

THE PARENT-SUBSIDIARY RELATIONSHIP.
INTERNATIONAL TECHNOLOGY COOPERATION: THE FIAT AUTO CASE

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ABSTRACT

The role of the subsidiaries, in the decision making process of international technology alliance operation and its execution, has increasingly become a critical factor for the success of the operation itself. The objective of this paper is to explore the factors that can influence the role of the subsidiary on the effectiveness of international technology cooperation. The work focused on three different international technology alliances in the Fiat Group Automobiles, representing different directions in the process and information flows within the parent-subsidary relationship. The case study method was applied to investigate these three selected alliances. Interviews were conducted with top management of FIAT in Brazil and in Italy. The findings have been summarized into four main **lessons** and they are discussed *vis-à-vis* the extant literature. From the theoretical viewpoint, these factors highlight further potential contributions to the current streams of research on MNCs and their process of technological innovation.

Keywords: Networks; International technology cooperation; Parent-subsidary relationship; FIAT Automobiles Group.

1 INTRODUCTION

In the last 30 years, inter-firm collaborations for technological innovation have proven to be a powerful solution to maintain a company's competitiveness in the global context. This is especially evident in the case of large Multinational Companies (MNCs), who have invested resources to set up and implement many different types of strategic technology partnerships.

A new phenomenon in this strategic decision-making process involves the role of the subsidiaries, particularly in developing international technology cooperation. The strategy permits the globalization of the markets, sought by many MNCs, as a result of having access and sharing the most consistent technological competences with the targeted markets. This cooperation can occur, both intra-firm, by leveraging the available competences within the overall MNC network, as well as inter-firm, by involving horizontal partners (competitors and distributors) and vertical ones (links of the industry's supply chain).

The present paper was inspired by the literature stating that, in the case of the MNCs the generation, deployment, acquisition and diffusion of knowledge may derive from the external as well as from the internal environment (Gupta & Govindarajan, 2000; Minbaeva, Pedersen, Bjorkman, Fey, & Park, 2003). The role of the subsidiaries in the whole process of international technology cooperation can influence the effectiveness of the collaboration itself.

The objective of this paper is to investigate the key managerial factors that affect the role of the subsidiaries and their contribution towards the success of the MNCs, in their international technological cooperation. Most of the research on the related issues was undertaken at the level of the parent firm (Cantwell, 2001; Chiesa & Manzini, 1998; Ingham and Mothe, 1998; Rogers, Carayannis, Kurihara, & Allbritton, 1998). The authors have adopted a comprehensive approach, focusing on the subsidiary's and the parent firm's perspectives, in order to better understand whether the two sides reciprocally influence each other, in the whole process of forming and managing international technology cooperation.

The present paper is structured as follows: the next section presents the proposed research question and its theoretical foundations. A section on the research methodology follows. Next, the evidences of the three Fiat's alliances, the related findings and lessons are discussed. The contributions to the theory, conclusions, research limitations and recommendations for future research are presented in the last section.

2 THEORETICAL BACKGROUND AND RESEARCH QUESTION

The multinational companies (MNCs) have been analyzed from different theoretical perspectives such as hierarchies, inter-organizational networks and internal markets (Birkinshaw & Fey, 2000; Hedlund, 1986; Perlmutter, 1969). This paper adopts the network perspective, which became the dominant approach to MNC research during the 1990s (O'Donnell, 2000, p. 526) and was also applied to the R&D activities of MNCs (De Meyer, 1993; Gassmann & Zedtwitz, 1999; Howells, 1990).

In previous research using the network approach (e.g. Andersson & Forsgren, 1996; Andersson, Forsgren, & Holm, 2002; Holm & Sharma, 2006; Schmid & Schurig, 2003), MNCs were predominantly conceptualized as loosely coupled networks (Bartlett & Ghoshal, 1989). Loosely coupled MNC networks entail relatively autonomous subsidiaries, each one with its own organizational and strategic goals and self-contained (not directly interdependent) activities (Astley & Zajac, 1990). However, the loosely coupled model has been considered inefficient by theorists (Astley & Zajac, 1991). Empirical MNC literature has also recognized that poorly coordinated decentralization during the 1980s resulted in duplications and poor integration of R&D facilities (Gerstner, 2002; Dyer, Dalzell, & Olegario, 2004).

