

Global product development and the role of Brazilian subsidiaries: similar and different realities in the automotive and white good industries

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Abstract: This work aims at analyzing the participation of Brazilian subsidiaries in the global product development process in the automotive and white good industries; more specifically, it evaluates the division of labor into product development activities between headquarters and Brazilian subsidiaries, and verifies what criteria leverages the Brazilian subsidiaries' participation in product activities.

Keywords: product development, transnational and subsidiaries.

1. Introduction

The automotive and white good Brazilian industries can illustrate and characterize different angles of both concepts and practices in terms of product development strategies. Product development initiatives at local automobile industry are characterized by a group of transnational subsidiaries installed in the country a long time ago, and recently, by newcomers (SALERNO et al., 2009). On the other hand, local product activities at the white good industry have been happening in a scenario of deep process of acquisition of Brazilian companies by global groups (CUNHA, 2003). These different starting points and scenarios are the raw material and the inspiration for this paper.

This Paper is structured in five parts. Firstly, it presents a theoretical discussion on the reasons for product development internationalization and the attractiveness factors from the subsidiaries point of view. The second section is dedicated to giving an overview of the methodology used. In the following section, the attention will be focused on presenting a succinct perspective of the product development scenarios in the Brazilian automotive and white good industries. Then, the fourth section discusses the similarities and differences between these cases. The main implications and conclusions will be presented in the last section.

In order to support these propositions, two researches will be used: the first one is a field research conducted by Salerno et al. (2009) with several auto companies, but attention will be concentrated on two cases of car assemblers with facilities in Brazil: CASE 1 and CASE 2. Also, two transnational companies with Brazilian facilities will be evaluated, one with headquarters in the United States and the

other in Germany: CASES 3 and 4 are based on a research recently conducted by Santin (2005).

2. The globalization of product development activities

Global product development is a permanent issue in the agenda of several industry sectors, mainly because it is related with the survival of companies that compete based on innovation, new product launch and time to market (PORTER, 1986; MIGUEL, 2006). Also, product development is important from countries perspectives, once the dominance of essential technology and competences are key factors to nations' success in the global market.

The globalization of economy, driven by transnational corporations, resulted in a global presence of these companies in emergent markets, in order to keep return rates, but mainly to escape of the saturated markets in North America and Europe (CHESNAIS, 1996). This phenomenon increased the complexity and the interconnections of companies' flow processes, in particular, at the product development process.

This scenario has dramatically changed the international product development division of labor and organization. One of the main changes verified in the specialized literature is the participation of subsidiaries of developing countries, including Brazil, in different phases of the product development process, and with different organization schemes.

The global product concept had changed through the years in several industries. In the beginning of 1980's, the idea of the global car was relevant because companies were trying to be more competitive and efficient, through

centralizing design and production all over the world standard products (LEVITT, 1983). But, in the 1990's it was clear that, due to market differences, and the consequent need to adapt products to local preferences, this idea was not feasible. Instead, the wining concept was how to better organize and distribute the phases of the global product development process, which, according to Clark and Fujimoto (1991), is divided into concept definition, product planning, product engineering and process engineering.

Beyond the attempted introduction of the global product idea, some derivative concepts such as platforms and modules also significantly changed the organization and architecture of the global product development process (BALDWIN; CLARK, 1997, MUFFATO, 1999; DIAS, 2003).

Reger (2004) points out that the overall product development investments outside of headquarter country based have symptomatically been increasing since 1980's. However, activities related with basic research and innovation, which characterize early phases of product development process, are geographically concentrated at headquarters and in North America, Japan and in Eastern Europe countries.

The literature of product development internationalization has been the target of several researches for many years. Among all the authors there are two main perspectives: the headquarters and the subsidiaries. Chiesa (1995) proposes two main categories that contribute to internationalize product development activities from the headquarters point of view: technological and market. The market factor is related with the strategic need to access local markets, mainly because it reduces the customers' distance, consequently increases the possibility to give quick responses to customers and reduces chances of competitors. The technological factors are due to possibilities to access local high qualified people and supplement key technologies at a low cost.

