An Initiative to Implement Open Innovation in R&D Department of a Chinese Multinational Company Located in Brazil

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Abstract—Open innovation has become synonymous of innovation strategy, ideas and knowledge flow that occur inside and outside the company through various interactions with suppliers, customers, universities and industries. It is a transition from closed innovation, focused exclusively on internal development and protection of intellectual property, to open innovation, where companies expand their initiatives, interacting with external partners, leveraging the knowledge spread and reducing innovation cycle. The goal of this paper is to make an analysis of open innovation adopted in R&D department of a Chinese multinational company located in Brazil, using data from a survey based on observations, analysis of reports and an unstructured interview with R&D Director of the company.

Index Terms—innovation, open innovation, innovation strategies, exploration, exploitation

I. INTRODUCTION

Companies are devoting time and money to create strategies and procedures to generate innovation with the goal of becoming more competitive and manage to survive in an increasingly globalized and demanding market. The main focus, until recently, was on building a center of internal research and development (R&D) able to create ideas and develop them until they get a product ready to be sold to consumers. To do so, the organizations made large investments, searched the best and brightest talents, hired them and overused the laws of intellectual property laws to protect their inventions [1]. The motto "developed at home" was a source of pride for companies that achieved their goals with a lot of effort, launching innovations to the market with exclusivity, reinvesting part of their profits in new R&D and creating a virtuous cycle of innovation. Reference [1] calls this form of innovation as closed innovation model.

The model of closed innovation was adopted by several companies for decades, however it began to lose strength, mainly due to the increasing number of knowledge workers and the difficulty of the companies in controlling their technical capabilities and proprietary ideas and increasing of private venture capital in new private companies aiming commercialization of the out coming ideas [1].

Manuscript received Aug 10, 2014; revised October 21, 2014.

Reference [2] also cites other factors for the necessity of searching for another model of innovation considering the shorter and shorter innovation cycle: the escalation of development costs for the research done in industries and the scarcity of resources, making organizations begin to also look outside their internal R&D in search of opportunities, partnerships and new ways of trading their technologies.

Thus, the flow of knowledge and innovation became more intense and the closed walls of the companies become more permeable, opening new paths to reach the market. This new model is called open innovation model [1].

Reference [3] says that useful and necessary knowledge is widespread and that even the best and most well prepared research and development center should be able to identify, connect to and leverage it in external sources as a key process to reach innovation. The ideas that emerged only in large organizations are now scattered in a variety of scenarios ranging from individual inventor or a startup high technology, to a research laboratory of an academic institution.

The goal of this paper is to analyze an initiative of the R&D department of a Chinese multinational company located in Brazil to implement the concepts of open innovation as a way to encourage new innovation strategies within the group organizations. A survey was performed to analyze the activities accomplished in Brazil from the perspective of open innovation, placing the strategy currently adopted in the department, whose maturity was compared to other companies' initiatives and propose new procedures to be considered for strengthening the model.

II. OPEN INNOVATION BACKGROUND

Open innovation is not restricted to the ideas generated internally, it uses those arising outside the firm as well, the firm can and shall find internal and external paths to develop their technologies. It is a system or architecture that combines internal and external ideas, creating value and enabling the organization to get hold of part of it. It is a model that encourages the company to use the technologies developed internally to take them to the market through external channels and not necessarily be the company's main business, but it will add additional value somehow [1]-[3]. In other words, in this new model the company opens the possibility of the external world to contribute for the development of its technologies through partnerships and alliances, including, but not limited to, universities, research institutes and even competitors, as well as encourages these developed technologies to be combined with others, opening room for new kinds of profitable businesses for the company [4].

Fig. 1 shows the representation of the closed innovation model, projects and researches are developed within the company and products have only one way to get to the market that it is through the company itself.



Figure 1. Representation of closed innovation model of Chesbrough 2003

In the open innovation model, projects and research are conducted inside and outside the company, making the flow of knowledge more intense, and leveraging new opportunities to put the products and technologies in the market. Actually, new markets can be created with this new strategy as shown in Fig. 2.