Recent developments seem to suggest that exclusive reliance on the loosely coupled model is less adequate for analyzing contemporary MNCs. They increasingly carry out R&D projects with interdependent global teams, at R&D centers located in different countries (see, for instance, Gassmann & Zedtwitz, 2003). The strategy behind this trend is to take advantage of globally dispersed resources, knowledge and capabilities in order to make R&D more innovative as well as more efficient. An often-cited example of this practice is Ericsson's global R&D network consisting of highly interdependent development units, strictly controlled by headquarters, where most decisions are centralized (Birkinshaw, 2002; Birkinshaw & Fey, 2000; Nobel & Birkinshaw, 1998). 3M is one of the top companies in the world as regards innovation, and it is able to combine adequate R&D decentralization with effective coordination (Guedes, Vasconcellos, & Vasconcellos, 2010).

Today, rather than accepting predetermined roles, subsidiaries are asked to actively engage themselves in developing their operations and exploring procedures to increase the efficacy of the whole MNC's network (Birkinshaw & Morrison, 1995; Crookel & Morrison, 1990; Galbraith, 2000; Simons, 2005). Unfortunately, most of the research on this subject is concerned with the increasing **globalization of production**. Only recently, have some researchers started to pay attention to the **globalization of innovation** (Florida, 1997; Greybadze & Reger, 1999; Kuemmerle, 1999; Narula & Zanfei, 2003).

There are many cases of subsidiaries that perform specific value-added activities, which are basically ‘embedded’ in the knowledge systems of their respective host countries (evidence is provided by Dunning, 1996; Jarillo & Martinez, 1991, Kuemmerle, 2002). The emerging phenomenon is the role of the subsidiaries supporting headquarters to manage the technological flows in the international scenario. Despite the evidence from the managerial field, the literature on internationalization has only recently started to take into consideration the role of the subsidiaries in enabling the parent company’s inter-organizational alliances and joint ventures. The growth of international technology alliances has been fuelled by technological cooperation (Hagedoorn, 1996; Howells, 1990), especially where national competitiveness might be at stake (Casson, 1991; Mytelka, 1991).

Technology alliances, joint ventures and cooperative agreements are partnerships between companies that work together to attain certain strategic objectives (Harrigan 1988). These cooperative agreements aim at joint innovative efforts or technology transfers that can have a lasting effect on the product-market positioning of the participating companies (Hagedoorn & Schakenraad, 1994).

Technology alliances are typical inter-firm cooperation agreements and they can be defined as modes of cooperative activity “for which a combined innovative activity or an interchange of technology is at least part of the agreement” (Hagedoorn, 1996, p. 601). Technology alliances have been carefully investigated, and close attention has been paid to the strategic decision making process at the parent company level, as well as to the conditions for the success of the alliance. They often involve knowledge-sharing between (potential) competitors, which can lead to additional concerns about forming this type of cooperation. Yet, a few contributions have analyzed the role of the subsidiaries in the formation of the international technology alliances.

Considering the extant literature and the evidences from the field, a gap has emerged and the following research question is in order:

What are some key managerial factors influencing the role of the subsidiary in the international technology cooperation of the MNCs?

The growing role of subsidiaries in this strategic decision making process can take place through increasing interaction between the parent company and its subsidiaries. Nonetheless, the parent-subsidary interaction in technological innovation has been mainly investigated from the parent company’s standpoint. Thus, given that a two-sided contribution may enrich the understanding of the dynamics this double perspective has also been adopted to develop this research.

