

## A case study of R&D internationalisation in Brazil

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### ABSTRACT

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The decision-making process that results in installing R&D activities outside of an organisation (whether nationally or abroad) involves a number of variables that deserve a more detailed analysis of their specificities. This need stems from the importance that R&D activities have taken in recent years in the organisational universe, due to the potential constitution of competitive advantage. However, following the logic of rationality contained in the theory of transaction costs demonstrated by the dilemma "Make or Buy?", R&D activities were also included in the process of evaluating the feasibility and relevance of carrying out activities internally or externally. In many cases outsourcing has occurred across national borders. This article was created with the aim of analysing the specifics of the decision-making process of three multinationals that have outsourced their R&D activities to Brazil. It is hoped that a contribution to the debate on the advantages and benefits of outsourcing these activities will be made.

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### 1. INTRODUCTION

The expansion of business operations to other countries is not exactly a recent fact or innovation. However, the systematisation of knowledge underlying the set of decisions that guide the choice form of internationalisation of operations and the organisation of these operations globally can be considered innovative.

With ensured presence in the domestic market and consolidation of the initial stage of internationalisation through exports, companies have realised the need to be present in their exports' destination countries. The direct investment options abroad include: (i) building their own manufacturing plant; (ii) acquiring a local company with its own brand and consolidated network of customers, suppliers and partners; (iii) being associated with a local company through joint venture arrangements. Each alternative has advantages and disadvantages, and implies different unit operation strategies and forms of relationship between parent and subsidiary, as well as different forms of knowledge management,

capitalisation, resource sharing and management of autonomy. The asymmetry of information available for foreign markets highlights the importance of the "make or buy" option that is dependent on costs and the characteristics of human and material resources, as well as the set of risks inherent in the foreign direct investment (FDI) process, such as political and technological risks.

However in the last two decades, the emergence of a new focus on the internationalisation process that consists of outsourcing activities are considered (so far) to be central to organisational operations, research and development. Despite the increased focus on sectors such as software development and pharmaceuticals, this trend can also be found in other sectors such as metalworking, chemical, polymers, cellulose and paper. A decision that could apparently be considered nonsense has consistent theoretical firmaments that denote connotations of strategic, operational, technological, market order beyond the economic and rational.

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The advantages of cost or differentiation and cartel formation among organisations from the economic sector have allied themselves to a set of other variables (like competitive advantage based on technology and knowledge), with methods of knowledge management incorporated into management practices for building strategic performance both in local and global markets. Operating with maximum efficiency has become the central focus and forces companies to compete on the basis of specific features and distinctive capabilities.

The outsourcing of R&D activities followed (initially) the same process of international expansion in terms of FDI, and was based on the establishment units abroad. This decision, as a rule, was based on identifying the set of local resources and skills that were considered essential in defining the role that a subsidiary would assume in the global corporate network. In many cases, outsourcing of R&D activities to subsidiaries occurred as a result of the development of skills and competencies of the subsidiary's employees, both in technological and managerial terms. In other cases, however, there was only R&D outsourcing with suppliers of R&D services and through the contracting of R&D and educational institutions.

This research was conducted in three multinational subsidiaries, one of German origin and the other two from the US, located in southern Brazil. The first subsidiary studied, which has its headquarters in Germany, began operating in Brazil in the seventies through direct investment and the construction of its own plant. The second subsidiary from North American opted for the acquisition of a local company with more than thirty years in the local market. The third company was formed through a joint venture agreement between a US company and a local company that was already the market leader in the sector and had more than sixty years of experience. Using the multiple case study method, the survey was conducted in order to analyse the parent companies' decision-making process for outsourcing subsidiaries' R&D activities, and to answer the following research question: "What are the variables considered in the decision-making process of multinational parent companies that define the process of R&D transfer to international companies' Brazilian subsidiaries?"

The first chapter of the article focuses on theoretical aspects, which explore the decision-making process and evaluate the alternatives of conducting internal and external R&D activities in Brazilian and multinational companies. The next section defines the case study's research method as well as the data collection procedures, and analysis of narratives that were seen to be more adherent to the research objectives. The article ends with the author's final considerations.

