	Dealing with Tacit knowledge	Knowledge and skills to solve problems (people's qualification and experience)
Literature Review	(H. Chesbrough & Crowther, 2006; Etzioni, 1996; Howells, 1996; Lam, 2000; Leonard & Sensiper, 1998; Polanyi, 1967; Roberts, 2006; Scott, Stuart, Stephanie, & Robert, 2003)	(Amin & Cohendet, 2004; Bengtsson, et al., 2008; Chiva, 2005; S. I. Cohen & Allen, 1969; Criscuolo & Nesta, 2008; DeFillippi, 2006; Dosi, et al., 2008; Dougherty, 1992; Easterby-Smith & Prieto, 2008; Robert M. Grant, 1996b, 1997; Howells, 1996; Leonard-Barton, 1992; I. a. T. Nonaka, David, 2001; I. a. T. Nonaka, H., 1995; Polanyi, 1958; Tell, 2011)

Synthesis	While KI focuses more on problem solving in this particular item, OI suggests that dealing with tacit knowledge supports innovative practices. Tacit knowledge is embedded in people's experience and complements problem solving.	
5	Weak ties (Hawkins, Best, & Coney) x Strong ties (ST)	Technical systems (Machinery, Labs)
Literature Review	(Granovetter, 1973)	(S. I. Cohen & Allen, 1969; Leonard-Barton, 1992)
Synthesis	Ties are also determined by technical systems because it implies relationships with suppliers, consumers and other stakeholders. In this item, these ties have been framed by the mentioned technical systems for the analysis.	
6	Network at individual level x Firm level	Integrative Capabilities (Absorptive capacity, ability to share knowledge)
Literature Review	(Henry William Chesbrough, 2007; S. D. N. Cook & Brown, 1999; Gann, 2005; Rothwell, 1994; Simoes-Brown, 2008)	(Cockburn & Henderson, 1998; W. Cohen & Levinthal, 1990; Lane & Lubatkin, 1998; Vanhaverbeke, Cloudt, & van de Vrande, 2007; Volberda, Foss, & Lyles, 2010; Zahra & George, 2002)
Synthesis	The various combinations are: Network at <u>individual</u> level with high or low intensity of absorptive capacity – and - Network at <u>firm</u> level with high or low intensity of absorptive capacity (<u>or both</u>). Networks in this item are the basis of knowledge sharing.	
7	Reorganization of existing structures x Creation of multiple ad hoc structures	Dynamic Capabilities (ability to change according to market or other demands)
Literature Review	(Dosi, et al., 2008; Granstrand, Bohlin, Oskarsson, & Sjöberg, 1992; Lane & Lubatkin, 1998; Littler, Wiesner, & Dunford, 2003; Okhuysen & Eisenhardt, 2002)	(Easterby-Smith & Prieto, 2008; Gulati, Nohria, & Zaheer, 2000; McGuinness, 2008; Teece & Pisano, 1994; Teece, Pisano, & Shuen, 1997)
Synthesis	Some reorganization or ad hoc structures demand dynamic capabilities. So, the relationship of OI and KI in this case depends on the intensity of each item applied by each firm.	
8	Informal x Formal Evaluation Process (x Transition from informal to formal)	Implicit/Social or Collective Knowledge (facilitates the creation of products i.e. regional usage of cosmetics, culture, etc)
Literature Review	(Littler, et al., 2003)	(Hatchuel, Le Masson, & Benoît, 2002; Lehrer, 1987; Scott, et al., 2003; Tushman & Scanlan, 1981)
Synthesis	Firms tend to move from informality to formality during their development. This might include the creation of systems that collect social knowledge by establishing interfaces with users, consumers and the community.	
9	Accelerate Innovation and/or Expand Market	Organizational Structure (vertical x horizontal)
Literature Review	(Christensen, Olesen, & Kjær, 2005; Laursen & Saltzer, 2006; von Hippel, 1988, 2005; von Hippel, 2007)	(Ahuja, 2000; Allio, 2005; Dosi, et al., 2008; Havens & Knapp, 1999; Lam, 2000; Lane & Lubatkin, 1998; Lindegaard, 2010; Okhuysen & Eisenhardt, 2002; Selznick, 1957; Tushman, 1977)
Synthesis	This item was created to observe the relationship between Internal x External Market acceleration in comparison to Vertical x Horizontal structures.	
10	Rewarding system in place	Managerial Systems (i.e. leadership style)