3 METHODOLOGY

The present study was designed to present some contributions to the extant theory on the role of subsidiaries in the management of international technology cooperation, starting with an analysis of case study. The exploratory nature of our research derives from the gaps found in the extant literature that has focused more extensively on the role of subsidiaries, as regards the **globalization of production**, than on the **globalization of the innovation process**.

Thus, the methodology applied to this research was founded on a case-based method, associated to the literature review and consultation of institutional data and reports. In addition, field observation and interviews were carried out in order to understand what happens and why. The case study method is usually considered appropriate when the research subject is still emerging, as in the specific context of our work (Dubois & Gadde 2002; Easton, 2000; Eisenhardt, 1989; McCutcheon & Meredith, 1993; Miles & Huberman, 1994; Yin, 1994).

The case selected is quite exemplary, and it contains extreme and unique circumstances that make it special. The Fiat Group Automobiles, and particularly its Brazilian subsidiary – FIASA – represents an example of the increasing contribution of subsidiaries to support the formation and execution of international technology alliances, in accordance with the parent company's strategies.

The selected case was analyzed from a longitudinal standpoint, in order to emphasize the relationship between the effectiveness of the technology alliance in the international scenario and the contribution provided by the rising competences of the subsidiary.

Fiat's data and information were collected during ten months, starting in March 2008, and the activity involved four senior researchers. No confidential data is included in the current article. The collected data is the result of qualitative (mainly interviews) and quantitative data, taken from reports provided by the company and institutional reports available at the company's website. It was necessary to use different sources of information in order to guarantee the respect of the principles of interaction and source triangulation (Eisenhardt, 1989; Yin, 1994).

As regards the planning of the interviews, a semi-structured interview protocol was designed, applying the framework of the management of strategic technology alliances proposed by Bruno and Vasconcellos (2003). The initial protocol included the following items, concerning the overall business strategies: the competitive priorities, the strategic goals of international technology alliances, the decision making process to establish an international technology alliance, the relationship between parent company and subsidiary, the impact of the international technology alliance on the subsidiary (when promoted by the parent company), as well as on the parent company/other subsidiaries (when

promoted by the Brazilian subsidiary). The interviewees were also asked to point out, according to their own experience, the main managerial factors related to the role of the subsidiary that influence the performance of the technological cooperation.

Two rounds of interviews with top executives were conducted through site visits or telephone calls. Each personal interview lasted between 45 minutes and 2 hours. During these interviews, one researcher was primarily responsible for the interview itself, and the other one took notes and complemented a previously prepared set of questions. Unclear answers were clarified by email or follow-up questions, in subsequent rounds. The interview protocol also included a comprehensive tour of the Brazilian site. In order to get a complete understanding of the dynamics between the parent company and the subsidiary and reduce the limitations of the one-sided research, it was requested from the headquarters to double-check the answers.

The following section describes the Fiat case and summarizes the events and findings resulting from the interviews and data analysis.

4 DATA COLLECTION AND FINDINGS

4.1 THE FIAT GROUP AUTOMOBILES

The Fiat Group is the largest industrial enterprise in Italy and one of the founders of the European motor industry. Prior to 2003, the Fiat Group was a conglomerate operating in different areas, from insurance to aerospace. In 2003, Fiat redefined its core business by focusing, both its manufacturing and service activities, on the automotive sector. During 2007, the Group continued to pursue its strategy of strengthening its industrial and commercial structure through targeted alliances, focusing primarily on high-growth markets such as Russia, India and China (around 25 operations within 2006-2008). In 2009 it merged with Chrysler, the third carmaker player in the American market.

The subsidiaries play a key role in the international strategy of the Fiat Group. The most relevant one among them is Fiat Automobiles S.A. Brazil - FIASA. The Brazilian operation was set up in the 70s, and it has been leading the local automobile market, particularly in recent years. Nowadays, FIASA is directly in charge of all the operations and sales for the group in Latin America. When it was founded, it represented the first successful effort to move towards a more global corporation.