## 2. ANALYSIS OF THE DECISION TO OUTSOURCE R&D ACTIVITIES

O'Connor and Ayres (2005) highlighted three stages in the research and development process of new products for the market: (a) discovery, centred in ideas and consists of basic research activities (both internal and external) through licensing, acquisition or investment; (b) incubation, focused on experimentation and technical tests, and creation of a market base and strategic alignment; (c) acceleration, aiming to commercialise the product in the market. In this way, the perception of the expansion of R&D functions with the inclusion of "use" or "utility" allows organisations to see new benefits of activities related to R&D that are based on interactions with other areas and organisational units, with R&D technicians interacting with customers and suppliers (BOYLE, KUMAR and KUMAR, 2005).

This perspective identifies the favourable outsourcing of R&D as emphasised by Dagnino (2003) and Domingues (2005), based on the fact that Brazilian companies have a resistance to investing in the innovation process. When they do, they prefer to incorporate ready technology via imports of machinery and equipment that reduce the uncertainty and risk of R&D investment.

The first and most recurrent explanation, woven into the theory of transaction costs due to Coase's theory of the firm (1937), recommends purchasing products and services on the market when internal costs are higher than those practised externally. However, the firm should internalise when transactions are frequent, uncertain and come to demand special investments (like specific assets) (SWEDBERG, 2003). This is verified by Johnson (2004), who showed the preference of the 98 most surveyed industries to internalise R&D activities because of its strategic importance.

A counterpoint by Alchian and Demsetz (2005) that is grounded in agency theory is presented, because the increase of domestic costs due to the need for supervision and control of internal processes (which ties in with Anik (2002), Morrison (2002) and Kramer (2002)) highlights the economic reasons for outsourcing R&D, based on the advantages of exonerating employees and administrative structures.

Goel (1999), Ulset (1996), Boath, Hess and Munch (1996) and Deb (1996) state R&D's outsourcing advantages that include identifying new opportunities for developing products, reduction of risk and investment, in addition to reducing product development time and the possibility of simultaneous management of several R&D projects, which once led to the transfer of R&D activities in the US software business to India (BLANCHARD *et al.*, 2004).

In the field of strategy, Barney and Hesterly (2004) observed that the superior performance of a firm relies on features and capabilities that are valuable, rare, expensive to imitate and without substitutes, and thus provide a strategic resource for the organisation. However, according to Williamson (1996), the specificity of these assets may hinder the outsourcing process that involves the contractual need to reduce the risk of the contracted.

Adopting a more conservative position, Rajneesh Narula (1999) and Miotti and Sachwald (2003) recommend a "dosage" of adequate internal, external and quasi-external R&D activities to be considered in the decision-making process: (a) distribution of the types of skills that the company has; (b) development of individual technologies and the variation of the characteristics of the technology (as this moves the new technology to maturity); (c) strategic and economic issues related to the competitive environment.

It can be seen that economic theory and strategy provide a solid basis for interpreting the results of the decision-making process in many organisations. However, it is understood that the multifaceted universe of organisations and the complexity of organisational decision-making processes have demanded the inclusion of confidence variables (intra- and inter-organisational) and knowledge management. These is needed to consolidate the theoretical basis for the human side of organisations, which represents the essence of organisational structure and is responsible for characterising

(largely) the way that organisational managers think and act (CASSIMAN, VEUGELERS, 2002; LOOF; HESHMATI, 2002).

A multiple case study conducted by Noveli (2006) showed that companies perceive a number of factors that argue against the outsourcing of R&D, with emphasis on (i) assigning patents and results ownership; (ii) duration of projects; (iii) different objectives of universities and companies; (iv) the bureaucracy involved in contracting an educational institution; (v) the university's level of involvement in a project and (vi) the uncertainty of the proposed R&D project. Carayannis *et al* (2000) also find that most of the managers responsible for R&D in businesses are reluctant to outsource R&D, because of the lack of control over the development process and lack of trust in the contracted, as shown in practice by Hall; Lerner (2009), Coad (2011); and Bogliacino and Cardona (2010). Chiesa *et al* (2000) verify this theoretical model and express concerns about contractual protection. They suggest criteria for the selection and hiring of companies for outsourcing R&D with emphasise on the intersection between priority requirements and the organisational characteristics of different forms of collaboration.

