Available online at www.sciencedirect.com

ScienceDirect

IFAC Papers Online CONFERENCE PAPER ARCHIVE

IFAC-PapersOnLine 48-3 (2015) 014–020

Strengthening of Open Innovation Model: using startups and technology parks

Rômulo de S. Fabrício, Jr.*. Fábio R. da Silva. Eliane Simões***. Napoleão V. Galegale****. Getúlio Kazue Akabane*******

** Centro Estadual de Educação Tecnológica Paula Souza. São Paulo, Brazil. (e-mail: romulo.fabricio@cpspos.sp.gov.br).*
*** Centro Estadual de Educação Tecnológica Paula Souza. São Paulo, Brazil. (e-mail: fabio@ifuture.com.br).*
**** Centro Estadual de Educação Tecnológica Paula Souza. São Paulo, Brazil. (e-mail: eliane@iqeduc.com.br).*
***** Centro Estadual de Educação Tecnológica Paula Souza. São Paulo, Brazil. (e-mail: nvg@galegale.com.br).*
****** Centro Estadual de Educação Tecnológica Paula Souza. São Paulo, Brazil. (e-mail: getulio@akabane.adm.br).*

Abstract: The R&D center of a Chinese multinational subsidized in Brazil has been making open innovation a synonym for its strategy based on partnerships with other companies, universities, and research institutes in Brazil. Still thinking how to strengthen its open innovation model the company seeks for new forms of partnerships to create an ecosystem for generating disruptive innovation. The R&D center can be a bridge to attract startups companies and develop a business model that can generate disruptive innovations for the multinational products. This paper studies how this open innovation strategy can benefit from a partnership with startup.

Keywords: open innovation, startup, disruptive innovation, product strategy, productivity, production systems, innovation.

1. INTRODUCTION

The R&D center of a Chinese multinational located in Brazil was created in 2008 in order to support research and the development of regional projects and thus increase the company's competitiveness and innovation. Its mission is to transform knowledge into high value-added products, processes and services, using creativity, flexibility and commitment to ensure the best technological solutions to the market and, consequently, make the R&D department in Brazil to become known worldwide in providing technological innovations following the information technology and multimedia.

The beginning was quite challenging for several reasons, among them: the fact that Brazil was launching a new digital television system with new standards to be implemented; The company did not have enough knowledge to work on complex projects (nor expertise needed to carry out the development); Lacks the confidence of the company´s headquarter on the viability of putting together a group of R&D in such a short time to achieve the proposed objectives and meet the competitive market of consumer electronics..

The company was already well established in the sale of monitors and sought space for their new television products, especially in the potential market in Brazil that was migrating to digital television. Its first step was to hire a Brazilian director, who understood the business, to set up an internal team to begin the development of project-based television in the Brazilian Digital Television System specifications.

The strategy adopted by this director was based on open innovation. The idea was to break the paradigm that prevailed in the thinking of the company. In other words, the goal was to assemble a team capable of full "in house" development and protect the intellectual property generated by discussing internally with other departments to bring the product to market - concept of closed innovation (Chesbrough, 2003).

However, the responsible for making the R&D happens, based on his professional experience, decided to pursue a different path, something that would bring more agility and a more constant flow of knowledge to the company, allowing a faster product development and access to different markets for the products developed using the concept of open innovation.

Chesbrough et al. (2006) says that the useful and necessary knowledge is very widespread and even the best and most well prepared R&D centers should be able to identify, connect and leverage this knowledge from external sources as a key process to reach innovation. Following this line of reasoning, the center of R&D decided to look outside the company and follow this strategy until then new to the company (Fig. 1).