Inzelt (2000) points out that the technological factor has gained tremendous importance, because it is strictly connected with the product development activities content. von Zedtwitz et al. (2004) adds that, local government pressure aiming to increase local content, and local educational infrastructure composed by top universities, and research centers are important factors that can leverage the internalization of product activities.

From the subsidiaries perspectives, Fleury and Fleury (2000) verified that the attractiveness factors are the regional and local volume and market size, the need to implement specific products and the local competence availability. Additionally, Birkinshaw (2000) and Dias (2003) state that the level of integration of local executives with the headquarters, and the entrepreneurship attitude of local executives are important factors that contribute to subsidiaries gaining product development mandates.

Hence, there are several market, technological and relationship stimuli that can influence product development activities internationalization from both headquarters and subsidiaries perspectives. Nevertheless, the issue is the significance of each of them in the automobile and white good industries.

3. Methodology

The methodology used by Salerno et al. (2009) in CASES 1 and 2 was a quantitative approach, based on a survey which resulted in 265 questionnaires answered. This phase was followed by a qualitative tool which involved some case studies with semi-structured interviews. The authors opted for this mixed strategy because the research had two objectives: first to collect a picture of the Brazilian automotive chain but also to understand in dept the main issues that can contribute to increase local autonomy in product development and its effects in the chain of suppliers.

Only a case study approach was used in the CASES 3 and 4 of the white good industry. This option of semi-structured interviews instead of answered questionnaires was adopted because these improve the agreement of opinions and interpretations of the questions. This technique also allows the interviewer to have access to information and facts not initially foreseen, but that can appear during the interviews, without, however, losing sight of the focus of the interview. Another key point is that interviews allow the interviewed ones to stray away from the official speech of the company, which is many times only intention and not practice, but brings its version and personal vision on the facts and data.

The white good field research instrument was designed to collect the following points: the strategy of development of new products and its weight in the business-oriented strategy of the company; the world-wide and local organization of product development; the participation and importance of the Brazilian offices in the phases of the product development process; the reasons that explain the decentralization of projects towards the Brazilian offices. The Brazilian points of attractiveness for this type of activity and the effect of the local product development in the local supplier or in the transnational units located in Brazil.

According to Yin (1994), Lazzarini (1995) and Voss, Tsikriktsis and Frohlich (2002), the case study methodology is recommended for researches when:

1. The interest of the researches are related with the understanding of the facts ("because" and "how") and not in its quantification;
2. There is no control on the events and behaviors of the facts and involved people in the research; there is, therefore, an investigation and exploration character;

3. The situations under analysis are contemporary, wide-ranging, complex and the phenomenon is not yet well understood;
4. The available theoretical body is not enough so that cause-effect relations are established; and
5. There is methodological need to use some sources to provide evidence to the facts.

All these points are completely aligned with our intention and purposes in the white good industry research.

Additionally, the case study method offers key requirements, such as to establish a level of direct contact between the researcher and the interviewers, allowing for a better understanding of the phenomenon and greater wealth of details. If these points are positive in the path of understanding and deepening the facts, they may represent risks. The reason is that it can thus distort reality and facts on the part of the interviewed ones and of the interviewer.

As pointed out by Voss, Tsikriktsis and Frohlich (2002), there are problems with historical data. For example, the participants can not remember important facts; distort or interpret facts instead of just telling them; make judgments of what occurred based on unavailable information on the basis of events at the time and to have limited access to information.

More than a person was interviewed, also from different organizational levels and finally results were compared with documentary sources of the company in two cases as a form to reduce the interpretation risks of the interviews. On the other hand, to minimize the risks on the part of the interviewer, the results of the interviews are shared with interviewed persons for confirmation of the facts and the collected data, even with the risk of censorship, which actually did not happen in any of the interviews.

Voss, Tsikriktsis and Frohlich (2002) stress that one of the decisive steps in the field research is the choice of the cases to be studied, either in number or in quality. One of the basic limitations is exactly the resources used in the research. The choice of some cases under responsibility of a single researcher can compromise the detailing and the quality of the analysis. However, a single case study can provide the searching the chance to have access to several sides and prisms of the phenomenon in study.

