

Integrating Technology, Management and Marketing Innovation through Open Innovation Models

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Abstract: This paper explores, through a company case study, the importance of innovation for the competitive development of a company and how the adoption of an open innovation strategy could be effective to face typical barriers associated with the implementation of such processes. The case analysis shows the importance of the University-Industry relationship and the relevant role that the government plays in fomenting these relationships. Likewise, we point out the value of adopting an integral vision of the innovation process that not only considers its technological dimension (new product development), but also the elements associated to marketing and organizational change practices. The case studied herein exemplifies the systemic character of innovation and the relevance it has for companies, particularly for SME's, to open its innovation strategy and integrate themselves with other actors to leverage its cognitive and financial resources as well as to explore new routes to bring the best of its internal technological capacities.

Keywords: Open innovation, technology innovation, innovation in marketing, University-Industry-Government relationship

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Introduction

Innovation is a key factor for economic growth and for enhancing competitiveness in industry. This is why it is not strange that governments, especially in developed countries, have for decades intervened actively in the economy designing and implementing policies that focus on a more dynamic innovation environment. Nowadays, there is consensus on the fact that innovation is a determinant engine to improve economies based on fostering local and country-wide competitiveness.

In the case of Colombia, special interest in fomenting innovation began to enter the political agenda in the early 90's. This started with the government passing Law 29 for Science and Technology and later passing the CONPES policies (National Council of Socio-Economic Policy) 2739 (in 1994) and 2848 (in 1996). These gave the basis for what became known as the National System for Innovation. Within these actions, several instruments were designed to foment innovation in companies. Combine financial support came from direct programs (such as project co-financing, a type of soft credit line), indirect programs (such as fiscal incentives), and the strengthening of government agencies, industry associations, and Non-Government Organizations (NGO's) to improve the relationships among the different stakeholders in the system.

Despite all efforts during the last decades, the Colombian system of innovation is still weak and is not articulated (OCDE 2014). Indicators such as the national expenditure in R&D and key performance indicators, both scientific (publications) and technological (patents), show that the country is still lagging even compared to other countries in the region. Likewise, innovation indicators, derived from the

latest industrial and technological development surveys, prove that there is a very low company dynamism in this field. On average, only a third of the Colombian industrial network have introduced innovations to the market in the last years.

Companies constitute by far the core of any system of innovation. These are the stakeholders called to boost the economy through the development of new goods and services or the implementation of new/improved processes that increase revenue, generate new jobs, and contribute to a greater wellbeing. However, research shows that innovations processes do not develop in isolation. On the contrary, companies tend to interact not only with other companies but also with universities and research centers, with the objective of gaining knowledge and complimentary resources (Fleming, 2001; Helfat, 2006; Laursen y Salter, 2006). As a matter of fact, an approach that has gained attention in the last years and that has been considered by some researchers as the new paradigm in innovation management is the concept of open innovation (Chesbrough, 2003). This concept suggests that companies could and should use not only internal ideas but also the existing knowledge from its environment to develop their innovation processes. The relationship between companies with external stakeholders can turn into the most effective strategy to exploit the internal technological capabilities and develop new products and processes.

In addition to what has been previously exposed, the development of innovation activities is also determined by the existence of an adequate regulatory framework. This is especially true in matters of intellectual property and the start of financial support programs that help minimize the associated risks and costs. It is precisely within this context that the University-Company-Government triad gains

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value as the backbone to generate or drive public policy to promote innovation and to encourage an innovation-driven performance for organizations.

This article explores how the interaction between all the stakeholders previously mentioned (company, university, government) can effectively promote innovation processes and identify the strengths and limitations of some measures that are currently implemented in Colombia related to public intervention. This is accomplished herein through a case study analysis of Aloe Technology S.A.S. Likewise, we attempt to identify some obstacles that Colombian companies face when they take on the challenge of carrying out innovation processes. Finally, we also seek to identify strategic elements that serve as a reference on good practices for other companies with interest in innovation.