10.1016/j.ifacol.2015.06.051

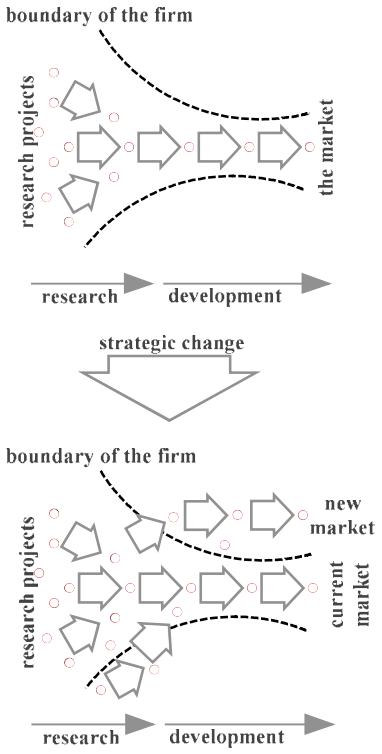

Fig. 1. Transition from closed to open innovation.

The R&D center has defined a series of activities to strengthen its team and develop diverse and challenging research projects. Some partnerships were made with research institutes, universities and other companies, thus adding knowledge and technologies that did not exist so far. A new way of working was adopted to accommodate this difference in strategy, including infrastructure development and project management. Something crucial in this process was the proximity of interested headquarters' stakeholders to the projects and partners in Brazil and then they could understand this new form of work and become more confident to move on.

The R&D center has developed several projects following this strategy and achieved great results and won the company´s headquarters and company´s global R&D trust. However, according to the management and board of the R&D center in Brazil, it is necessary to advance in this model and make it even more collaborative and capable to generate disruptive innovations. This strategy can add even more value to the products and also bring more competitiveness and innovation to the company´s business by developing technologies that are used not only regionally, but also globally.

The objective of this paper is to analyze the current state of implementation of open innovation developed by this Chinese multinational in Brazil and understand how it can benefit from the flexibility and dynamism inherent in startups and what initiatives are being taken by the company in this regard. It is, therefore, a case study, combining interview with the direction of the center of R&D in Brazil, business environment observation and literature review in search of strategies adopted by other companies or national innovation systems around the world.

2. OPEN INNOVATION

According to Chesbrough (2003), open innovation can be defined as the intentional use of inputs and outputs of knowledge to accelerate internal innovation and expand market possibilities for use of these innovations. It is based on some important principles such as:

- Not all needs can be addressed within the company and it is important to seek knowledge and people outside the company;
- Rely on external R&D centers and use the internal R&D to make the management and development together, taking account of the part and not the whole;
- It is not necessary to rely only on the internally originated research to profit from it;
- Build a good business model is often better than to be the first to reach the market;
- If the company uses the very best of the internal and external, is very likely to succeed.

These principles were created by Chesbrough (2003) to compare the usually practiced with the more collaborative visions and initiatives. Most competitive companies are no longer proud to say that a particular technology was "developed in house", because the results of this open environment tend to be better (Burcharth, 2014).

The management of innovation is prone to the use of third parties to achieve greater agility and flexibility, forcing companies to reconsider their strategies and processes. By becoming a network of organizations, the mentality of "do-it-yourself" has become outdated (Gassmann, 2006). For Tung et al. (2013), no organization or institution has reached a leading position in the development of technology by accumulating all the knowledge in isolation, but achieved this through a mutual collaboration environment and rapid spread and transmission of knowledge.

According Huizingh (2011), open innovation is a kind of umbrella covering, connecting and integrating a range of activities that actually existed. This made academics and practitioners to rethink the design of innovation strategies in a connected world.

Learn how to implement open innovation is an important step and Gassmann and Enkel (2004) identify three ways to put into practice the process. The first process, called "outside-in", happens when there is a greater integration of the company with its suppliers, customers, partners and other sources to facilitate the creation and flow of knowledge.

This process is widely used by companies with low technological capacity and they join other companies to license patents, obtain technologies and thus add value to their products.

In the other hand, the second process called "inside-out" works in the opposite direction when internally developed technologies are made available to the market through the sale of intellectual property. It is a way for the company gets an additional income and is best used by technological industries that are able to generate and license their inventions with other companies and get an extra income.

And finally, the third process called "coupled" is a combination of the two previous processes. This process builds alliances with complementary partnerships where there is a mature network and the parts are well aware of their roles within it. Fig. 2 summarizes the three cases.