On the other hand, a single case study has the disadvantage of being limited to propose generalizations and conclusions. Moreover, it has the inherent risk of the researcher to interpret events, which can be mitigated with the use of a case and through comparisons of facts and data between them. Therefore, the use of multiple cases contributes to increase the validity of the research results as a safeguard against the researcher's involuntary deviation of analysis.

The choice of cases is not random, but made on the basis of specific and convenient criteria (YIN, 1994).

Miles and Huberman (1993) apud Voss, Tsikriktsis and Frohlich (2002) suggest three options for the choice of cases: to work with a representative case and a similar one; to select different cases to one given theory; to study polar or opposing cases.

In this sense, the white good industry CASES 3 and 4 represent a variation of the polar cases. Therefore, transnational subsidiary was selected as it had indications to have a larger degree of local responsibility in the development of products: CASE 3. On the other hand, a transnational subsidiary was chosen, which seems to have lesser content with activities of product development: CASE 4.

For the purpose of this article, CASE 1 and 2 were also taken from the automotive industry with the same perspective. CASE 1 subsidiary has signals of high level of competence and autonomy in terms of product development, and CASE 2 represents exactly the opposite situation according to Salerno et al. (2009).

In summary, the choices for this work, as well the companies, the products and studied units, apparently aimed to analyze distinct moments with regard to innovation in products.

4. Brazilian automotive and white good industries: product development realities

4.1. Product development in the local automotive industry

Brazilian automotive industry has had a fundamental technological and socio-economic role in the country since the 1950's. Besides the presence of traditional brands such as Volkswagen, Ford, General Motors (GM) and Fiat that were established between the 1950's and the 1970's, the last decade was characterized by a new wave of investments bringing companies such as Audi, Toyota, Honda, Peugeot, Renault and Mercedes-Benz.

Salerno et al. (2009), Carneiro-Dias and Salerno (2003) and Dias (2003) conducted several researches including carmakers companies. For the purpose of this paper, two representative cases will be taken: CASE 1 and CASE 2. The reason is that they represent different realities in terms of local product development activities.

CASE 1 subsidiary has been established in Brazil since the 1950's. It has four plants in the country that produces vehicles, trucks and engines for the native market and also for export. The Brazilian unit is the second in terms of global production volumes, and the third one in terms of general sales. It also is the oldest foreign unit inside the corporation. CASE 1's group has been the market leader since it arrived in the country, except in 2001 and 2002, when it was beaten by the Italian unit.

The initial phase of relationship between the local unit and the headquarter was marked by technological transference, mainly in the period of the protected market in the country. At that time, CASE 1 Brazilian unit developed local products over German platforms with relative success, as is the example of the “best-selling car” in the history of the Brazilian automotive industry. Along the years, this history of projects leadership created and expanded local competence in product and process engineering, and also established essential laboratories installations to test, to validate and to support developments. As a result of several local developments, the subsidiary had a relative independent situation in terms of product development.

In the late 1990’s, its autonomy to lead product activities was reduced due to a global strategy of centralizing product development activities. Nowadays, a contrary movement is noticed in CASE 1, as the Brazilian centre of style team was in charge of the design of a sedan version, and was recently responsible for the development of the “X” compact model also.

According to Carneiro-Dias and Salerno (2003), much of the integration between the local unit and the headquarters was a result of internal conflicts, once executives from the Brazilian unit (some of them are ex-directors from the headquarters) struggled for more participation. In this sense, the “X” project was proposed by the Brazilian unit and was not originally supported by the headquarters, being approved only after two years of intense and hard negotiation. During this period, CASE 1 Brazilian unit had to prove its technical and financial capacity, and the real need to define a new entry level model since the company had available the third generation of the “best-selling car” mentioned before. Executives interviewed in Brazil said that the resistance of the headquarters had much to do with the fear of loosing power. This comes due to the possibility of the return of local independence, since the unit has local competence and installations, or even worse, the Brazilian unit may become a competence centre for some products. Even with the project approved by the headquarters, they required control over activities and final approval, in most cases, only to confirm what the Brazilian team had done, or just to ask for minor changes.

Carneiro-Dias and Salerno (2003) still comment that, the “X” project may mean that the reason to maintain the final approval with the headquarters seems to be more political, than technically related.