The Design and Engineering Department of the FIAT Group Automobiles has selected three different international technology alliances, representing three different directions in the process and information flows, within the parent-subsidary relationship. The first among them is the **parent to subsidiary** FIAT-TATA alliance; the second one is the *borboleta* **parent to subsidiary** technology transfer; the last one is the **Locker[®] subsidiary to parent (to subsidiary)** project.

4.2 PARENT-TO-SUBSIDIARY: FIAT GROUP AUTOMOBILES – TATA CORPORATION

On February 14th, 2007 Fiat and Tata announced an agreement for the production of pick-up trucks in Argentina. The agreement, which called for a Tata license to build a pick-up vehicle bearing the Fiat nameplate at the Fiat Group Automobiles' plant in Córdoba, Argentina, followed a feasibility study that began in July 2006 and was carried out by the central Design & Engineering Department, at the parent company. The execution of this alliance is now on hold. From the strategic viewpoint, this alliance was conceived by Fiat itself, to reinforce its presence in the low-cost market segment, through its cooperation with outstanding technological partners. Operationally, despite the long assessment by the Turin headquarters, it was difficult to meet the necessary feasibility requirements. In order to accelerate the technology transfer, from Tata's plant and engineering departments to Fiat's factory in Cordoba, the Italian headquarters required the cooperation of the Brazilian subsidiary, which is the company's single unit in Latin America with the appropriate competences in terms of manufacturing and engineering.

4.3 PARENT-TO-SUBSIDIARY: THE *BORBOLETA* PROJECT

The Automated Manual Transmission (AMT) was developed and is continuously being improved by Magneti Marelli. Magneti presently supplies all the leading carmakers in the world, especially the top-range ones, including Ferrari, Porsche and Jaguar. In 2006, FIASA needed to reinforce the sports and top performance perception of its product portfolio. The AMT could be helpful to associate the FIAT brand to state-of-the-art technology and reinforce the image of an innovative and top-performance company, in the Brazilian market. The technology transfer required the additional development of a gear-shift integrated to the steering wheel. For this customization, the Italian branch of KSS Inc. (North American manufacturers of components for carmakers) was involved. The *borboleta* technology was adopted by FIASA, in the Brazilian market, for the *Stilo* model.

4.4 SUBSIDIARY-TO-PARENT: THE LOCKER[®] PROJECT

The Brazilian car market is very demanding, at all levels, and it is consistent with the main characteristics of the so-called Sport Utility Vehicles (SUV). FIASA aims to launch some small SUV models, particularly extending the **Adventure** model, which is a successful product family of derivative innovations. In order to reach this strategic goal, FIASA has decided to join a co-development program suggested by Eaton North America.

Eaton had developed a mechanical locking differential for truck applications, and wanted to enter the automotive low-cost segment, by adapting this technical solution. FIASA was interested in this technology because it had a reduced impact on the existing car differentials. Eaton had already tested the reliability of the locking system in truck applications, showing that it could be adopted to lock a 2-wheel drive train with the same benefits of a 4-wheel drive train, in a high-traction context, as is the case for most Brazilian terrains (sand, ground, stones, clay etc.). In terms of costs, this technology could meet FIASA's requirements to provide high performance at a very affordable cost.

The project was successfully implemented in 2008. Afterwards, the Italian headquarters approved FIASA's efforts to unveil the potential of this simple technology, and it has decided to consider the possibility of extending this technology to other subsidiaries within the Group.

5 LESSONS LEARNT AND CONTRIBUTIONS TO THE THEORY

In order to facilitate the discussion of the results, the management process of the above described alliances may be presented in three main stages, namely (Table 1):

- Strategic decision making related to the alliance start-up
- Executing the alliance
- Leveraging from the alliance.

From the **decision making** standpoint, the described case emphasized the existence of different processes, between the parent company and the subsidiary, which may simply be defined as **centralized** and **decentralized**. The observed case demonstrates that both can co-exist, within the same MNC. The rising frequency of the decentralized process is yet another consequence of the increasing role of the subsidiaries in managing the flows of knowledge in an MNC.