All of the researched authors believe that fully outsourcing R&D activities is not feasible due to the importance of knowledge for the organisation, because it is one of the central features of its operation, as well as the fact that it is a potential source of competitive advantage. Knowledge, for Nonaka and Takeuchi (1997), refers to beliefs and commitments and has a meaning that is relational and specific to context-specific. However, the environment per se does not create knowledge without individuals, it only supports and provides context for its creation. Instead it provides a new perspective for interpreting events and objects as well as making visible meanings and unexpected connections (SOUZA; MENDES, 2008).

Landau (1999) presents empirical evidence that justifies R&D outsourcing because of the need to access new knowledge for increasing internal expertise, as well as to provide access to new market niches. Lokshin, Belderbos and Carree (2005) also found that companies with structured internal R&D

**Tab. 1**

Analysis of internal and external R&D in light of economic theory and management of knowledge, strategy and trust

MOST RELEVANT AUTHORS AND THEIR CENTRAL ARGUMENTS	ECONOMIC THEORY	KNOWLEDGE MANAGEMENT	STRATEGY	TRUST
Difficulties of outsourcing R&D: (i) ownership of patents / results; (ii) duration of projects; (iii) different goals of the university and the company; (iv) bureaucracy involved in contracting; (v) the level of involvement of the contracted, (vi) uncertainty (NOVELL, 2006)	■	■	■	■
Chiesa et al (2000) suggest criteria for the selection and contraction of companies for outsourcing	■	■	■	■
For Veugelers and Cassiman (2002); Loof and Heshmati (2002), outsourcing of R&D is limited due to the lack trust in technical competences of partners	■	■	■	■
Deb (1996): internalisation offers less risks of leaks of research results to competitors, improves productivity and gives greater control	■	■	■	■
For Souza and Mendes (2008) cultural barriers can be an obstacle in the knowledge management process	■	■	■	■
Cummings and Teng (2003) showed that physical distance is not decisive for the success of the knowledge-transfer process, the most important being the sharing of the same knowledge base, the intensity of interactions between the transmitting and receiving units, as well as active participation of the transmitter in the articulation of the knowledge-transfer process to the receiver.	■	■	■	■
Barney and Hesterly (2004): R&D activities involve development of organisations' strategic resources - valuable, rare, costly to imitate and not substitutable.	■	■	■	■
Asset specificity can hinder the process of R&D outsourcing activities (WILLIAMSON, 1996).	■	■	■	■
Outsourcing is for Boath, Hess and Munch (1996) an appropriate use of flexible and efficient resources that provide cost reductions.	■	■	■	■
For Woodhouse et al. (2002) the outsourcing of R&D activities allows the achievement of higher levels of quality, skills, capacity, and better infrastructure like machinery and equipment.	■	■	■	■
Swedberg (2003) recommends internalisation in frequent transactions and uncertainties.	■	■	■	■
Alchian and Demsetz (2005) show the higher costs of R&D internalisation.	■	■	■	■
When the internal costs are higher than the externally costs, the firm should choose to purchase products and services on the market (COASE, 1937).	■	■	■	■
Outsourcing, for Anik (2002), Morrison (2002) and Kramer (2002), has the advantage of lower engagement for managers and reduced board structure.	■	■	■	■
Deb (1996): outsourcing involves less investment in specific assets and reduction of budget, costs, risks and uncertainty.	■	■	■	■
For Goel (1999) and Deb (1996), outsourcing reduces development time and simultaneous driving of various R&D projects	■	■	■	■
Nonaka and Takeuchi (1997) argue that knowledge is relational, specific to context and is concerned with beliefs and commitments.	■	■	■	■
A solid internal infrastructure in R&D provides the development of technical skills and absorptive capacity (LOKSHIN, BELDERBOS and CARREE, 2005).	■	■	■	■
According to Saito; Bernardes; Consoni, Rondani (2013) headquarters abroad tend to define their strategy from a global perspective and then consider local markets and internal capabilities of their subsidiaries.	■	■	■	■
R&D internalisation may represent an important competitive advantage (JOHNSON, 2004)	■	■	■	■
Outsourcing R&D favours access to new knowledge to increase internal expertise and access to new market niches (LANDAU, 1999).	■	■	■	■
Silveira; Armellini; Aquino and Giroletti (2012) show that most of the subsidiaries have strong intra-network integration (74%) but are poorly integrated in external networks (31%).	■	■	■	■
For Mortimer (1995), Hall and Bagchi-No (2007) outsourcing favours the combination of knowledge and networking	■	■	■	■
Quinn (2000), Nicholls-Nixon and Woo (2003) find that external R&D is an important incentive for the structuring of internal R&D	■	■	■	■
Outsourcing R&D favours relationships on a personal and inter-organisational level (BARNES, PASHBY and GIBBONS, 2006)	■	■	■	■

Source: Authors

have more suitable conditions for absorbing externally contracted R&D results.