Literature Review	(Henry William Chesbrough, 2003a; Murray & O'Mahony, 2007)	(Allio, 2005; Havens & Knapp, 1999; Lindegaard, 2010; Selznick, 1957)
Synthesis	Rewarding system is part of managerial system that can be used differently according to leadership styles.	
11	Platform onto which people can add their ideas and contributions	Values and Norms (Culture)
Literature Review	(Meyer & Mugge, 2001; Sawhney, et al., 2006)	(S. D. N. a. D.Y. Cook, 1993; Ernst & Kohn, 2007; Gherardi, 2002; Pilania, 2006; Sackmann, 1992; Sahota & Lemon, 2004; Schein & 1993; Shibata, et al., 1991; Tushman & Scanlan, 1981)
Synthesis	In this item culture is seen as the foundation for contribution systems where people can add their ideas.	
12	Breadth (n of sources) x Depth (importance)	Invisible Assets (i.e. people's perception of a firm as a 'green' company)
Literature Review	(Dougherty, 1992; Laursen & Salter, 2005; Laursen & Salter, 2006)	(Blackler, 2002; Hawkins, et al., 1995; Rindova & Petkova, 2007; Tell, 2011)
Synthesis	The way that firms deal with brand, R&D concessions, licensing, patents, goodwill, and people's perceptions in general, either by making arrangements with several of them (breadth) or dealing more specifically with few of them more profoundly (depth).	
13	Formal X Informal Relationships	Organizational reaction to internal and external contingencies
Literature Review	(Bessant & Tsekouras, 2001; Bruner, 1990; Mowery, 1982; Perkmann & Walsh, 2007; Polanyi, 1958; Powell, Koput, & Smith-Doerr, 1996)	(Bengtsson, Bergek, Berggren, & Söderlund, 2009; Bengtsson, et al., 2008; Carlile, 2002; Cassiman & Veugelers, 2006; Chiva, 2005; Criscuolo & Nesta, 2008; Enberg, 2007; Fernandez-Breis, Castellanos-Nieves, & Valencia-Garcia, 2009; Gransstrand, et al., 1992; R. M. Grant, 1996a; Gulati, et al., 2000; Huang & Newell, 2003; Kodama, 2009; Lane & Lubatkin, 1998; Laursen & Salter, 2005; Nævestad, 2008; Okhuysen & Eisenhardt, 2002; Pisano, 1994; Ravasi & Verona, 2001; Söderlund, 2010; Tell, 2011; Tsekouras, 2006; Tushman & Scanlan, 1981; Wallin & Von Krogh, 2010; Yang, 2005)
Synthesis	The type of relationship (formal or informal) might determine different ways of reaction to internal and external contingencies	
14	User Innovation	External Integration (suppliers, researchers)
Literature Review	(Flowers, 2007, 2008; Flowers & Henwood, 2010; Hienerth, 2006; von Hippel, 1986; von Hippel, 1988, 2005; von Hippel, 2007)	(Bengtsson, et al., 2009; Bengtsson, et al., 2008; Carlile, 2002; Chiva, 2005; Criscuolo & Nesta, 2008; Enberg, 2007; Fernandez-Breis, et al., 2009; R. M. Grant, 1996a; Huang & Newell, 2003; Kodama, 2009; Okhuysen & Eisenhardt, 2002; Pisano, 1994; Ravasi & Verona, 2001; Söderlund, 2010; Tell, 2011; Tsekouras, 2006; Wallin & Von Krogh, 2010; Yang, 2005)