In the Fiat-Tata alliance, the parent company explored, negotiated and made the decision without strongly involving the subsidiary, which, consequently, was left with the operational effects of the agreed partnership. This decision was mainly based on the assessment of the strategic, marketing and financial benefits of the collaboration for the global network of both corporations. These competences are naturally found at the parent company, who understands the needs of the specific countries and markets in which it competes, and may assess the impact of the synergies for these corporations. On the other hand, this alliance is the only one, out of the three presented above, that is not progressing in both the execution and leveraging stages, despite the validity of its strategic motivations.

The main difference between the Fiat-Tata alliance and the two other ones lies in the process adopted, since it was not adequate to the magnitude of the impact exerted by this technology alliance. The **centralization** of the decision making and, later, of the first part of the execution, was inappropriate, as they underestimated the local competences to implement a global strategy. The involvement of the local subsidiary, in the advanced stages of the execution, created a situation typical of product development and innovation management, related to the impact on the cost of engineering and manufacturing changes. The result of these alterations, from both the technical and financial viewpoints, was the delay of the project.

	FIAT-TATA	“Borboleta”	Locker®
Decision making	Exclusively parent companies of both partners.	Subsidiary, requiring the approval of the parent company.	Subsidiary, requiring the approval of the parent company.
Executing	Initial run of operations by Fiat parent company + engineering competences of the partner. In a second sub-stage, involvement of the engineering and manufacturing competences of the Brazilian subsidiary.	Subsidiary	Subsidiary
Leveraging	The alliance is progressing from the organizational point of view. The specific project is on hold in Latin America.	Full market and technical success. The subsidiary is exploring the possibility of extending this technology to other models: first in Latin America and then in other countries.	Full market and technical success. The subsidiary has underlined the possibility of extending this technology to other models for other subsidiaries with similar context and demand.

Table 1- Main stages of the three international technology alliances.

Source: Developed by the authors

Based on this first evidence, the first lesson might be stated as follows:

L1: in the MNCs, the earlier a parent company involves its subsidiaries in the process of international technology alliances, the higher are the chances of success for the alliance.

The critical contribution of the subsidiary to the success of the international technology alliance is related to two main factors, which should be investigated more deeply in our future research. First of all, **early subsidiary involvement** is definitely more crucial in international technology alliances, which have a strong impact on the overall network of the MNC. Furthermore, during the interviews with FIAT's management, it became clear that the relevance of **early subsidiary involvement** is more strongly related to the level of the subsidiary's competences than to the need for a **political** acceptance of the alliance.

In terms of a theoretical contribution, this lesson opens up a new area of study, derived from the research on MNCs, of an established model within the literature of supply chain management. The role of suppliers in the operations as well as in the innovation process of manufacturing companies, has gained enormous importance in the last decades. Early Supplier Involvement (ESI) has been advocated as a means of integrating the suppliers' capabilities, in the supply chain system and operations of the purchasing company (Dobler & Burt 1996). ESI is particularly regarded, by some authors, as a mechanism for the involvement of preferred suppliers, in the early phases of product design and development (Dowlatsahi, 1992; 1993; 1997). Partnerships are formed with suppliers to take advantage of their technological expertise in design and manufacturing. Dowst (1984) outlined nine areas in which suppliers can be involved in the buyer's design process. The benefits of using ESI are perceived as significant by most authors and practitioners in supply chain management (Dobler & Burt 1996). Testing this model in a different context (from inter-firm to intra-firm cooperation), adapting it to different theoretical perspectives (from Operations and Supply Chain Management discipline to Strategic Management of Technology) and – finally – adopting a different methodological approach (the network analysis) can be a unique contribution.

The managerial issues, related to the network of competences through which a MNC can be represented, are typical of the area of research pursued in this paper. What is relevant for this research is to observe that MNCs - managed as a system of competences and related flows of knowledge - have moved their technological competences (whether consciously or not) towards their subsidiaries, in order to benefit from this globalization. As an example, Russo, Cavalcante, Vasconcellos, and Sbragia (2008) have stated that Siemens adopts a strategy to develop competences, at its subsidiaries, to take

advantage of available human resources at competitive costs, by creating centers of excellence in key technological areas. According to these authors: “Today, Siemens Brazil’s R&D centers already supply services to business units in Brazil, and to other Siemens’ subsidiaries, but directed to the information and telecommunications segment” (Russo et al., 2008).