CASE 1 study points to one important agent, what impacts the international division of product development labor is government policies. One example of government policies are the Brazilian incentives for the production of small engines, and the use of ethanol as an alternative fuel. Despite political discussion, the fact is that these government initiatives contributed to increase the local engineering

competences. CASE 1 Brazilian unit recently launched an engine equipped with a “flex fuel” injection system, which works with gasoline, ethanol or any mixture of them. This system was developed by a first tier supplier.

CASE 1 also showed the decentralization of the product development activities towards Brazilian subsidiaries is much stronger for the entry level models, than for the high-ones. This autonomy happens because the local and regional market has a strong demand and fearful competition in the low-cost products.

The second case study is the French company named CASE 2. It was installed in Brazil as a part of the globalization and economical openness, in the second half of the 1990’s, but it is important to consider, that the company had kept a production site in Argentina for the last decades. Actually, the company has one production site focused on producing one minivan, one compact and a three-volume car for the internal market.

The company clearly adopts a product development centralization strategy. There is a research centre dedicated to conceive and develop new products in France, the *Technocentre*, since 1997. Carneiro-Dias and Salerno (2003) comment that, according to interviewers, the main reason for establishing this centre was to reduce time to market, and to accelerate innovation. The *Technocentre* has enough facilities to run the development of five models simultaneously.

The Brazilian subsidiary has an engineering team responsible for small product and process adaptations, process developments and to monitor market evolution. However, the level of responsibility of the Brazilian team has increased, mainly following the growing the need of vehicles’ adaptations to the local market conditions such as temperature, humidity, degree of roads’ conversations and ethanol fuel availability among others. In practice, this means that the Brazilian models are getting more and more different from the European ones.

The authors state that this local evolution was not originally planned, but on the contrary, the strategy was to centralize development activities at the *Technocentre*. However, CASE 2 executives smoothed this centralization strategy, as they realized that it was not possible to conceive a completely standardized product for the developed and emerging markets. Nowadays, Brazilian engineers and technicians spend time in the *Technocentre* in contact with the French team, aiming to increase their competence with access to corporate procedures, new technologies, products, processes, and also building personal networks.

On the other hand, just to illustrate, the Italian Brazilian subsidiary represents an opposite situation. The subsidiary has been present in the country since 1970’s, and has presented continuous growth and profits in the last years despite the international crises of the Italian unit corporate.

Clearly, the Italian group strategy is to create a development centre for emerging markets in the country. Indeed, the Brazilian subsidiary has been attracting growing product development investments, and to reduce its dependency on the Italian development centre. In the last years, at least US\$ 100 million was invested in the local styling centre and laboratories.

Also, contrary to CASE 1, Carneiro-Dias and Salerno (2003) state that the Italian unit local executives interviewed did not mention the existence of any conflicts or barriers during the process of obtaining the headquarters' authorization for investments.

One important remark is that the Brazilian subsidiaries of CASE 1 and the Italian company have relatively more product development autonomy than the local American unit, even considering that the CASE 3 group has been in the country also since the beginning of the national auto industry. The reason is strictly connected with the headquarter strategy.

One of the key findings of this research is that product activities have been carried out in different ways among the carmakers. While there are local subsidiaries with high autonomy to host new product development activities, and owner phases of developments process, on the other hand, some companies are constrained to follow projects, drawings and specifications from the headquarters, and are restricted to process manufacturing responsibilities.

In the light of examples of local autonomy and participation in product development, Salerno et al. (2009) concluded that in general, the local automotive industry is characterized more by activities related to production process improvements and small product changes, than really profound product innovations.

Finally, Salerno et al. (2009) state that there are attractiveness factors that contribute to increase local subsidiaries participation at the global product development scenario: regional and local volumes, local market conditions and regulations (the "flex fuel" and the small engine cases), specific niche of market, product development overload at headquarters, local technical and management competence, local market diversification and homogeneous markets requiring new products (CASE 2 local changing strategy), integration with headquarters and the strategic importance of the subsidiary for the corporation (the local unit of Italian unit).

The initial list of market, technological and relationship factors that influences internationalization division of labor of product development activities presented by Chiesa (1995), Birkinshaw (2000), Fleury and Fleury (2000) and von Zedtwitz et al. (2004) can be updated with the following aspects: local market conditions and regulations, product development overload at headquarters and strategic importance of the subsidiary for the corporation.