Moreover, Mortimer (1995) and Criscuolo, Haskel and Slaughter (2005) showed that companies who outsource R&D are more able to develop internal skills and interact with the external environment, combining knowledge and networking. Quinn (2000), Nicholls-Nixon and Woo (2003) and Hall and Bagchi-No (2007) also showed that R&D of some companies attribute their success in developing internal competences to relationships with external knowledge sources, such as university researchers and other companies linked to the sector, both on a personal and organisational level (BARNES; PASHBY, GIBBONS, 2006).

Research conducted by Cummings and Teng (2003) corroborated the argumentative aspect to highlight the importance of understanding the participants in the knowledge transfer process (of R&D units), the specifics of the knowledge to be shared, the similarity of the characteristics of the knowledge base, object for transfer among the recipients among those who transfer and the intensity of interactions among the transfer process' participants and their active participation in articulation and planning of that process.

These are specific traits that represent the idiosyncratic organisational culture that influences the process of knowledge and technology transfer (SOUZA; MENDES, 2008). This finding is further corroborated by the research of Saito; Bernardes; Consoni and Rondani (2013), who show that headquarters abroad tend to define their strategy from a global perspective and then consider local markets and internal capabilities of their subsidiaries. Similarly, studies from Silveira; Armellini; Aquino and Giroletti (2012) empirically support this view by identifying that most subsidiaries have a strong intra-network integration (74%), but have poor integration externally (31%).

One can see that authors differ on several points, based on arguments presented by the analysed theoretical aspects. However, it is understood that the adoption of the form of R&D depends on the context, as the results of Cummings and Teng's (2003) and Cassiman and Veugelers' (2002) studies demonstrate, where the relevance of context to the combination of knowledge from internal and external sources is highlighted.

In conclusion, "Economic Theory", "Knowledge management", "Strategy" and "Trust" dimensions were identified in the literature review, both by seminal authors and contemporaries, as variables that have the most influence on the decision-making process aimed at defining how to perform R&D activities. For this reason the author chose to narrow the focus of the study to these dimensions.

### 3. METHOD

A case study research method was chosen on the grounds that it provides better adhesion to the goals and questions that guided this study. The core elements of the research refer to the evaluation of the process of internationalisation of R&D activities, based on variables that include the theoretical basis for transaction costs and development of Brazilian subsidiaries' skills and capacity in the design process and modelling of corporate strategies of their parent company's abroad.

According to Goode (1975), the case study is not a specific technique, but is more a means of organising social data while preserving the unitary character of the studied social object. Hartley (1994) holds the same perception, believing that the case study approach is not a method in itself, but a research strategy that consists of a detailed investigation of one or more organisations or groups within an organisation, with a view of providing analysis of the context and processes involved in the phenomenon under study. Stake (2005) and Yin (2010) also highlight the suitability of the case study method for investigating contemporary phenomenon within the context of real life whenever the boundary between the phenomenon and the context is not clearly defined.

The case study was conducted in three industrial organisations that produce for the local market as well as for export. These organisations were chosen for the research based on two criteria: (i) geographical divisions, the location of Brazilian subsidiaries (in the metropolitan region of Porto Alegre) and (ii) the presence of an R&D unit in its organisational structure. The research was conducted in two stages: (i) a technical visit with presentations on the organisation and a visit to the factory; (ii) an in-depth interview with the manager indicated by the surveyed companies and the person responsible for the R&D area. Each interview had an average duration of two hours and annotated notes

where made in a field diary. The interview notes were transcribed, coded and analysed no later than six hours after their completion.

We opted for the analysis of narratives as the most appropriate form of treatment to bring out the discursive elements related to the research objectives. After transcribing, the text was interpreted and rewritten in a more cohesive, fluid way that is in a first person narrative format. Following this, the text was submitted to the interviewed people and a conference for adjustments and contributions were made. To be part of the cultural process, where symbolic systems create and are created through discourse, the narrative communicates different points of view, with constructed meanings that make sense of the world (BOJE, 1995; MOEN, 2006). The texts were interpreted, and for this reason, the contextualisation of the narrative becomes mandatory, because the speech is constructed from objective and subjective elements that are found in the environment where it is inserted. It is then interpreted by the researcher in light of their own assumptions that are formed in their own personal and professional experience (RIESSMAN, 1993; CZARNIAWSKA, 2000).