Figure 2. Representation of the open innovation model of Chesbrough 2003

Considering that open innovation leverages the ideas generated internal and external, Ref. [2] identifies three possible processes for implementation. The first is the "outside-in" where a greater integration of the company with its suppliers, customers and other potential origins occurs to create a flow of knowledge that strengthens the development of innovations for the company, it is more widely used in industries with low technological capacity and is associated with use of license and purchase of external patents, just to add value to the business. In this case, the industry creates ways to bring innovations from other companies to improve their performance and competitiveness.

The process "inside out", on the other hand, takes the company's technologies to the market through the sale of intellectual property and multiplies or diversifies the technologies in the market by combining the company's technologies with other technologies found in the external environment. This process is more widely used by technological industries that license their technologies or sell their intellectual property as a means to generate new revenues and interactions with other technology companies.

The coupled process is a combination of the two processes and works to build alliances through complementary partnerships, working in cooperation with other companies through the strategy of networks for the development of technological projects as shown in Fig. 3.



Figure 3. Three processes of open innovation of Gassmann 2004

As can be seen in Fig. 3 the use of this new model of open innovation is quite comprehensive and allows one to define a series of activities or procedures to be adopted to increase the company's ability to make innovation, the use of one or another way will depend on the strategy to be adopted and the inherent characteristics of the company that will need to adapt its culture to fit the new scenario. A company that has always worked in the development of its products internally and has as standard procedure to protect its intellectual property using the legal framework of patents or trade secrets, need to make adjustments in its culture to enable the internally generated knowledge to be exchanged with the outside world and vice versa.

Reference [5], in his study of the innovation model of Procter & Gamble, highlights the importance of promoting a new internal culture of sharing ideas, makes connections and seeks external partners who are working on solutions for problems found internally. According to his account, at the beginning of the strategy change, employees felt uncomfortable, believed that the initiative would eliminate the jobs or that the company would lose expertise. Another fact also related to the culture that causes barrier to the use of open innovation is the "not invented here" syndrome, engineers and researchers create negative attitudes towards acquisition and sharing of external knowledge, creating the necessity to define management training to avoid this kind of attitude [6]-[7].

One way to evaluate the process of transforming the paradigm of closed to open innovation inside a company is through the concepts of exploration and exploitation from a context of innovation networks. The goal is to learn how much the company makes use of one and/or other technique [8]. Exploration of new ideas and opportunities can be summarized as research, variation, risk taking, experimentation and discovery. There is no strong relationship between the parties involved. They work in researching new technologies and capabilities, but do not have a long partnership term, seek opportunities without a big commitment, so networks are formed to find technological trends and feed the database of knowledge, with less certainty of results and far away from the main focus of the company. In contrast, the exploitation is associated with refinement, production, efficiency, implementation and execution, there is a longterm partnership and greater involvement of the parties. They work on product development, spreading existing technologies and developed by the participants of the network companies. Both forms are important for the company which wants to become more open, however, because of limited resources, many adopt either [9].

Reference [10] presents a study with 176 Taiwanese high-tech companies to find out the relationship between open innovation and the performance of firms considering two perspectives, one outside in, based on the acquisition of external technology to complement the businesses, and the other inside out, based on the commercialization or transfer of technological knowledge to outside company with the purpose of obtaining monetary and non-monetary benefits. The study comes to conclusions among which the importance of having a team of internal research and development to mediate the acquisition of external technologies and the performance of the company, in other words, to integrate external technologies and make better use of open innovation. It is important for the company to have a group of internal R&D to be able to technically manage the flow of knowledge from outside to inside the company.

Studies in several technology companies show some tendencies of procedures and activities to be undertaken for the implementation of an open innovation strategy. One of the attitudes is related to the investment on research and development. IBM, for example, has been investing around 5-6% of revenues on R&D since 1996, which brought it a considerable return in number of patents in the United States. Although this may be seen initially as a closed model, it has been proved to be an open model "inside out", IBM patents help in the search for new businesses and give to the company the strength to try new ways to the market to its technologies, ensuring even greater bargain in negotiating partnerships with other technology companies [2].