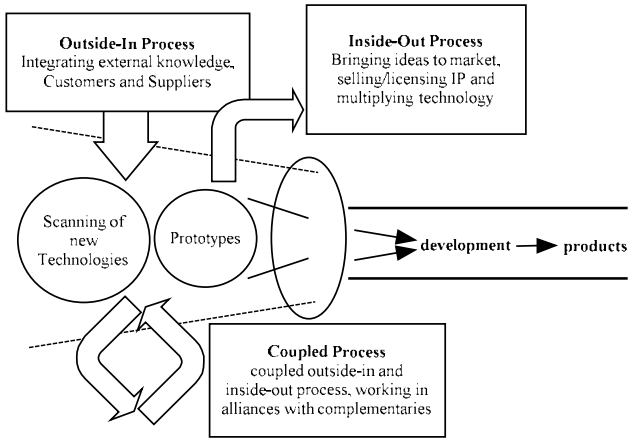

Fig. 2. Open innovation deployment processes.

The company's size is also an important feature for open innovation and the smaller businesses can gain a lot from it, since their resources and markets are very limited and, moreover, their efforts are already facing the outside and it is not something new for them (Lee et al., 2010). On the other hand, it is important to note that because they are small and have few resources these small businesses have many difficulties to build and maintain a collaborative network.

That´s why so that many empirical studies show that open innovation is mostly used by large companies (Keupp, Gassmann, 2009; Van Vrande et al, 2009). In this context, the bigger companies can lead a strategy to approach small companies and create a partnership environment that brings benefits to both. It is a "win-win" relationship, where the bigger company gives its infrastructure and the smaller company adds value through its inventiveness.

3. THE SMALL TECHNOLOGY COMPANIES

The small technology companies known as startups have been studied by Carmel (1994) who noted that they were quite inventive and innovative. Tung et al. (2013) believes that a startup encouragement policy has become an important way to maintain the momentum and efficiency of the economy, and is a way of doing and thinking new products and new values.

Although the concept of startups varies according to countries and rules or laws applied in each of them - examples cited by the OECD (2013) note that Argentina and Brazil define the startups as new technology-based companies. In Chile as companies with high growth potential. And Colombia and Peru as ICT companies (Information and Communication Technology). Definition that seems appropriate for the continuity of the relevant analysis in this study is presented by the same OECD (2013) that defines startups as featured companies for high impact and innovation.

Anthony (2012) highlights three characteristics of startups: they have a tendency to work with open innovation, have a flatter hierarchy and a business vision - characteristics which ultimately allow them to approach big companies. For Anthony (2012), large companies can take advantage of this leaner feature, the bigger business agility, and ability to foster partnerships in search of disruptive innovations. And this, he said, should be done by defining a business model that can unite the best of both worlds, with the combination of the characteristics of startups with entrepreneurial vein and the ability and resources of large corporations.

In this scenario, startup companies have the agility and flexibility needed, formed from good ideas and their creators' inventiveness. Nevertheless, they lack precisely what the big companies have to spare: infrastructure, brand, market space, consolidated partnerships, excellence in processes and other capabilities to help them develop global solutions (Fig. 3).

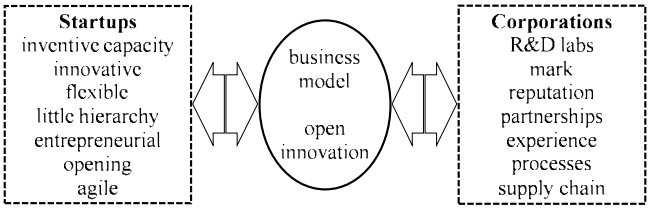

Fig. 3. Large corporations and startups relationship.

So what will unite these two forces is the business model and an open innovation-based strategy. Large corporations should become business catalysts and seek through this initiative to improve the innovation system as a whole.

4. METHOD

This article essentially follows the descriptive research since it seeks to describe relevant event characteristics in a market or among groups of people - according to Malhotra (2001). The strategy is primarily qualitative and the authors analyzed the actions and the plan adopted by the company.