4.2. Brazilian product development activities in the white good industry

White good industry has been present in Brazil since the 1950's. Nowadays, it counts on the presence of major global players such as Whirlpool, Electrolux, Bosch-Siemens and Spring-Carrier that produces the entire line of household appliances: several types and categories of refrigerators, ovens, air conditioning and clothes washing, drying and dish washer machines.

The importance of this industry in the local economy has been related not only with the generation of direct and indirect jobs, but also because it contributes to a positive trade balance result with product exports.

White good Brazilian-owned companies used to lead local product development activities for a long time, and also shaped a local chain of parts and equipments' suppliers. According to Rachid et al. (2003) and Cunha (2003) global and local strategies of the white good industry clearly prioritize product and process innovation as a fundamental key factor of competitiveness. The main innovation trends in this industry are new function, microelectronics components introduction, utilization of recycling components, new design, color and finished diversification in order to sophisticate, to simplify, to reduce dimensions and costs of products and environmental impact, also. This industry does not normally take radical product innovation, but continuous improvements mainly because the product technology is mature. This means the companies in this industry have access and use basically the same technology for the products.

The authors conducted a recent study involving two Brazilian subsidiaries: CASE 3, an American group and CASE 4, a German group, with Brazilian units both located in São Paulo state. CASE 3 company has a long tradition in household appliances with plants and engineering capabilities in all continents. This international group took the financial control of the Brazilian company in 1997 after a long period of joint technological cooperation and investments since the 1950's. The branch studied was established in 1990 as result of a partnership with the CASE 3 group, and it is focused on manufacturing clothes and dish washing and drying machines for the Latin American market. The Brazilian-owned company had long experience and tradition in innovation and launching new products in the local market, even before being incorporated to the international group.

The global product development policy of this group is changing from a decentralized project concept to a model that encourages coordination and synchronization of development initiatives, in order to optimize the use of resources. The global product strategy is mainly based on innovation, with knowledge sharing between professional

of subsidiaries, and recently the company is introducing the product platform concept, i.e., developments for similar markets are hosted in one specific subsidiary with the participation of engineers of many countries, that can adapt them to regional particularities. Also, the company is organizing its product development structure with “center of competence”, which means that some specific subsidiaries are assigned to support development initiatives. In this context, professionals of the Brazilian unit will perform an important role, since it was assigned as a center of competence for structures of washing machines.

This subsidiary has been leading complete product development activities of clothes and dish washing and drying machines projects, and it is a worldwide reference in the group in developing “top-load” washing machines dedicated to the low-cost segment. In this context, two developments deserve special attention.

Based on marketing data, local executives took the initiative to develop and launch a compact and low-cost clothes washing machine for the regional market. This project was completely developed in the Brazilian subsidiary, from the concept definition to starting of production. The entrepreneurship attitude and relationship of local executives with the headquarters, and the accumulated local competence were decisive to the project success, which is aligned with Birkinshaw (2000) and Fleury and Fleury (2000).

The second development, a compact and low-cost dishwasher machine for the regional market was even harder, because the unit had never designed or manufactured this product before. The same success factors that were present in the previous project were fundamental for the local project team to develop, and to introduce a new product, even facing extreme knowledge barriers and restrictions to access the dish washing technology, which was dominated by a German subsidiary. The Brazilian executives did not count on the cooperation and technology transference of the German executives because they did not believe that the Brazilian team was capable of completing the project successfully since they did not have previous experience with this product.

Additionally, the local technical team has been leading specific product development initiatives for the American, Chinese, Mexican and Indian markets. The acknowledgement of the Brazilian competence in designing and finding solutions is causing migration of many engineers and technicians, from Brazil to other Engineering centers all over the world. During the interviews, executives emphasized that local educational infrastructure, with the proximity of top universities and research centers have been performing an important role in the current stage of the subsidiary, and even for the future, which is in accordance with von Zedtwitz et al. (2004) field verifications.