#### 4. RESULTS

ALPHA company is the largest producer of chainsaws in the world today. It was founded in Germany in 1926 and currently owns units in Brazil, Switzerland, Austria, the USA and China. The Brazilian unit was the company's first subsidiary, being constructed in 1973 and starting operations in 1975. The German unit manufactures products aimed at the professional high-quality sector, US production focuses on the hobby segment and Brazil and China produce for the professional low-tech market. Currently, the company employs 9,000 employees of which 1,200 have been allocated to the unit in Brazil. Each unit of the company specialises in the production of final products or their parts (components), which must present outstanding competitiveness.

Founded in 1990, GAMA is a global manufacturer and distributor of agricultural equipment and spare parts, with headquarters in Duluth, Georgia. It has been present in the Brazilian market since 1996 when it acquired a Brazilian company in the same sector, and is located in the metropolitan region of Porto Alegre. In its internationalisation process, the

company always adopts the same "modus operandi", that is, to acquire operations of pre-established brands in local markets. Currently, the GAMA account in Brazil has three manufacturing plants and offers a product line focused on agriculture, including tractors, combines, hay, forage and soil preparation equipment and sprayers.

The third researched company is BETA, a US multinational that is currently the world leader in the production of air conditioners. It began operating in Brazil in 1983 through a joint venture with a Brazilian company and has 210,000 employees working in over 90 plants worldwide, generating more than 36 billion dollars in annual sales. The process of internationalisation consists of acquiring companies with variable participation (in Saudi Arabia, the company is a minority partner) that operate in a local market with their own brands that have already been consolidated by the target market. Today BETA's Brazilian subsidiary is the largest manufacturer of air conditioners in Brazil and has two factories (Canoas and Manaus).

After going through the early stages of internationalisation via exports, ALPHA decided to carry out operations abroad without intermediaries or middlemen, instead taking control of the process themselves to reap the benefits offered by managing one's own operations, as highlighted by authors such as Goel (1999) and Johnson (2004). The location of the first assembly unit was determined by cultural proximity, with a predominance of Germanic cultural traits and German language skills (Brazil, Switzerland and Austria), as well as by the ability to implement its own operations in order to ensure the control and maintenance of quality levels (ARRANZ; ARROYABE, 2006; CASSIMAN, VEUGELERS, 2002). Due to increased competition in the global market, these criteria were modified and decisions began to be linked to market opportunities, production and distribution costs, availability of skilled labour and the existence of potential operational partners (CHIESA; MANZINI; TECILLA, 2000; DEB, 1996).

BETA's Brazilian subsidiary had already been operating in the local market since 1934 in the refrigeration sector, which became a national reference from the sixties in the production of air conditioners. In 1983, the company partnered with US multinational BETA in a joint venture, which had already been the model adopted in other countries, always opting for association or acquisition of

consolidated companies in local markets. This model of internationalisation facilitates the preservation of capital and reduction of risks (KRAMER, 2002; PIGA; VIVARELLI, 2004).

GAMA arose from the acquisition of a German subsidiary in the United States by a North American company. After consolidating its position in the domestic market, it started its strategy of internationalisation and opted for the acquisition of operations that were already in operation with established brands. This involves more initial investment, more time for adjustment of the structure, processes and forms of action, which is a standard way of acquiring a company (QUINN, 2000; WOODHOUSE; CUMMINGS; FEINGERG, 2002) whilst ensuring the continuity of operating revenues (NICHOLLS-NIXON; WOO, 2004). The Brazilian subsidiary was acquired by GAMA in 1996, had operated in the Brazilian market since 1961, owned manufacturing know-how, was aware of local circumstances and possessed an efficient distribution network.

The three surveyed companies showed transfers of R&D activities from the parent company to subsidiaries but in different ways, as already noted Narula (2007). Information sharing happened non-linearly for specific reasons (intrinsic to each organisation) and was idiosyncratic in relation to the configuration of the knowledge transfer process and the construction of local know-how (MORRISSON 2002; LOKSHIN; BELDERBOS; CARREE, 2011).