Synthesis	This item focuses on suppliers, researchers and other participants observing their contribution to innovation as well as users that make inputs to innovation. User innovation is also an external source for integration	
15	Use of external network community	Internal (cross-functional, individual problem-solving, spanning boundaries)
Literature Review	(Bessant & Tsekouras, 2001; Birkinshaw, Bessant, & Delbridge, 2007; Gulati, et al., 2000)	(Andersson, Holm, & Johanson, 2006; Carlile, 2002; Dosi, et al., 2008; Huang & Newell, 2003; Leonard & Sensiper, 1998; Mintzberg, Jorgensen, Dougherty, & Westley, 1996; Okhuysen & Eisenhardt, 2002; Tushman, 1977; Tushman & Scanlan, 1981; Zarifian, 1996)
Synthesis	The use of external communities might impact on internal mechanisms for the integration of knowledge. Some firms can do either or both.	
16	Communities of Practice	Transfer of knowledge
Literature Review	(Brown & Duguid, 1991; Lane & Lubatkin, 1998; Powell, et al., 1996; Roberts, 2006; Wenger, 1998)	(Carlile, 2002; Easterby-Smith, A. Lyles, & Tsang, 2008; Kogut, 2000; Ringberg & Reihlen, 2008; Scott, et al., 2003; Szulanski, 2000; Tushman & Scanlan, 1981; Watson & Hewett, 2006)
Synthesis	One way of transferring knowledge is by contributing via communities of practice.	
17	Swift trust in collaboration	Communication between specialists
Literature Review	(Meyerson, Weick, & Kramer, 1996)	(Carlile, 2002; Tushman, 1977; Zarifian, 1996)
Synthesis	The relationship between specialists in the cosmetics industry requires some level of trust. This item focuses on variations of this, including swift trust.	
18	Acquisition of Innovative Units	Efficiency – people's attitudes towards learning
Literature Review	(Cassiman & Veugelers, 2006; Granstrand, et al., 1992; Rice, 1994)	(Argyris & Schön, 1978; Bessant & Tsekouras, 2001; Brady & Davies, 2004; W. Cohen & Levinthal, 1989; W. Cohen & Levinthal, 1990; Fernandez-Breis, et al., 2009; J. Hagedoorn & Duysters, 2002; Pérez-Nordtvedt, Kedia, Datta, & Rasheed, 2008)
Synthesis	By innovative units this item considers not only the acquisition of new physical departments but the creation of new teams that can contribute efficiently towards learning.	
19	Internal R&D x External R&D	Scope – The greater, the harder for the competitor to copy
Literature Review	(Arnott & Pervan, 2005; Baum, Calabrese, & Silverman, 2000; Cassiman & Veugelers, 2006; Celadon, 2007; H. Chesbrough, 2003b, 2011; H. a. V. Chesbrough, Wim and West, Joel, 2006c; Henry William Chesbrough, 2003a, 2007; Henry W. Chesbrough & Appleyard, 2007; Freeman, 1987; Glaude, 2006; Granstrand, et al., 1992; John Hagedoorn & Schakenraad, 1994; Howells, 1996; Lane & Lubatkin, 1998; Nikulainen, 2008; Rothwell, 1994)	(Chandler, 1990; Van De Vrande, Vanhaverbeke, & Gassmann, 2010)

Synthesis	The greater and more complex mix of internal and external R&D strategies, the harder for the competitor do copy.	
20	Technology Scanning (putting ideas into practice to create value).	Flexibility – Capacity to build one innovation initiative on the top of another
Literature Review	Arnott and Pervan 2005; Cassiman and Veugelers 2006; Glaude 2006; Chesbrough 2006c; Celadon 2007; Chesbrough 2007; Chesbrough and Appleyard 2007; Nikulainen 2008; Chesbrough 2011)	(Bird, Osland, Mendenhall, & Schneider, 1999; Eisenhardt & 2002)
Synthesis	Firms should be capable and flexible enough to build innovative ideas by scanning technology and people's capabilities (absorptive capacity)	

Table I Conceptual framework – Relating OI and KI with the reviewed literature

Research Strategy - The Case Study

This research aims to make an analysis that will be carried out within an industrial environment, the cosmetics sector in Brazil. The focus of the research is on the firms' ability to integrate knowledge under the influence of different degrees of innovation openness, exploring the interaction of the main actors in this process. So, a qualitative research is employed, as the context is very important and should therefore be analysed. Multiple case studies will allow replication of responses to the research, or will allow the description of circumstances where responses are not replicated (Yin, 1994). One of the participating organisations will be used as a pilot case (Yin, 1994) enabling the refinement of aspects of the research such as interview schedules, interview questions and interview techniques. This pilot was carried out in Brazil as an attempt to refine the instrument of collection of data within the socio-cultural environment of this study. Choosing one specific sector such as the cosmetics sector, facilitates the validation of the research in its final stages, as the design of this study uses a replication approach, that is, each individual case study consists of a "whole" study, in which convergent evidence is sought regarding the facts and conclusions for the case; each case's conclusion are then considered to be the information needing replication by other individual cases (Yin, 2009). The choice of cosmetics industry is also relevant as research in this industry is still incipient. Research data was collected from multiple sources in each case. This allows for triangulation of data sources (Yin, 1994) in order to confirm, or discon-

firm, answers to the research questions. Observing activities in loco, interviewing professionals, and analysing secondary data were employed as methods to collect data. Semi-structured interviews were selected as the primary data collection method for this study.