The second Brazilian subsidiary studied is part of a CASE 4 group. This traditional group also has units and engineering centers in several parts of the world, but the majority and most important of them are in Europe. This company bought a traditional brand of Brazilian ovens in 1994, as part of its strategy of global presence and proximity to emerging markets, which is compatible with the concept of market factor of Chiesa (1995). Indeed, as part of its strategy of offering a complete range of products for the Latin America market, it decided to start-up a Brazilian unit focused on producing refrigerators since 1998.

The global product development strategy of the group is based on centralization of product platforms (MUFFATO, 1999), and avoidance of items proliferation. These strategies have the aim to standardize products, and minimize costs at the design phases and even during the serial production.

The Brazilian engineering workforce is focused on “tropicalization” activities, which consist in introducing small features, to adapt global refrigerators to local customer needs, specially aiming the low-end segment. Therefore, this subsidiary is basically involved in the final phase of the development initiatives, which is the transference to manufacturing team to start serial production.

Actually, the unit plays a discrete role among all units of the corporation in terms of product development. However, the Brazilian subsidiary has been stimulated to increase its management and technical competences, which can be recently observed with the replacement of originally expatriated German managers for Brazilian executives. Indeed, interviews with local managers demonstrated that there is local strategic intention to provide high competence and knowledge to the product and process development team of engineers and technicians. This goal has been achieved through continuous training investments, and also hiring top professionals in the market.

Meanwhile, the local product development team has been leading some initial projects. After sales and marketing analyses, local executives verified a window opportunity to develop and introduce a one-door low-cost refrigerator, with “dry defreezing” characteristics. The initial idea was to adapt one current product from a German platform, but dimensions restrictions made it infeasible. Even under technical restrictions and skepticism from the headquarters, local management got the “green light” from Germany to start the development with local resources. Then, the local product team drove the project from concept design to production process development. Some final tests and verifications were approved by German engineers, due to local lack of equipment and knowledge. Once more, the argument proposed by Birkinshaw (2000) is present; it emphasizes the need of local management initiatives.

These cases have shown that subsidiaries product development activities have been increased, or at least are

kept at the same level as before, despite the acquisition process. In fact, it was found that these Brazilian subsidiaries have participated in early phases of global product development process. However, this degree of participation is unbalanced.

5. Local product development content: similarities and differences

The automotive and white good industries analyses revealed some convergent and other divergent aspects. The international product development division of labor between headquarters and Brazilian subsidiaries is selective and diversified between both industries. There are cases with local subsidiaries having high competence, facilities and deep participation, from conceptual design to production process definition (CLARK; FUJIMOTO, 1991), as is the case of the Brazilian carmaker Italian unit, even the CASE 1 Brazilian unit, and the local subsidiary of the CASE 3 white good company. But, in other cases, local units do not have the same level of participation, as are the case of the CASE 2 branch and the Brazilian unit of the CASE 4 household equipments.

Besides some product developments for the local or regional market, the Brazilian participation in global product development initiatives is much more restricted to production process improvements and small product “tropicalization” activities, than really being part of the global product and technology innovations. Nevertheless, upcoming product politics, such as global platforms are increasing the Brazilian participation in the white good industry.

Also, companies long-established in the country have a more expressive participation in global product development initiatives. This condition is important, but suffice to guarantee an expressive participation in the global product development process, mainly if the automotive American subsidiary, long present in Brazil, is considered, but with a discrete participation in development activities.

There still is a difference between these two industries. The carmaker industry has units dedicated to produce cars and improve production process, almost without contact with product changes, and other units focused on developing technology, as CASE 2s’ *Technocentre*, while in the household industry, the subsidiaries normally have both dedicated teams of process and product engineers and technicians. The reason is that the white good industry requires high speed to change, and adapt products to local market characteristics.

There are also some coincidences and divergences regarding the factors that can attract product development activities locally. The market factor mentioned by Chiesa (1995), the regional volume, and the specific niche of

market mentioned by Salerno et al. (2002) were factors present in the cases of the low-cost clothes and dish washing machines; also in the local development of the low-end one door refrigerator with dry “defreezing” characteristics, and in the case of the “X” compact car project.