The original strategy of the company ALPHA consisted of only providing the Brazilian subsidiary with operations for assembling transported equipment in the facility, which had a minimum requirement of expertise in terms of technology and local employees. This was the position of the German parent company that, as highlighted by Mortimer (1995), represented the preferred alternative of internationalisation of industrial operations in the seventies and eighties.

However, over the decades, the Brazilian operation prospered and found that the *modus operandi* adopted had resulted in very high costs and thus reduced the profitability of the local operation. In line with the logic of economic rationality (KRAMER, 2002), the parent company turned the assembly plant into a factory, investing in better infrastructure and organisation in the areas of commercial and management as well as in

operations. The manufacturing of products that were intended for Brazilian and Latin American markets became the responsibility of the Brazilian subsidiary, which required the better preparation of local staff for the implementation of process control and management of resources and assets (CUMMINGS; TENG, 2003; LOKSHIN; BELDERBOS, CARREE, 2011).

This decision did not yet include the performing of more complex tasks, such as the testing of various products and components or R&D activities. Years later, due to changes in Germany's environmental legislation that aimed to reduce emissions of potentially polluting waste, the parent company was forced to invest in R&D. The alternatives were: (i) contract German researchers; (ii) contract research institutes in Germany (i.e. outsource R&D, but in the country of the company); (iii) outsource R&D to foreign subsidiaries.

The first alternative would have meant increasing the fixed costs of the company for an indefinite period, which was considered unfeasible. This type of situation, which led to the migration of operations to developing countries, has been portrayed by Howells (1999). The second alternative involved high costs, little control over compliance deadlines for contracted tasks and risks of leaking sensitive information to competitors. Due to the high level of excellence and technological standards of research institutes, several agreements were signed for projects of greater complexity, confirming the results of the studies from Woodhouse; Feingerg and Cummings (2002), Cummings and Teng (2003) and Quinn (2000).

The third option was facing resistance from technicians and German researchers that were based on the shared belief related to the lack of competence of Brazilian colleagues to develop complex activities like R&D. The argument favouring this alternative was related to the reduced costs of salaries of Brazilian researchers in addition to Brazilian labour law, which although archaic allowed employment for a specified period and the possibility of dismissal without cause (NOVELI, 2006).

In order to circumvent the lack of local expertise, several German researchers were transferred to Brazil to coordinate R&D activities and share knowledge and know-how with Brazilian employees. At the same time, several Brazilian employees were transferred to work in the parent company in

Germany, which allowed the company to increase research staff in the Brazilian subsidiary.

The process of merging R&D activities was based on an "evolutionary focus", that is, the gradual learning of a team of local employees, which is supported by organisational learning theories and knowledge management in organisations, as explored by Nonaka and Takeuchi (1997) and Howells (1999). This process highlights the need to monitor and evaluate the enhancement of local skills to support organisational strategic positioning. With the incorporation of a local company into the global company, an initial evaluation identified several problems and inefficiencies (operational and managerial), which led the parent company to perform a transfer of professionals (from the US to Brazil and vice versa) to promote alignment and adjustment. This focus has also been shown in studies, such as Deb (1996), which confirm the prioritisation of operational excellence in order to maintain the quality standard recognised by the market.

Improvements in local conditions for the introduction of new activities allowed the parent company to outsource R&D activities that were more complex, and had responsibility and scope in the global network of subsidiaries. This process culminated in the installation a centre of excellence in research and development in the Brazilian subsidiary, and assigned the centre and the Brazilian manager to coordinate global production of projects, with forecasted manufacturing in five different countries.

As in the GAMA company, authors found that the parent company had the priority of sharing cultural values with the Brazilian subsidiary's team, leaving in the background the transfer of technology and know-how, which confirms the results of Souza and Mendes (2008). The choice of this model of internationalisation was motivated by the fact that the Brazilian company had already been operating in the Brazilian and Latin American markets for over thirty years and owned facilities, infrastructure and trained personnel. Thus, the decision-making process was structured to include this set of characteristics (HITT; TYLER, 1998; MORRISON, 2002) and allowed the immediate transfer of R&D activities to the research centre in the subsidiary with investment.