In the case study, we begin by looking at the company's initiation and then follow it until the present time. We look at how the company proceeds to systematize innovation activities and to develop an integrated strategy that includes not only technological innovations but also marketing innovations (OECD, 2005). We perform the analysis employing the open innovation approach, and we identify how the strategies that the organization implements comply with the principles highlighted by this paradigm. Throughout the analysis, we study the context and the conditions that favor the development of innovation processes from a more systemic approach, with particular attention to the role of government.

Aloe Technology market entry: The Odyssey of the entrepreneurial team

Entrepreneurship has gained importance in modern economies because of their potential to promote productive transformation processes and revitalize the economy of the territories. In fact, some authors have argued that the world's economy has undergone a transformation that goes from managerial capitalism to entrepreneurial capitalism (Audrestch et al, 2006; Baumol et al, 2007).

In recent years, several studies have analyzed the key factors behind the entrepreneurial activity and their impact on national development. In this field, the widest and broadest research is the Global Entrepreneurship Monitor (GEM), which has been ongoing since 1999 and in its latest version covered about 70 economies. An interesting aspect of this research is that it not only considers the entrepreneurial activity rate (EAR) of a territory, but also qualifies it according to the fundamental motivation that gives rise to entrepreneurship: a) a need for self-employment or b) recognition of an opportunity in the market. In relation to this classification, the results of the latest GEM report showed Colombia with an opportunity entrepreneurship rate of 26.7% compared with 18.1% entrepreneurship activity rate due to necessity (GEM 2013). While it is possible that the answers gathered from the survey contain some bias, one can also see the evidence of a positive behavior in the figures, highlighting a greater boom of ventures that identify market opportunities associated with the product they offer.

Aloe Technology proves the concept of this type of entrepreneurship. This company had its origin in the business vision of five members, three relatives and two outside investors, who had every intention of doing business. The characteristics of these investors include high levels of technical knowledge and experience in developing applied research processes in the industrial sector. One of them, a university professor with an engineering doctoral degree, made an exploratory research on business opportunities associated with the exploitation of natural resources in Colombia's Caribbean region. As a result of that analysis, he identified the existence of a crop that despite having an abundant supply in the region was being underutilized from the industrial point of view. This crop was the Aloe Vera leaf.

Aloe Vera (*Barbadensis* Miller in this case) is a plant with several cosmetic, nutritional, and medicinal properties. It is a stimulant of cell growth, anti-toxic, antimicrobial and it also has astringent, analgesic, and anti-coagulating properties. Today, Aloe Vera is used in various economic sectors and activities. These range from companies that produce raw materials for personal care, cosmetics, and medicinal products, to companies that produce food and beverages.

The initial exploration made by the entrepreneurs showed that there were more than 75 companies that used Aloe Vera as an ingredient to their products and were mainly importing the raw material since there was not enough supply in the country for this demand. This market study was the trigger that motivated the start-up of the company with an initial investment of over US \$300,000.

The entry of the company to the market was foreseen primarily as an extraction and first transformation towards the production of Aloe Vera gel as a raw material (in different concentration levels) for a B2B operational model. At the time, the company had the objective of fulfilling a market share need specializing in raw materials towards the food & beverages and cosmetics industries that used this component as an ingredient of their products.

The company started in 2009 but its manufacturing plant only started operations during the last quarter of 2011. Nevertheless, the optimism once held on the opportunity to gain market share rapidly shifted to a strong realistic scenario in which the demand for pure Aloe Vera gel with high quality grade was not even close to match the initial forecast. This was mainly due to the fact that many of the national companies that claimed the use of Aloe Vera as an ingredient for their products were in reality buying a lesser quality grade Aloe Vera gel. Moreover, this gel was already mixed with glycerin and/or propylene glycol to enhance the percentage of solids they sold in the product. For over 18 months, the company struggled trying to find a breakeven point that did not come. At the end, the entrepreneurs realized that offering a pure raw material for the national market was definitely not going to boost the company and they had to rethink the business.

In addition, the entrepreneurs did not foresee any need to adjust the initial budget and decided to use financial credit lines to fund the operation. This actually created more damage towards the development of the business due to the associated high upfront financial capital costs.