Gupta and Govindarajan (1991) were the firsts to observe the knowledge flows at a MNC, and they defined four generic subsidiary roles ranging from, Global Innovator to Integrated Player, Implementer and eventually Local Innovator. Other authors have also emphasized the peculiarity of the managerial and organizational solutions to increase the effectiveness of the decision making process involving parent company and subsidiary in the observed context of international cooperation for technological innovation.

The Fiat case shows that, the higher the level of technological competences required to fully consider the impact of the cooperation agreement on the overall MNC’s network, the higher the level of involvement of the subsidiary to acquire the necessary competences, as anticipated by Harzing and Noorderhaven (2006). This aspect deserves further study by scholars, and the related propositions need to be validated and generalized. Despite this, there is no evidence in our case description that the parent company has fine-tuned its strategic decision making process, to take into consideration these implications. Overall, this would be a key managerial issue to be further investigated.

Another relevant consequence of this emerging differential of technological competences in a MNC can be derived from the present case. The FIAT experience demonstrates that, in two alliances out of three, the subsidiary has played a central role in the process, starting with the decision making and moving to the execution and search for leveraging. These alliances were conceived at the **subsidiary** level, as a result of the local competences, mainly in the engineering and manufacturing areas. The reinforcement of these competences has allowed FIAT to be the leader in the Brazilian car market in the last six years, after a long period of being considered a low quality and low performance brand. The company has also maintained its critical success factors in Brazil, while the parent company is still coping with a long-lasting crisis in the domestic market, which has yet to be solved.

The excellence in engineering and manufacturing, built up by the Brazilian subsidiary, has generated an innovative flow for the international technology alliance of the FIAT Group. It starts with the decision making at the subsidiary - with the approval of the parent company; the feasibility is then confirmed in the local market; and finally, its leverage is maximized by extending the benefits of the alliance to the whole network of the MNC.

Thus, the second lesson may be stated as follows:

L2: the deeper the technological competences are at the subsidiary level, the higher are the chances of the subsidiary playing an active role in the process of international technology alliances.

This means that a double-flow process can emerge, i.e. a new stream of generation and consolidation of technology alliances, from the subsidiaries to the parent company, concurrent with the historical flow from the parent company to the subsidiaries.

This emerging contribution of the subsidiaries can be further deployed. Considering the Fiat case, additional evidence has also been found. The technological competences of the Brazilian subsidiary, and the collaborative relationship with the partners in both the *borboleta* and the **Locker**® projects, have encouraged FIASA to exploit the benefits of the technology that was jointly developed, in order to maximize the leverage resulting from the efforts (investments, people, assets) as required by the project. In the *borboleta* project, the decision was taken to extend the technology to the whole **Adventure** family of local products. It was also suggested that the parent company **store** this solution on the **shelf of innovation**, to be easily transferred to other product families. In the **Locker**® project, the role of the subsidiary has been much more proactive. As was the case with the *borboleta* device, the parent company was to adopt the technology and then identify the potential **customers**, within the network of the FIAT Group Automobiles.

From a theoretical standpoint, this finding can encourage an extended validation of the related proposition by observing, not only the existence of flows of knowledge among parent companies and subsidiaries (Harzing & Noorderhaven, 2006), but also the intensity and the direction of these knowledge flows, relating them to the MNCs' performance. This finding extends the original Hagedoorn and Schakenraad's perspective (1994).

The increasing flow of knowledge from the subsidiaries to the parent company is, in the authors' opinion, a recent phenomenon, which may be stated as the third lesson:

L3: the deeper the level is of the subsidiaries' technological competences, the more proactive these subsidiaries are to leverage the international technology alliance.