The process of sharing know-how and R&D activities in the three organisations was done through

transferring professionals (from the US to Brazil and vice versa), which has been explored by Narula (2007). A divergence in the development of local partners and their inclusion in R&D activities for the organisation's line of products is highlighted in the reviewed literature (PIGA; VIVARELLI, 2004; NICHOLLS-NIXON; WOO, 2003). In the ALPHA company, know-how transfer was restricted to a Brazilian subsidiary and its staff, while the main suppliers of parts and components (including raw materials such as steel) remained in the parent country. The GAMA company placed no restrictions on the development of its local partners, provided that they were in compliance with the rules and standards of the organisation, both in terms of technology as well as control and management processes (LANDAU, 1999; JOHNSON, 2004).

Each of the organisations showed a specificity in the decision-making process to internationalise R&D activities in the light of the four dimensions that emerged from the literature review, namely, (i) Economic Theory, (ii) Knowledge management, (iii) Strategy and (iv) Trust. The initial decision of ALPHA's board to set up its own plant in Brazil, with the specific purpose of exclusively performing the product assembly and facilitate its distribution in Latin American, followed the perception identified by Barney and Hesterly (2004) that R&D activities involve development of strategic resources of the organisation that are valuable, rare, costly to imitate and without substitute. According to Deb (1996), this provides a greater level of control with the view of ensuring better productivity.

However, this initial position changed along with its strategic positioning of the model of internationalisation in light of the knowledge management dimension, insofar as the improvements in the level of expertise of the local staff facilitated the transfer of higher levels of complexity and even R&D activities (WOODHOUSE et al., 2002). This decision was also supported by the trust dimension, as highlighted by the authors Cummings and Teng (2003), especially in the technical sphere, which was built from the interaction between the technicians from the parent company and the Brazilian subsidiary (cross transfer).

In the case of BETA it is possible to identify the originally designed model, the joint venture contract with the Brazilian company. This was backed by Coase's (1937) theory of transaction costs, regarding



higher internal costs of coordination to the market in relation to the construction of the marketing and distribution network. However, this finding did not extend to production and R&D activities that, from the perspective of transaction costs (economic theory) as well as knowledge and trust management, did not facilitate transfer to their Brazilian partner (BARNES, PASHBY AND GIBBONS, 2006). This original strategic positioning changed as there was an increased level of confidence based on improvements in the technical knowledge of the local staff (LOKSHIN, BELDERBOS and CARREE, 2005).

operations that could then be incorporated into the overall corporate network in the shortest time possible and offer contributions to the network, which included in R&D activities. This strategy is also supported by authors such as Woodhouse et al (2002) and Lokshin, Belderbos and Carree (2005). The arguments for this decision are supported in knowledge management (skills of local technicians), which favoured trust when sharing processes with the subsidiary, as well as the values that guide decision-making.

**Tab. 2**

Synthesis of the process of internationalisation in R&D

	ALPHA	BETA	GAMA
Adopted form of internationalisation	Establishment of a unit	Joint venture	Acquisition of a local company
Original strategy	Assembly operations of the product and local marketing.	Entry into the local market, with pre-established brand support and consolidated distribution networks.	Rapidly expanding market, with support of a pre-established operational plan in operation, in addition to consolidated marketing and distribution networks.
Operationalisation of internationalisation	Construction of a manufacturing plant, contracting operators and management team.	Qualification of the local operation aimed at operational excellence.	Standardisation of products and processes (operational and managerial) for their integration into the global corporate network.
Original level of autonomy of the Brazilian subsidiary	No autonomy. Responsibility restricted to operations.	Autonomy only in business management, which may suggest modifications and product adaptations for local conditions.	Full autonomy for the coordination of processes of change in the subsidiary was reserved for the transferred manager of the parent company.
Factors that led to the transfer of R&D activities to the local subsidiary	Changes in environmental legislation of the European Community and the achievement of internal local skills' improvement (technical and managerial)	Identification and positive evaluation of internal local skills (technical and managerial) and external (input suppliers and technical service providers).	Original strategy was to establish a global R&D network with global management of knowledge and skills.
Form of transfer of know-how / knowledge sharing	Cross transfer of professionals, parent company technology imports and recently shared developments	Cross transfer of professionals, parent company technology imports and recently shared developments	Cross transfer Of professionals, parent company technology imports and recently shared developments
Restrictions on the process of knowledge transfer and inclusion in R&D processes	Only employees of the subsidiary, without interaction with suppliers or educational institutions in Brazil	Without restriction, provided that it met the technical competence required as well as level of secrecy	Without restriction, provided that it met the technical competence requirements