Innovation: Aloe Technology strategy to rethink itself and compete

With a huge burden ahead, the entrepreneurs understood that the road initially conceived for the business plan was not adequate. They then moved forward with a new process of market exploration to identify real growth opportunities by generating products with more aggregate value. The production of specialty beverages and cosmetics appeared as very promising areas for interesting development. Nevertheless, despite the growth perspective, these sectors also showed strong entry barriers due to the size of competitors and the scale economies these already had in effect.

The entrepreneurs also understood that they had to develop products with a different value to those offered by competitors to enter this market share. Taking advantage of their existing capacity and technology, they decided that the best option was to develop products with a greater content of Aloe Vera. The products were directed towards a more exigent consumer who valued the wonderful natural properties that Aloe Vera provide for medicinal and nutritional use. That is, they decided not to compete directly in markets already captured by current well positioned competitors but rather compete in a more reduced but more specialized market with a higher perceived value from the consumer standpoint.

This assumed, as any other innovation process, great financial and technological challenges for the company. These new products required large R&D expenditure in areas where the company had little to none of the required technical competencies. Likewise, the company was not financially healthy and had no availability to assume the necessary investments for both the product/process R&D phase and the CAPEX/OPEX for the plant enhancement to reach production stage.

The latter situation is not exceptional. On the contrary, this is a most-likely scenario to be faced by companies at the moment they start innovation activities, especially for SME's. For instance, according to the data derived from the National Innovation Survey applied in Colombia (EDIT VI), the greater odds found by companies to proceed with innovation activities are the lack of resources and the lack of qualified personnel¹. Tackling these barriers constitutes one of the reasons to justify the public intervention towards fomenting business innovation.

In the case of Colombia, the government has for some years implemented programs focused in giving support to the development of innovation activities. These programs have been designed with the goal of fighting the market imperfections (associated to the access to CAPEX), as well as those named System failures (associated to the interaction among stakeholders).

A traditional scheme now in place is the use of co-financing instruments through which companies are granted non-refundable financial resources for R&D and innovation activities, privileging the interaction of these agents with universities and research centers. These types of programs have been traditionally coordinated by Colciencias as the responsible government agency for policy making and the articulation of the National Science, Technology and Innovation System.

One of the company founders, being a university professor and a researcher with the knowledge of the aforementioned instruments, proposed his partners to explore the possibility of applying for these funding opportunities. They therefore approached the academic sector and formulated an R&D project which was then submitted to a call for grant proposals coordinated by Colciencias and that focused on the consolidation of new technology-based business ideas. They obtained funds approved for about US\$140,000.

The support obtained through the public program yielded not only the financial resources needed to face the R&D challenges related to the development of new products, but it also induced a better relationship between the company and the partnering university. This second aspect was fundamental because it allowed the company to undertake activities otherwise impossible to deal with or out of scope for the company. As a result of this project, Aloe Technology developed, at the prototype stage, products to enter into the functional cosmetics market: hydrating lotions in both foam and liquid spray forms.

This perfectly exemplifies one of the open innovation modes proposed by Chesbrough & Bogers (2014) associated to the use and exploitation of external sources of knowledge. Aloe Technology started at that moment a new phase in its business development process. The company positioned innovation as the most strategic asset and developed it with external actors, primarily with academic institutions, as part of its fundamental strategy. The moment they decided to enter markets with more aggregate value products, the company realized the importance of R&D as the basis for their innovation processes and also the importance of opening doors to cooperate with external scientific agents in order to gain new and improved competencies and resources that allowed them to strengthen and leverage their internal capabilities.

University-Industry collaboration has been recognized for decades as an important strategy for business innovation and regional economic development (Etzkowitz, 2003; Laursen & Salter, 2004). In the case of Colombia and especially for technology-based companies such as Aloe Technology, this type of interaction becomes fundamental if we take into account that the R&D capacity resides primarily in academia. While in the USA more than 80% of the researchers work in industry, Colombian universities concentrate more than 90% of re-

(1) 66% of innovative or potentially innovative companies attribute a medium-to-large importance to the lack of resources while 51% recognize lack of qualified personnel as an important obstacle.

searchers. For a technology-based SME to open its innovation strategy so as to integrate the academic sector becomes a key factor to acquire the knowledge it needs for its innovation processes. If, in addition, the government facilitates this interaction, the risk associated with these activities is then reduced therefore generating very strong synergies.