The case study was the method chosen, as the authors intended to study a particular situation in a specific context, deepening on the analysis of the data. According to Yin (2005), the case study method is used to understand complex social phenomena and this method is useful when researchers seek to understand how relationships and perceptions in the organization investigated work.

Laville and Dionne (1999) help to build the definition of case studies, saying they offer research with direct explanations of the case and also the most attractive elements of context.

This is the time to deepen given and collected information, with no restriction compared with other cases, being more flexible. A major drawback of the case study method is that it does not allows researchers to generalize the results. Still, if the case was chosen by being typical or characteristic in a broader context, it contributes to a better understanding of the phenomena (Laville and Dionne, 1999).

The study is about a Chinese multinational R&D department subsidized in Brazil and the evidences used were observation of the activities performed on a daily basis, project reports analysis and unstructured interview with the direction of R&D.

This study also used the literature review to compare how the literature has dealt with the practices of open innovation and the involvement of startups in the innovation strategy adopted by the R&D departments, highlighting and comparing the current situation with the way that is being followed.

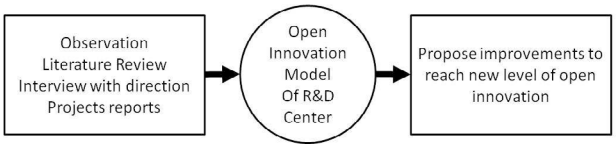

Fig. 4. Method

5. RESULTS AND DISCUSSION

The R&D Center in Brazil was created in 2008 when the country was going through a transition from analogue to digital television. The company did not have a product capable to meet this new market demand and having a team of R&D was strategic and critical to the company's goals of gaining market share in the Latin America´s TV market.

The first step was to hire a director with sufficient background in this kind of technology projects that could lead the company in this transition and in the challenge of creating a multidisciplinary group of R&D in Brazil.

The organization´s first approach was to have an internal group to do all development projects, including the new hybrid television platform (analog and digital). One of the premises was to protect intellectual property and, therefore, the research should have being conducted only by this group. It was a closed innovation model (Chesbrough, 2003).

Considering the difficulties inherent in the project and the importance of having a heavy flow of knowledge, the director of the department decided to take a more open approach, seeking partnerships with universities, research institutes, other industries and global technology companies. This was something completely new and seen as very risky by the corporation. However, the vision of the director it was the best way to ensure greater flexibility in project development and a way to make sure the team's learning curve would raise quickly - otherwise it would probably lose time to market and their products lose ground to the competition (Chesbrough, 2003). Considering the three cases suggested by Gassmman and Enkel (2004) on how to implement open innovation, in Brazil was adopted the "outside-in" method, or search for external knowledge, technology and expertise in order to increase the technological capacity of the company, reducing the project development cycle.

One of the biggest challenges highlighted by the R&D department director was to break the cultural barrier of the company (Huston, 2006), especially concerning the fact that institutions external to the company would have access to strategic information of projects. The contracts and the establishment of partnerships faced enormous difficulties to be approved, several questions from the company´s headquarters needed to be answered and doubts put in check the chosen path. During the interview used for this study, the R&D director has mentioned that one way to overcome this problem was to bring two levels of stakeholders from the company´s headquarters to Brazil: operational and strategic. At the operational level engineers worked together with the Brazilian teams and make the report for the company´s headquarters. At the strategic level important stakeholders came to Brazil to meet the partners, to understand the staff technical capacity and discuss the best way to work (way of work). In addition, new projects are also defined through these visits that take place once a year. These changes and new procedures were essential to ensure the smooth running of activities and were in fact an organizational innovation implemented so the work could be done - by Zheng (2014), changes needed to make things happen.

All projects developed with the participation of Brazil were based on open innovation and partnerships with institutes and universities. All infrastructure, approval and management processes were built and idealized based on this network architecture, what helped to strengthen the relationship between the teams throughout Brazil and the world. However, it is important to note that within Huizingh (2011) proposal on innovation, the company was not completely open. Its processes were developed in a collaborative environment and were allowed to receive inputs from external partners and/or internal staff, but the results achieved were closed, in other words, this was a private open innovation, according to Table 1.