In this area, FIASA's contribution occurred through the perception and exploitation of the additional spillovers of benefits - for the corporation as a whole - of the international technology alliance, established for its local needs (both the intra-firm *borboleta* and the inter-firm Locker®). This

additional stage, in the process of forming and executing an international technology alliance, was not encouraged by the parent company.

In terms of managerial implications, the authors believe that it might be useful to formalize, reward and standardize the search for leverage from any technological project, for example, in order to increase, systematically, the potential benefit from international cooperation within a MNC.

Recently Sumelius and Sarala (2008) have stated that subsidiary knowledge development is likely to be influenced by how the subsidiary is controlled by the MNC headquarters (Ghoshal & Westney, 1993). Foss and Pedersen (2002, 2004) have also stated that some types of control are likely to have a stimulating and encouraging effect on subsidiary knowledge development. According to these two authors, two aspects of the headquarters control mechanisms are of particular importance: (1) to what extent they facilitate the subsidiary in its knowledge development, and (2) to what extent they motivate the subsidiary in its knowledge development (Sumelius & Sarala, 2008). The authors of the present work believe that a third key control mechanism should be deployed and spread: to what extent the parent company encourages the subsidiary to share its knowledge with the other branches of the network, and to leverage from it, within the whole MNC context.

From the managerial standpoint it would be valuable to pay strong attention to the whole **life cycle management** of the technological innovation, generated through the international cooperation agreements. As an example, from the Fiat case, it should be underlined that the search for exploitation of the international cooperation - driven by the Brazilian subsidiary - was the result of a single top manager's insight. This person had wide responsibility in the Design & Engineering Department at FIASA, and he was personally involved in the process of the intra-firm *borboleta* and the inter-firm Locker[®] projects. Particularly in the latter - and after moving back to the Design & Engineering Department at the parent company with global responsibility - he has encouraged the sharing of benefits from the technological innovations he had initially handled. Furthermore, he has started the **customization** of the original technological solution, to the specific needs of an European subsidiary, who has also decided to implement the so-called Locker[®] technology.

As the needs of this **internal customer** are quite different from those of the Brazilian subsidiary, the central Design & Engineering Department - together with the technological partner - needs to make some alterations to test the new version and verify its manufacturing feasibility. This additional activity has to take place at the parent company because that European subsidiary does not hold the same level of technological competences as the Brazilian one. Moreover, the Brazilian subsidiary is not in charge of generating innovation for the network of the FIAT Group Automobiles.

Using the Gupta and Govindarajan's definitions (1991), the FIAT Group Automobiles consists of a **network of local innovators**, controlled by the parent company. The increasing level of technological competences transferred from the parent company - which has pursued a massive strategy of technology outsourcing for the domestic market - to the subsidiaries, and particularly to the largest one in Brazil, has turned FIASA into a major generator of outflows of knowledge. It is clear that not all the other subsidiaries may have locally the technological competences to adapt the inflow of knowledge to suitable innovations.

Therefore, in networks like the ones described above, it may be discussed that this **integrative** and **supportive** role could be played, alternatively, by the parent company or by the subsidiary originating the knowledge flow, thus transforming the scopes of their technical departments and increasing their role to what Gupta and Govindjaran (1991) have defined as an **integrated player**. According to the extant literature, the subsidiary's ability to contribute to the other units' competence development is not counterbalanced by the transfer of knowledge from one subsidiary to the other ones, due to context specificity (Andersson, Forsgren, & Holm, 2001). Yet, these findings uncover an additional lesson that can be summarized as follows:

L4: in order to maximize the leveraging from an international technology alliance in a MNC, some cells of the network of knowledge have to develop specific technological competences to facilitate the integration, standardization and transfer of the outcomes of the partnership, to the whole network.