From product design to the market: the challenge of consolidating an integral innovation strategy

As a result of the University-Industry cooperation project, Aloe Technology designed two products with large percentage of Aloe Vera gel to enter the cosmetics market. The new challenge that the company faced was to move from the design phase towards industrial production and commercialization. This demanded again relevant financial resources besides the development of marketing competencies that the company did not have at the time.

The manufacturing facility was originally designed solely for gel extraction, but not for the manufacturing of cosmetics. To build with state-of-the-art technology for this purpose presumed a considerable capital investment which entrepreneurs were averse to assume independently. The solution was to joint venture in a strategic partnership with a well-established cosmetics laboratory with demonstrated experience in new product introduction. In such a way, the company opened its innovation strategy not only to the acquisition of knowledge but also to cooperate with other companies to manufacture the product. Aloe Technology faced both basic dimensions identified by Chesbrough in its open innovation paradigm: the use of external funding and the exploration of new routes to exploit the internal technology capacity and get to the market (Chesbrough, 2003). These are the two strategies that Dahlander and Gahn (2010) named "inbound" and "outbound" innovation strategies.

Besides manufacturing, Aloe Technology had to face another challenge. The initial business model was conceived to be a raw material supplier for companies where Aloe Vera is a component of their product formulation. Therefore, initial customers were other companies where the relationship was based mainly in quality aspects and price. The company never had to constitute a trademark or aggressive consumer marketing campaigns since its end customer was industrial and communications in this case has to be adjusted to B2B commercial trade norms.

The incursion in the cosmetics markets implied the development of commercialization strategies different to those mentioned before. For Aloe Technology, as with many other manufacturing companies, the development of new products is the basis for resilience and innovation is the means to achieve it. However, consolidating as an innovative company involves much more than the development of the technical skills associated with product design. Innovation is important in complementary areas (e.g. processes, marketing) and, in particular, to set forth the management skills for the effective integration of all these aspects in the overall strategy of the company (Tidd and Bessant, 2005). In today's competitive environment, product innovations

are relatively easy to imitate and grant an advantage only in the short term. The long term success of the company in depends on its ability to manage and develop innovations in a systematic way, addressing different components of its business model (product, process, marketing and organization) to respond quickly to customer needs. This ability is much more difficult to imitate by competitors and grants therefore a more durable competitive advantage (Hamel, 2007; Skarzynski, & Gibson, 2008).

The aforementioned aspects were recognized promptly by the company and, building on previous experience, it participated again in a call for grant proposals oriented towards business strengthening. The company submitted a new project of collaborative activities aimed at strengthening the innovation capabilities of the company. In this case, the company paid particular attention to developing marketing innovations that would allow consolidating the new products on the market.

As part of this new Project, the company set up a team that worked together with experts from the partnering university in the area of marketing and innovation management.

From the marketing point of view, the initial problem was the type of product to be offered and the type of market to be reached. The choice was made taking into account the following phases: a) preparation of the strategy (Segmentation, Target Market and Positioning); b) developing the desired product mix, associated with the strengths and opportunities encountered, and c) the development of prototypes to be tested in the target customer segment. These phases came from a structured market research process (Lambin, 2009), which is based on the implementation of product as a result of the elements of value that the consumer perceives (Saura & González 2008). In the first phase, we used secondary sources to verify the markets of high growth potential and to find related products. Likewise we conducted in-depth interviews where we found the type of mental representations of selected products in selected markets. Subsequently, we checked the functional and emotional brand attributes of products (Keller, 2008) and found the core values to identify key market entry points. Finally, Aloe Technology designed prototype products, which were tested in the target consumer market to make final adjustments before sending them to the market.

As a result of the previous marketing exercise, the company identified that the majority of cosmetic products on the market had low concentrations of Aloe Vera and that this factor, recognized by consumers as a relevant concern, could be exploited more intensively. They made two prototype products and performed market tests. For this, the Company chose a customer sample from the market segment under study, whom were given the product to use it so as to receive feedback from them.