Table 1. Process X Result Matrix

Innovation Process	Innovation Outcome	
	Closed	Open
Closed	1. Closed Innovation	3. Public Innovation
Open	2. Private Open Innovation	4. Open Source Innovation

Something important to be highlighted in this whole process is related to technology transfer. The organization should be organized in order to guarantee the flow of knowledge in all directions, not just by a contract with a research institute or university where the expected result would be the delivery of a package at the end of the work plan. The relationship had to be deeper and more fluid and a greater interaction between the teams was necessary - as it was evident in interviews with the R&D direction. Explicit knowledge was vital to the processes, but tacit knowledge was also essential. There were

partners adding value through their expertise and previous technologies and, on the other hand, the internal R&D coordinating activities in order to absorb the technology into the company. In this model, the ideas, projects and innovations ceased to be static to generate several future results. Discussions, brainstorming and lessons learned in the processes should generate insights for new and promising projects and were always feeding back the chain.

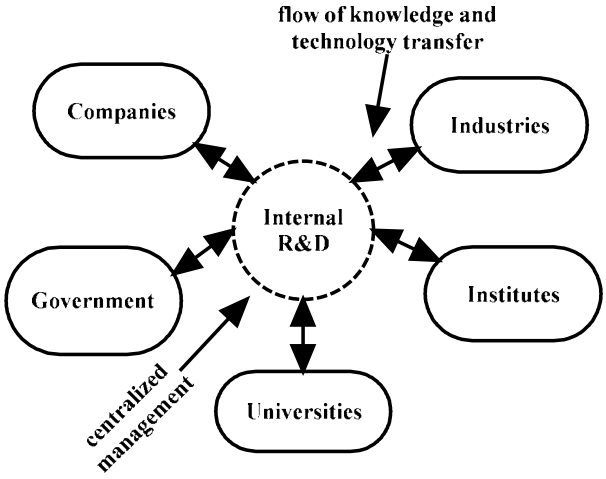

Fig. 5. Project development network.

Although the organization had a good direction and the network worked well in the projects, it was clear that, when compared to the literature on the subject, some adjustments could be made to achieve even better results. The flow of knowledge and technology transfer always happened between a partner and the company, but hardly among the partners (Fig. 4).

This strategy would eventually create a limitation or barrier to the exchange of experiences and the birth of new ideas - making the maturing of the open innovation model even harder.

Still during the interview, the R&D department management reported the work being done to improve the open innovation strategy currently adopted. One of the actions taken was to approach the universities through participation in technology parks. According to ABDI (2008), the Brazilian Association of Industrial Development, technology parks have as main objective to provide "intelligence", the infrastructure and services required for the growth and strengthening of technology intensive companies.

It is a model of concentration, organization, coordination and promotion of innovative projects. In Brazil, the parks are intended to help consolidate the formation of a strong and competitive "industry of knowledge". Technological parks allow not only the interaction with universities, but also with startups - given that this is a suitable environment for the birth of this kind of company and a place where they seek support for their new business and their products. Basically, the parks bring together two distinct worlds: the scientific and technological world and the business world (Fig. 5).

Based on Anthony (2012), the center of R&D should continue its systematic work of innovation focusing on a simplified business environment, decentralized decisions, learning and fault tolerance.

According to Anthony (2012), it is the Fourth Age, the mixture of entrepreneurship and venture capital with the corporations' internal laboratories unique abilities. Being a consolidated company with its own infrastructure, it can lead and manage this initiative working together and close to startups and young innovators to help them maximize their impact and thus achieve greater maturity and ability to add value to their products through disruptive innovations.