Investing on getting closer to the main customers of the company to conduct tests in product and conceptual technologies has proved a good strategy, because it allows collecting information directly from those who will use the products available in the market, which is an opportunity to make the necessary changes for improvement, ensuring that there will be effective use of the new product offered for sale.

Keeping good relationships with universities and other industries ensures the company to track the current technical development and the exchange of experience in technological development. Following this approach, companies seek to include their researchers in their initiatives of open source development, where communities are created to solve certain problems or develop software that could be useful for several companies. In this environment there are various contacts and this can be a potential source of innovative ideas.

Another initiative is to establish an agenda of workshops for innovations, inviting the scientific community, partners, suppliers and customers to help in the research done within the company. It tends to be advantageous for several reasons, including the creation of a network with a certain degree of commitment with issues researched by industry, making it possible to collect a number of valuable suggestions to feed the cycle of open innovation.

Having the borders of the company opened, not only observing the technological movements, but also keeping in touch with several other companies allows, for example, to add value to the company's competence through partnerships with small technology firms called startups or even purchase some of those companies as a means to increase its portfolio of technologies, something very common and practiced by companies like Google and Facebook.

III. METHOD

Literature review and collection of data from the research and development department of a Chinese multinational company located in Brazil were used. The evidences used were: observation of the activities that are daily performed; analysis of report about the projects done since 2008; unstructured interview with the director responsible for R&D department. From the review of the theoretical framework about open innovation, best practices exercised by companies that already make use of this model stood out and there was a correlation with what has been practiced in the target firm. Eventually it was possible to highlight the current situation and design activities and procedures for the future with the goal of strengthening the strategic open innovation model used by the R&D department of the company object of study.

IV. ANALYSIS AND DISCUSSION

When setting up the research and development department in Brazil in 2008, the company already had two other R&D Centers around the world, one located in Xiamen, China and the other in Taipei, Taiwan. It was a time of transition from analogical TV to digital TV in Brazil. The Brazilian system of digital television Board had already made public the technical standards by the Brazilian Association of Technical Standards (ABNT), but there was not a product capable of treating both analogue and digital television on a single hardware and software platform.

The multinational company object of this study, although consolidated with the sale of monitors, was still new in the television market and had no internal expertise to develop a complete platform of televisions for the Brazilian market. Thus, the department of R&D to be created in Brazil was strategic as it needed to develop local technologies that had the potential to become regional, with the expansion of the Brazilian system of digital television for Latin America, and even global, with the use of locally developed technologies that could be used by the headquarter and other subsidiaries of the group.

The project of creation of the R&D department was started with the hiring of a director expert in digital television with experience in research and development of innovative projects. To make things worse, the company did not have any experience with the Brazilian Digital Television System (SBTVD) and practice of making technological development projects, focusing its business on production procedure and quality manufacturing. Hiring an expert director was an attempt to fill those gaps.

The director was hired and had the initial task of creating an internal team with high technical skills that could be able to initiate the development of an analogical and digital television platform for the Brazilian market.

The subsidiary in Brazil could use as funding research and development, government incentives, created from a law of information technology which exempts some production companies of information technology goods from taxes and allows the value of taxes to be invested on the development of technological projects.

The aim was to forming an internal team, with the choice of a provider of a chip, to develop a hardware and software for Brazilian System of Digital Television. However, besides the limitation of development time, there was a scarcity of financial and human resources, because the investments would be high and the funds provided by IT law were not able to meet all needs. Furthermore, the knowledge in the company was dispersed and it would be difficult to have necessary experts internally, it would be needed to hire professional knowledge outside the company.

Clearly the goal of the company was working on a traditional closed model, where internal researchers and engineers were responsible for implementing the whole system and thus protecting the company's intellectual property, something very characteristic of Chinese companies, considering their level of maturity to innovation, where being innovative technologically is something that should be treated internally, consisting of a strategic perspective of strengthening its internal resources and internal skills [11].