Collection of empirical data

A preliminary collection of data was done using a Likert questionnaire, which was applied in every company before the interviews. It was designed to discover the positioning of each firm in a scale, from "more traditional" (closed) innovator to "more open" innovator. The results helped to improve the ideas to be used during interviews. As a result of this initial study, I was able to refine the data collection instrument.

Comparing the preliminary results with the analysis, it can be concluded that firms NA, RA are "more open", BU, BT, LC and CA are "hybrid" and AL, HN, BN are "more traditional".

The questionnaire (phase I) was created based on both concepts, OI and KI, and one person of each firm answered it, normally a director of technology / innovation or CEO in large firms, and general managers (owners) of SMEs. The rationale behind this approach was based on the fact that this study proposes a comparison between more open and more closed firms. Therefore, it was decided to check if there was reasonable level of difference in openness, at least between

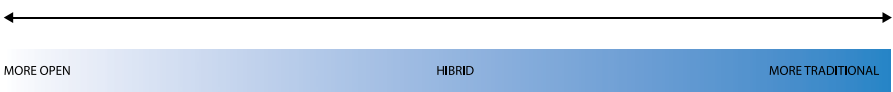
	More Open	Hybrid	More Closed						
Firm	NA	BT	BU	RA	LC	CA	AL	HN	BN
Size	Large	Large	Medium	Large	Small	Small	Medium	Small	Medium
Location	São Paulo	Curitiba	Curitiba	Curitiba	Curitiba	Curitiba	Curitiba	Manaus	Curitiba
Degrees of openness									

Table 9 Firms divided by degrees of openness (Phase I) / * Data from preliminary questionnaire only

Total of Open Innovation Relating Practices	38	33	20	31	12	15	7	6	9
SAMPLE FIRMS	NA	BT	BU	RA	LC	CA	AL	HN	BN
Openness	More Open		Hybrid				More Closed		

Table 23 – Total of Open Innovation Relating Practices (Phase 2)

some of the chosen firms. Even though the methodology does not intend to generalize the results, it was preferred to choose a varied sample to enrich the study. The second and most important part of the analysis (phase 2), that is, the application of semi-structured interviews, had to be compared with previous data obtained on the questionnaires, in search for possible discrepancies between both methods. Only large firms use project-based strategies to integrate knowledge, and SMEs rely more on informality. The share of common knowledge is more common between those professionals with similar academic degrees, particularly in pharmacy, biology or chemistry. However, some degree of rigidities can be noticed when sharing knowledge between different departments.

Collaboration across areas and disciplines is also more common in large firms, in particular when it is an international collaboration. SMEs concentrate knowledge in few people and normally the owner has got a lot of power when it comes to decision making. Important studies in the field points to a dialogical approach, trying to understand how face-to-face dialogues result in new organizational knowledge, “the dialogical of utterances per se is an important mechanism through which cognitive change and, thus, new knowledge may come about” (Tsoukas, 2009, p.942).

Brazil’s national education levels are still behind its recent economical development causing shortage of specialized and technical labour. So, firms need to invest heavily in internal training policies in order to overcome the limitations of the market.

There are few suppliers of chemicals that are used in cosmetics, normally large multinational firms (i.e. Givaudan) established in Brazil. This creates an interesting characteristic to the sector as competing cosmetics firms rely on these few suppliers. Therefore, vertical collaboration is a *modus operandi* in this sector; and trust becomes essential. So, technological integration (external) requires competences of firms to be linked with technologies offered externally so they can assimilate and replicate this knowledge gained from external sources. This external knowledge “cannot simply be acquired by reactively scanning the existing pool of available technical information” (Iansiti & Clark, 1994, p.571). Horizontal collaboration is more common among large firms that are supported by their own lawyers to deal with intellectual property issues for example. Company NA has created its own department for academic relations where an employee’s expertise is dedicated to its interaction with universities and research institutes. Also, all firms without exception are implementing internal training in some degree. Large firms tend to focus on international trends, whereas SMEs are more concerned with quality assurance programs. This is in line with some ideas from researchers who said that “internal knowledge or technical capabilities remain crucial in determining firms’ innovative capabilities and financial performance even when firms divert their attention more and more towards external knowledge” (Vanhaverbeke, et al., 2007, pp. p.2).