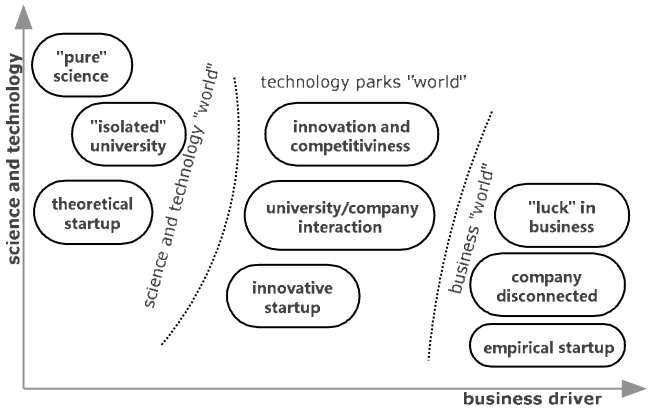

Fig. 6. The science and technology world and the business world

Universities have an environment that can greatly strengthen any innovation model. The first reason is because it has a strategic role in the promotion of knowledge (Baldoni, 2014). The second reason is because they become more and more entrepreneurial and innovative as they participate on science and technology parks. It is an environment prone to attract skilled labor, young entrepreneurs and startups looking for support, other industries and research institutes.

Be inserted at this kind of location is an important step towards an innovation ecosystem, since the interaction increases substantially and the ability to develop shared relationships help innovation (Ferrari et al., 2014). This kind of environment naturally promotes research and technological development (Stramar et al., 2014) and the startup initiatives become frequent, increasing the range of investment opportunities, of partnership and of innovation.

6. CONCLUSIONS

This study presented the main concepts related to open innovation as well as some practices to be adopted to make the transition from closed innovation to open innovation. It also presented a case study of an R&D department's efforts to strengthen and mature its innovation system.

The R&D department aims to create a less homogeneous and without clear boundaries network. Today it already has a technological projects development group supported by a set of stable relationships. The company already had several positive results from these initiatives but it understands that

in order to achieve a greater maturity and to develop disruptive innovations it is necessary to create a stronger innovation ecosystem where the projects are developed transversely across the participating organizations (Fig. 6).

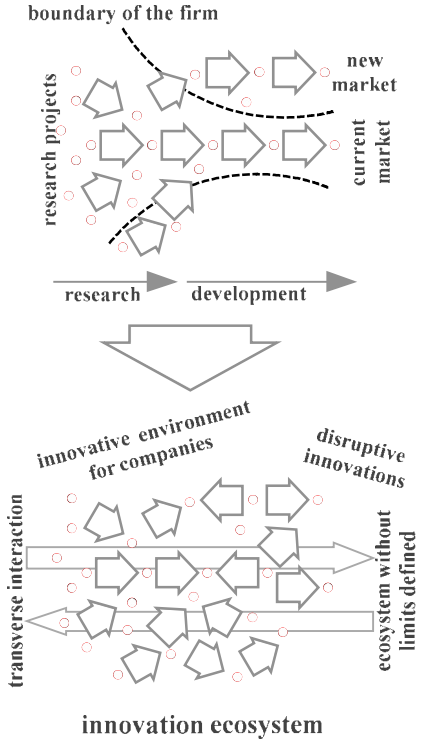

Fig. 7. Transition to an Innovation ecosystem.

Two other things were observed from literature review to improve open innovation model:

1. Technology Park is one good approach to open a link of communication with other companies and universities. This kind of space can help R&D Center to bring more information and knowledge to the firm, strengthening the innovation system;

2. The R&D Center can take advantage of Startups due to theirs features and focus on innovation.

According to management staff, some meetings are happening both with technology parks organized by universities as well as with startup accelerators. The main objective is to keep maturing this process and develop an environment prone to the generation of disruptive innovations.

REFERENCES

ABDI. (2008). *Parques tecnológicos no Brasil, estudo, análise e proposições.* Associação Brasileira de Desenvolvimento da Indústria. Brasília, DF, Brazil.

Anthony, S. D. (2012). The New corporate garage. *Harvard Business Review*. Boston, MA, U.S.A.