The acknowledgement of local competence and migration of professionals to different countries was present in the case presented in the CASE 3 white good industry (von ZEDTWITZ et al., 2004). Also, Chiesa (1995) technological factor and Salerno et al. (2003) local technical and management competence availability was present in the case of the low-cost clothes washing machines. The local market conditions and regulations aspect was present in the “flex fuel”, and the small engine developments. This factor was not verified in the white good industry. The strategic importance of the subsidiary for the corporation was noticed in the local Italian unit. Finally, the entrepreneurship attitude and the integration of local executives with headquarters were decisive success factors for all developments in both industries (BIRKINSHAW, 2000).

Table 1 compare the four cases in terms of global product development strategy, participation of subsidiaries in product development and the important industry factors that can contribute to retain and expand the local content of product activities.

6. Final remarks and conclusions

This paper discussed the participation of the Brazilian subsidiaries in the global product development process. Also, the understanding of the factors that can enhance local participation in the global product initiatives was sought. The work presented and compared two local industry sectors: the white good and carmakers.

It was found out that in both sectors the transnational corporations have different product development decentralization policies, but the innovation of product and process issues are core aspects of their competitive strategies.

Clearly, there is no standard situation in the carmakers and white good industries due to the participation of Brazilian subsidiaries in product development activities. On the contrary, there is a large number of scenarios and new experiences, but the truth is that local subsidiaries are predominantly focused on the final stages of the product development process, with some rare exceptions. The two industries study showed that the internationalization of product development suffers strong influence from attractiveness factors such as the South America volume, specific niches of low-cost products and high level and qualified workforce availability at low cost.

Some transnational companies are adopting more centralized development models, as CASE 2 and CASE 4 companies, while others are opting for decentralization

Table 1. Summary of the subsidiaries cases.

	Automotive industry		White good industry	
Quick profile	CASE 1 Local products: vehicles, trucks and engines	CASE 2 Local products: vehicles	CASE 3 Local products: clothes and dish washing and drying machines	CASE 4 Local products: refrigerators
Subsidiary startup	50's	90's	90's	90's
Global product development strategy	Centralization of product development activities with some extent of autonomy to specific subsidiaries.	Centralization of product development activities.	Migration from decentralized to worldwide synchronized product development activities.	Centralization of global platforms developments.
Participation of local subsidiary in product activities	Leadership of product development activities such as the "X" compact car and the new sedan, but with control and approval from headquarters.	Restricted to small process and products adaptations ("tropicalization").	Leadership of complete product development activities from concept definition and product planning of low-end products for local market. Technical support to other units in the world.	"Tropicalization" of low-end products and process adaptations.
Industry attractiveness factors	<ul style="list-style-type: none"> • Regional and local volumes • Local market conditions and regulations • Specific niche of market • Product development overload at headquarters • Local technical and management competence • Local market diversification and homogeneous markets requiring new products • Integration with headquarters and the strategic importance of the subsidiary for the corporation. 		<ul style="list-style-type: none"> • Regional and local volumes • Specific market niche • Product development overload at headquarters • Local technical and management competence • Local market diversification and homogeneous markets requiring new products • Integration with headquarters and the strategic importance of the subsidiary for the corporation. 	

and creation of more autonomous units, such as the Italian unit. However, there are companies in the middle of this range, as CASE 1 and CASE 3 companies. There is no "best way" to set up a global product development strategy, since there will always be interests from two sides: the headquarters and the subsidiaries. From the headquarters perspective, the concern will always be the establishment of one efficient global product development strategy according to different markets segments. This means that, in some product segments, centralization and the use of platforms aiming at standardization will be an option, but in others, this strategy may not work. Also, sometimes rational and technical decisions can be mixed up or simply replaced by political issues, such as the fear of losing control and delivering more power to subsidiaries, which was clear in the case of the "X" car development in the CASE 1 Brazilian unit and in the CASE 3 subsidiary during the dish washing project.

From the subsidiary, and even the host country standing point, the initiative and wish to grow up and develop competences is always present. From this perspective, their executives continuously dispute with headquarter and other subsidiaries of the group for additional participation and more autonomy to develop process and products locally. The immediate consequences of local product mandates

are the increment of subsidiary technical and management capabilities, and in a broad view, it contributes to the Brazilian dominance of essential technology and competences. The authors intend to continue this investigation looking more deeply into the companies from other sectors in order make a broader comparison in the near future.

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