6 CONCLUSIONS, LIMITATIONS AND FURTHER DEVELOPMENTS

As an overall conclusion, the findings of the present research have identified four managerial factors that are presented in the form of **lessons learnt** and are related to the role of the subsidiaries, on the effectiveness of the international technology cooperation of MNCs. Due to the exploratory nature of the present study, these factors may not be considered as the only ones affecting the observed phenomenon. Further research is necessary in order to increase the understanding of additional factors.

A first contribution of this paper is to address the theoretical viewpoint, as summarized in Table 2. The two-sided methodology perspective has revealed the chance of replicating, in this context of research, the so-called Early Supplier Involvement approach, thus confirming the conclusions, related

to the theory of an Early Subsidiary Involvement (Dobler & Burt, 1996; Dowlatsahi, 1992; 1993; 1997). This contribution has also suggested other areas of research, mainly as regards the design of a process and the control mechanisms, to support the sharing of knowledge generated by the subsidiary.

It should be pointed out that contributions to the theory proposed in this paper need to be further tested. The present study was based on a qualitative evaluation using the case study method. Furthermore, the authors' belief in the findings stems from the fact that previous research in other disciplines support the study, and the lessons learnt were based on the operations, technology management and international business literature.

As regards the managerial implications, a continuous process of leveraging the international technology cooperation, both at the level of the headquarters and the subsidiaries, should be implemented, to develop innovations. Furthermore, some cells in the MNC network of knowledge have to develop specific competences to facilitate the transferring of the technology produced by the subsidiaries. Further *ad hoc* control mechanisms should also be designed to favor these processes.

Since the present study is limited to three international technology alliances (both intra-firm and inter-firm), occurring in the automotive industry, in a specific geographic context, a subsequent research program should be designed, to investigate additional cases of different industries in different contexts, in order to further validate the conclusions proposed in this paper, as suggested by Johnston, Leach, and Liu (1999).

Research question	Lessons learnt	Contribution to theory	Extant literature	Example
What are some key managerial factors influencing the role of the subsidiary in the international technology cooperation of the MNCs?	1. The early involvement of the subsidiary in the whole process of international technology cooperation increases the chances of success of the cooperation.	Early Subsidiary Involvement (ESI)	Ad hoc literature does not exist. We suggest to replicate the ESI theory in Supply Chain Mgt., as: Dobler and Burt, 1996 Dowlatsahi, 1992; 1993; 1997 Dowst, 1984	<i>Borboleta</i> project
	2. The deeper the technological competences are at the subsidiary level, the higher the chances that the subsidiary has in playing an active role in the whole process for international technology cooperation.	Two-way process of technological innovation through international cooperation, from parent to subsidiary, from subsidiary to the MNCs' network	Harzing and Noorderhaven, 2006 Hagedoorn and Schakenraad, 1994	Fiat-Tata pick-up project
	3. The deeper the level of technological competences of the subsidiaries, the more they	A new key control mechanism should be deployed and diffused: to	Sumelius and Sarala, 2008 Gupta and	Locker® project

	can be proactive in leveraging from the international technology cooperation	what extent the parent company motivates the subsidiary in sharing their knowledge with the other cells of the network and in looking for leveraging from it within the whole MNC context.	Govindarajan, 1991	
	4. In a MNC, some cells have to develop specific managerial competences to facilitate the integration, standardization and transfer of the outcomes of the cooperation, run at the subsidiary level, to the whole network.	Need for both a specific process and the related owner in order to manage the diffusion of the subsidiaries' technological competences within the MNC's network.	Andersson, Forsgren, Holm, 2001	Locker® project Borboleta project

Table 2- Summary of evidences from the present research.

Source: Developed by the authors

Finally, the present research has shown the need to explore another potential key factor. This study has confirmed that MNCs are very relational environments, and that the quality of the parent-subsidiary relationship (and their executives) as well as the flows of communication between these parties may have an impact on the effectiveness of international technology cooperation. In this type of environment, trust and trustworthiness in this kind of relationship might be a relevant factor to be analyzed. Therefore, a subsequent research has been designed, to study the impact of trustworthiness on the effectiveness of the international technology cooperation of MNCs.

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