Baldoni, L.; Furtado, A. T. (2014). A consolidação do "Parque científico e tecnológico da Unicamp". *ANPROTEC – XXIII Seminário Nacional de Parques Tecnológicos e Incubadoras de Empresas*. Brasília, DF, Brazil.

Burcharth, A. L. de A.; Knudsen, M. P.; Sondergaard, H. A. (2014). Neither invented nor shared here: the impact and management of attitudes for the adoption of open innovation practices. *Technovation*, volume 34, pages 149-161. PhilaDelphia, PA, U.S.A.

Carmel, E. (1994). Time-to-completion in software package startups. *Proceedings of the 27th Hawaii International Conference on System Sciences (HICSS)*. pages 498–507. Manoa, Hawai.

Chesbrough, H. W. (2003). *The era of open innovation.* MIT Sloan Management Review. Cambridge, MA, U.S.A.

Chesbrough, H. W.; Vanhaverbeke, W.; West, J. (2006). *Open innovation: researching a new paradigm*. Oxford University Press. Oxford, U.K.

Ferrari, M. A.; GASPARINDO, L. R. S. (2014). A importância dos relacionamentos compartilhados para startups em ambientes de inovação - estudo de caso do Cietec. *ANPROTEC – XXIII Seminário Nacional de Parques Tecnológicos e Incubadoras de Empresas*. Brasília, DF, Brazil.

Gassmann, O.; Enkel, E. (2004). Towards a theory of open innovation: three core process archetypes. *R&D Management Conference (RADMA)*. Lisboa, Portugal.

Gassmann, O. (2006). Opening up the innovation process: towards an agenda. *R&D Management*, volume 36 (3), pages 223–228. Hoboken, NJ, U.S.A.

Huizingh, E. K. R. E. (2011). Open innovation: state of the art and future perspectives. *Technovation*, volume 31, pages 2-9. Ottawa, Canada.

Huston, L.; Sakkab, N. (2006). Connect and develop: inside Procter & Gamble's new model for innovation. *Harvard Business Review*. Boston, MA, U.S.A.

Keupp, M. M.; Gassmann, O. (2009). Determinants and archetype users of open innovation. *R&D Management*. volume 39(4), pages 331–341. Hoboken, NJ, U.S.A.

Laville, C., Dionne, J. (1999). *A construção do saber: manual de metodologia da pesquisam ciências humanas.* Editora UFMG. Belo Horizonte, MG, Brazil.

Lee, S.; Park,G.; Yoon, B.; Park, J. (2010). Open innovation in SMEs - an intermediated network model. *Research Policy*, volume 39, pages 290–300. PhilaDelphia, PA, U.S.A.

Malhotra, N. (2001). *Pesquisa de marketing: uma orientação aplicada.* Bookman. Porto Alegre, RS, Brazil.

OECD. (2013). Organisation for Economic Co-Operation and Development. Start-up Latin America - Promoting innovation in the region. *OECD iLibray*. Paris, France.

Stramar, A. R., Pegorini, G.; Moreira, E. T.; Giehl, R. B. T.; Crancio, A. F. (2014). A influência das competências organizacionais de um parque tecnológico sobre as empresas incubadoras. *ANPROTEC – XXIII Seminário Nacional de Parques Tecnológicos e Incubadoras de Empresas*. Brasília, DF, Brazil.

Tung, C.; Tseng, T.; Yen, W. (2013). Technology management for emerging technologies. *Proceedings of PICMET '13*. PICMET. San Jose, CA, U.S.A.

Van de Vrande, V.; de Jong, J. P. J.; Vanhaverbeke, W.; de Rochemont, M. (2009). Open innovation in SMEs:

trends, motives and management challenges. *Technovation*, volume 29, pages 423–437. Ottawa, Canada.

Yin, R. K. (2005). *Estudo de caso: planejamento e métodos.* Bookman. Porto Alegre, RS, Brazil.

Zheng , Connie. (2014). *The inner circle of technology innovation: a case study of two Chinese firms.* Technological Forecasting & Social Change – Elsevier, volume 8, pages 140-148. Melbourne, Victoria, Australia.