Source: The Author

GAMA's original strategy (the third company analysed), unlike the previous two, aimed to reduce entry time and consolidate operations in the Brazilian market. This endorsed the decision to purchase local

The three cases analysed facilitated the identification and characterisation of different reasons and forms of internationalisation of R&D activities of multinational companies in Brazil. It was

possible to verify that decisions are guided primarily by four dimensions, namely, economic, organisational strategy, trust and knowledge management, which support the process of choosing the most suitable alternative for perceiving and interpreting the environment where the investment of the organisation is directed.

It also appeared that when environmental conditions change, the originally conceived strategies also change and adapt (within the limits of perceived risks) to the quality standards of the products and operational and technical processes. This concern was emphasised in ALPHA and was the main reason for the low level of interaction with potential local suppliers. The issue of confidentiality (also related to the trust dimension) did not stand out as much as the concerns about capacity and expertise of local employees or suppliers.

## 5. FINAL CONSIDERATIONS

The process of internationalisation of operations is decided based on a set of variables, whose breadth and scope depends on the type and form of internationalisation that the organisation seeks to accomplish. In the case of internationalisation through FDI, input costs and the structure of suppliers, availability and level of knowledge and skills of human resources, logistics costs of manufacturing, tax and labour laws, all sorts of incentives, consumer market and its characteristics, in addition to political risks and economic context, are considered.

Note that the decision to internationalise operations - regardless of type, shape or amplitude, implies designing strategies that are built on the organisation's purposes, which are related to the involvement that the organisation seeks in the target market. We can see that the highest level of involvement, characterised by establishing trusts and based on pre-existing or developed local technical competences, are seen in the transfers of more complex activities such as research and development.

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In the three cases studied, the companies ALPHA, BETA and GAMA are multinationals with subsidiaries in Brazil, but had different paths through which Brazilian subsidiaries gained the parent company's trust and managed to take responsibility for the conduct of R&D activities. The research has highlighted differences in the underlying criteria of the processes of analysis and decision-making adopted by the three organisations in order transfer know-how and technology to Brazilian subsidiaries, as well as the characterisation of the context and local expertise that contributed to that decision.

The study results showed elements that provided answers to the following research question: "What are the variables considered in the decision-making process of multinational parent companies that define the process of R&D transfer to international companies' Brazilian subsidiaries?" Among the most frequent dimensions identified through the literature review are (i) Economic Theory, (ii) Knowledge management, (iii) Strategy and (iv) Trust, which emerged as variables to be considered in decision-making, environmental legislation, economic policy, the level of competence of technicians and managers of subsidiary and local suppliers as service inputs. The analysis of these variables resulted in different perceptions of managers of multinationals involved in the study, which was reflected in divergent design models of internationalisation of R&D activities. It is understood that cultural factors may have contributed to differences in perception, which affected the decisions that guided the implementation of R&D processes in the three organisations.

The author believe that the focus of the research is current, relevant and deserved the attention of researchers, who are able to contribute to the design of management models for operations and R&D that can result in the greater autonomy of multinational companies' subsidiaries in Brazil.

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# O estudo de caso de internacionalização de P&D

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## DETALHES DO ARTIGO

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### Palavras-Chaves:

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## RESUMO

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O processo decisório que resulta na realização de atividades de P&D externamente à organização, seja em território nacional ou no exterior, envolve uma série de variáveis que merecem uma análise mais detida no tocante a suas especificidades. Esta necessidade decorre da importância que as atividades de P&D vem assumindo, nos últimos anos, no universo organizacional, devido ao potencial de constituição de diferencial competitivo. No entanto, seguindo a lógica da racionalidade contida na teoria de custos de transação, evidenciada pelo dilema "Fazer ou Comprar?", as atividades de P&D também foram incluídas no processo de avaliação da viabilidade e pertinência a serem realizadas internamente ou externamente. Em muitos casos, a externalização ocorreu além das fronteiras nacionais. Este artigo foi construído com o objetivo de analisar as especificidades do processo decisório de três multinacionais, que externalizaram as suas atividades de P&D para o Brasil. Espera-se, que desta forma seja possível contribuir para o debate sobre as vantagens e benefícios do processo de externalização destas atividades.

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