Considering the difficulties inherent to the project and the importance of having intense flow of knowledge, the director of R&D department decided to follow a more open innovation strategy, seeking partnerships with universities, research institutes and other global industries, something new and still viewed with suspicion by the multinational company.

The R&D department was created with the mission of transforming knowledge into products, processes and services with high added value with creativity, agility and commitment in order to ensure the best technological solutions to the market, suitable to the demands and needs of the Brazilian market. And as vision, the department aimed to become worldwide known in innovation technology in segment of information technology and multimedia. There were local demands and this was a gap to be filled by the department, but Brazil R&D also had expectations and plans to expand its research globally, believing it could help the company in the transition from closed to open innovation process.

As Brazil R&D Center did not have technologies to exchange with the outside world, the process adopted was the "outside-in" [2], instead of negotiating the use of technologies developed internally, the company started to seek partnerships to create a large flow of knowledge from outside to inside the institution and allow the development of projects quickly and with a smaller cycle than usual, typical of the industries that have restricted technologies and try to add value by using experts and technologies coming from universities, research institutes and other industries.

One of the major challenges highlighted by the director in Brazil to follow this line was the cultural barrier as cited by [5], mainly the fact of having other institutions outside the company working on strategic projects. Partnership contracts, as well as the work plans submitted by universities and research institutes have brought up so many questions to be approved by headquarter, because there was not an understanding that this was the best way to manage the technological projects from the firm. A good practice, reported during interviews with the director of the area, was to bring key stakeholders of headquarter to get to know the chosen partners and the potential they had, it seems to have been essential to achieve the necessary confidence to move forward. These visits have become current and happening at least once a year and aimed to visit local technology partners and monitor the development of the projects. It was an innovation in the organizational process with the implementation of a new way to ensure that the work could be done, implement changes to make things happen [11].

According to the director of the area, the first project to develop a hardware and software platform to the Brazilian digital TV system was only possible because of partnerships with research institutes and universities and the paradigm shift adopted by the company so far. The formation of a network development was possible, in a short period of time. Several specialists were hired internally and others were coming from universities and research institutes that were partners. Partnerships brought accumulated experience and aggregated existing technologies, making the times of the projects significantly reduced and the resulting products stay within the expectations of the company and the market.

According to [9]-[8], it was observed that the department seldom uses exploration techniques to foster and research future technologies, making intense use of exploitation, consolidating long-term partnerships for the development of products demanded by the Brazilian market. The consequence of the choice of open innovation strategy is that there was a breakthrough in product development from existing and stabilized technologies in the market and a consolidation of

partnerships with research institutes, Brazilian universities and suppliers of global platform. However, it is not possible to realize initiatives for research and development of disruptive innovations able to leverage other types of models such as the "inside out" with getting royalties from the sale and licensing of technologies and patents, for example.

All projects developed in Brazil rely on external partnerships allowing indeed a smaller development cycle to get to the product in the domestic and regional market. The reports obtained with the director show that the flow of technical knowledge and project management have worked very well and some projects even have more than eight different partners around the world, demonstrating the managerial and technical complexity. Among the participating countries can be highlighted Brazil itself, the United States, China and Taiwan.

At the end of each year meetings with local partners are held to define a list of possible projects to be developed in the next year, the list is taken to the headquarter which actively participates in the discussion and qualification of projects to be developed. However, it is not possible to observe greater integration with customers, marketing area and other external partners. As demonstrated by the case presented by [2], the participation of suppliers and customers, and other industries can considerably strengthen the results in the definition of projects, given the possibility of a greater exchange of knowledge and ideas. Workshops could be conducted with scientific community, consolidated partners and other potential partners to discuss the problems and lines of research adopted by the company.

Reference [1] mentions that one of the reasons for the model of open innovation to have appeared was the fact of private venture capital having emerged to be applied in small companies of technologies arising from good ideas, which today is still more intense, even having internet sites specialized in raising funds for projects registered in them. This is undoubtedly a great choice to strengthen the model of exploration of technologies that can add value to businesses, precisely because the small companies or startups have a leaner management structure. Thus it is possible for them to see more disruptive innovations. The department of R&D in Brazil could exploit the workshops, making the mechanisms of approach with startups, encouraging innovative ideas and technologies for their products, opportunities to license patent or even buy those startups.