Customer reviews allowed the company to make some modifications in both product attributes (aroma) and its presentation (package). Customers associated initial versions of the package with an affordable product that was not associated with the final price and also did

not communicate efficiently about the product advantages over the competition. In fact, during the market test no client mentioned that the product had 60% of aloe as a unique attribute. This is because this aspect was not reflected in neither the product container nor the package - a clear consequence of marketing myopia (Levitt 1960). This allowed us to establish an efficient route correcting some common mistakes made by organizations with a marketing philosophy of product orientation (Lamb et al 2013).

With respect to innovative components, Aloe Technology with the support of the university consultant group carried out the design and implementation of their Innovation Management System. They started from the reformulation of its organizational policy and moved onto the design of the tools needed to manage the different phases of the innovation process. While the company learned the importance of innovation and, as mentioned made significant efforts in this field, the fact is that the development of these activities was not due to a systematic process, but rather the interest and dedication of some of the entrepreneurs. Generating ideas for new products was, until then, based on the vision of the founders. However, it was not a process communicated with the rest of the operational areas of the company. Similarly, there was no clear strategy to stimulate and exploit the creative potential of employees and make an assessment of the ideas with the greatest market potential. Leveraging the accompaniment of academic cooperation, the company began a process of inner transformation that addressed among others the following:

1. The design of a policy and innovation objectives aligned with the business strategy of the company.
2. Creating an organizational structure to support innovation activities of the company both for implementing innovation projects and for management of the system.
3. Designing a system for the provision and distribution of resources for innovation
4. Identification of tools relevant to the development of innovation activities in the business innovation process. This includes the definition of tools to support processes: a) generation, evaluation and selection of ideas, b) managing innovation projects; c) valuation and protection of innovation results.
5. Definition of assessment methods, monitoring, and improving the innovation system.

As a result of this second project of collaborative activities, Aloe Technology identified new channels and strategies to get their product to the end customer. They also developed a system to holistically manage their innovation processes. They considered the technological dimensions, the dimensions of the market, and organizational challenges (OECD, 2005). This system is based on the open innovation paradigm, and it recognizes the need to coordinate with external actors in order to acquire knowledge and complementary skills. It also involves collaboration with other stakeholders to exploit market opportunities. This is relevant since many of the success stories of innovation in Colombia are related to specific product needs and do not obey structured and planned processes (Malaver & Vargas, 2004).

Conclusions

Open innovation has become a relevant concept for the analysis of business innovation processes. Its importance is, if anything, much greater in the context of emerging countries where companies have few internal capabilities and can hardly advance innovation activities without resorting to collaborating with external agents. In this sense, the analysis of experiences that exemplify the adoption of this strategy and identify key success factors is an aspect of interest from not only an academic point of view but also in the field of business management.

This article examines, through the study of a particular business case, how an organization can reinvent itself and compete by integrating innovation into their business strategy. The analysis highlights the importance for businesses, particularly for small and newly established, to interact with knowledge networks available in their environment in order to access complementary resources and capabilities to develop new products or processes. In the Colombian context, and generally in the context of Latin American countries, universities are key actors in these knowledge networks, and they concentrate most of the R&D capabilities in the region.

University-Industry cooperation becomes therefore a relevant strategy for innovation and its promotion should be a priority line of action in the framework of public policies on science, technology and innovation. The state (government), as discussed in the case study, plays an important role in the revitalization of any system of innovation, designing and implementing instruments to correct market failures and system failures faced by enterprises. A well-designed public instrument not only promotes access of SMEs to financial resources they need to develop innovation activities, but it can also encourage collaboration between different systems' stakeholders.

The Aloe Technology case has also shown the importance of taking a holistic view of innovation processes, combining the development of products and processes to design new marketing channels, new marketing strategies, and even drive changes in the organizational structure. Innovation covers the various functional areas of the company and not always depend on technological developments. In fact, the ability to have an organization that develops complementary innovations to the development of new products is a key to achieve sustainable long-term advantage and to capture the benefits derived from their innovation efforts.

In this sense, the commissioning of public programs to promote technological innovations (new products or processes) is not only relevant but it also strengthens the organization's abilities to systemically manage their innovation processes.

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