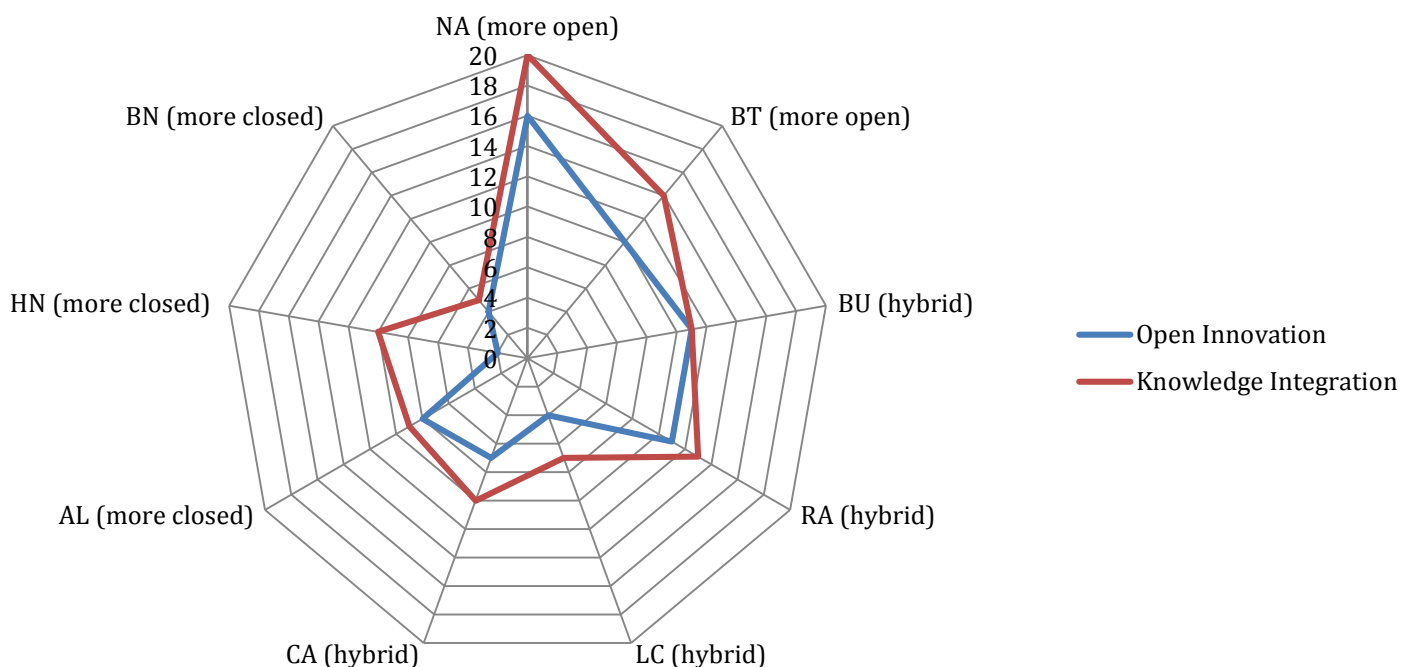


Figure 2 – Radial graph comparing results from more open, hybrid and more closed firms

SMEs, as in large firms, also combine knowledge in different and specific manners. BU's main source of external knowledge is a group of therapists spread all over Brazil. As LC was originated from a large firm to become its main supplier of soaps, it has developed an almost 'symbiotic' process of knowledge integration with this firm. Recently the firm is developing new strategies in order to 'break free' from this. So, the firm has begun to scan market needs that are not fulfilled by its main client firm. CA concentrates its efforts in certified organic cosmetics and obtains knowledge from developed countries, even though its raw materials are nationally grown. The integration of knowledge occurs mostly at administrative level, particularly because the firm has been created in an incubator and sponsored by government agencies. Finally, BN is a manufacturer of hair colouring products that compete 'head to head' with multinationals such as L'Oreal. The firm is clearly driven by strong marketing campaigns and publicity in the media.