In informal conversations with some employees and the director of the Brazil R&D department, it was possible to note the need to create an entrepreneurial culture and risk acceptance, because it is necessary to leverage the current stage of the innovation department model, focuses on the development of more stable projects targeted for existing products.

It was clear in the interview that the department tries to divide its projects into two major groups: product development, using established technologies, with a shorter development cycle and tied to production; and the development of technologies with a longer development time, exploring new subjects and technologies. Most projects are related to stable technologies, which ultimately inhibit disruptive innovation initiatives by its engineers and researchers.

Finally, it was evident in the interview that the department of R&D is going towards the use of the methodology of open innovation "inside out", dealing even with competitors to license developed technologies using innovation network and exploitation technique, demonstrating greater maturity and fluency in procedures for open innovation, motivating the company to become more competitive by adding value to their clients. All procedures observed also show that the department has gotten the respect of other R&D centers of the company and is trying to negotiate the use of technologies developed locally in the global context.

V. RESULTS

Since Chesbrough launched the term and explained what the open innovation model was, many studies have been done to analyze, diagnose and evaluate companies that use the inherent characteristics of the operating mode of open innovation. Research shows that, in general, companies increase in efficiency and performance when they open their doors, inviting other companies, research institutes, universities, independent inventors, suppliers and customers to work together in research and development of new products, new services and new organizational processes [7], [10], [12].

This paper analyzes the initiative of a research and development department of a Chinese multinational company located in Brazil in implementing a form of management and culture of open innovation. Guided by the formation of a internal team of R&D, which is responsible for making moderation, interaction and knowledge transfer from outside to inside the firm, developing projects in partnership with companies, research institutions, regulatory agencies and university, it was possible for the multinational group to consolidate itself in the television market in Brazil and Latin America.

From the analysis of technical reports provided by the company it was possible to verify that the department of R&D, since its creation in 2008, had significant involvement in the development of open management model, having over 15 different partnerships with the outside, at least 6 (six) of them well consolidated and continue today, including a very close relationship with two other worldwide R&D Center of the group, Taipei and Xiamen, which always request support to Brazil for the development of technological projects. Over 100 technology projects were developed, highlighting the full implementation of the specifications of middleware of the Brazilian digital television system that has been integrated and ported to over 10 different platforms. The R&D department had direct participation, only in the year 2014, in more than 48 products that are in the market or are about to reach the hands of the end consumer. Brands of the group also had a considerable growth in the television market, according to background information obtained internally and can be accessed at sites of statistics. The company is among the 10 largest television producers in the world and among the 5 largest television producers in Brazil.

VI. CONCLUSION

The result achieved by the R&D department of the company object of study shows that open innovation is indeed a practicable way to reduce the time of research and development and innovation cycle through the search and adding value with knowledge, technology and external experts. The research also confirmed that having an internal R&D is important to assist in the flow of information and technology transfer from the external world into the company. It is easier and there is more significant improvement in performance and efficiency of company when it acquires external technology and that there is a difficulty to follow the reverse path, to commercialize and/or to transfer technologies to outside the firm [10].

It can be seen that the practices assumed by the department are consistent with the concepts of open innovation, but there is room to further strengthen the model adopted. From the interview with the director of the department in Brazil, it was clear that the initiative motivated the firm to migrate from a mode focused on production to use their engineers and partners to develop technologies that add even more value to the company's products.

The department could increase its network of partnerships, through more intensive contact with their lead customers, with the marketing team and with potential partners around the world. This would further increase the flow of knowledge, improving the return on quality of ideas generated and research done by the group, bringing as a consequence a cycle of innovation to be even more virtuous.

A suggestion of continuity of this work would be to extend the interview, but now in a semi-structured form, for internal and external collaborators of the network in order to understand how they feel about the model currently adopted and what improvements could be done to achieve a better result.

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