Conclusion

This cross-case analysis has been carried out to compare different conditions of openness and the implication of these on knowledge integration, as well as its influence in innovation.

Firm size appeared as an important factor because of the high costs and increased complexity involved the OI practices. Large case firms demonstrated an advantage in building processes that enable OI. Also, these firms have the ability to launch new products faster than SMEs due to their advantageous financial status that allow for large investments in marketing and publicity. Apart from that, large firms normally have their own laboratories and can compete with multinational in category 2 products, a higher regulated category of cosmetics that SMEs have difficulties to produce.

The preliminary questionnaire applied in the phase I of data collection resulted in two 'more open' firms, four 'hybrid' and three 'more traditional' in the nine case firms. This suggested that all firms, more open, hybrid and more traditional carried out open practices to a certain degree. During phase 2 of the data collection, thirty three interviews were carried out among the nine case firms. Results corroborated to a certain degree with the preliminary questionnaire (phase I). The results reveal that more open firms were also more intensively practicing knowledge integration, and that a degree of proportionality is also present between the two categories, that is, openness and knowledge integration, with the exception of the firm BU, a hybrid firm, whose practices are much more traditional comparatively.

Finally, all firms demonstrated a considerably high level of intensity in knowledge integration practices. Knowledge acquired externally is normally 'ordered' by internal needs and strategic direction.

Implication for Management theories

This study contributed to the expansion of the two concepts chosen as the theoretical basis of this study, Open Innovation and Knowledge Integration, exploring the relationship between these two concepts. It can be summarized that, based on these findings, the theory of innovation management that focuses on open innovation and the theory that focuses on knowledge integration could be extended and further compared in future studies.

The analysis and interpretation of results confirmed the existence of a relationship between these concepts, and a variation of intensity of related practices that suggests some sort of direct proportionality between them. Also, more open firms demonstrated higher levels of intensity in knowledge integration practices. Knowledge acquired externally is normally 'ordered' by internal needs and strategic direction, and it is a practice that is present in every case firm.

Policy

Government policies are pushing economic growth by using sectoral strategies. Sustainability and environmental issues are amongst the most important ones in the cosmetics sector, and actions have been taken to minimize the impact that industries can cause. In spite of the efforts made by the Brazilian authorities, there is still a huge gap between economic development and educational development in the country. A huge technological gap has been seen in the study between large (medium) and small firms, corresponding to the categories of cosmetics 1 and 2. These differences also caused a 'knowledge gap' between these firms, because those working with high-tech materials or category 2 products also utilize high calibre workers that deal with higher complexity. Small firms, normally making category 1 products, tend to contract ad-hoc specialists in specific situations and occasions, and this can present difficulties in terms of competitiveness. As technology is not the only differentiator in this sector, small firms make use of niche marketing tools (i.e. organic products) that do not depend on high technology but still cause an impact to a certain group of consumers.

Brazil's socio-economic situation has arguably played an important role in the growth of cosmetics consumption in recent years, and it is to be considered and further observed in similar research.

Limitation of this Study

This research has focused on a cluster of the cosmetics industry in the southern part of Brazil. This has to be taken into consideration in order to avoid generalizations that might not reflect the true when research is to be done outside this region. The cosmetics sector has got particularities that are totally different to information technology and other high-tech sectors. For this reason, findings of this study should not be replicated in other similar industries that follow comparable regulations.

There have been important developments in the literature of KI such as studies on knowledge flows (Volberda, et al., 2010), focus on firm-internal knowledge (Koch, 2011), on tacit knowledge (Hong, Suh, & Koo, 2011) and on micro-dynamics (Strambach & Klement, 2012) amongst others. This indicates that future research in KI can benefit from more developed concept that probably offers more nuanced understanding for researchers.

Further Research

This study is the first attempt in comparing open innovation and knowledge integration concepts in the cosmetics industry, aiming to contribute with Resource (Rubenstein-Montano, et al.) Based View theories. Most research done previously was concentrated in high technology firms in other sectors mainly related to information technology or biotechnology. So, the differential created by this research can offer new possibilities for research in this area by showing characteristics of a medium-technology industry in a developing country.

Future studies could improve the understanding of inter-firm relationship in the sector and the consequences of this for innovation. The relationship between these concepts has been confirmed as interdependent and it is mediated by variables such as age, size, product category, distribution, orientation of integration (vertical versus horizontal) and technological base.

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