



The front end as a process: the case of a multinational Brazilian firm

Processo de captação de novas oportunidades no desenvolvimento de novos produtos em uma empresa industrial de motores elétricos

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Abstract: This article examines the context of the front-end process in a multinational Brazilian firm that manufactures electric motors. By adopting an in-depth case study method, this article evaluates the front end as a strategic and tactical process within the Brazilian firm studied. The competitive arena, consisting mainly of Asian competitors, encouraged the Brazilian firm to review the stages of the front-end process and include new activities, such as (i) involving abstractive practices in the first stages; (ii) developing cross-functional capabilities in the research and development department; (iii) adopting tear-down activities of competitors' products concerning all business segments; and (iv) defining *a priori* the boundary conditions of financial constraints.

Keywords: Front end; Capturing of new opportunities; New product development; Innovation management.

Resumo: Este artigo analisa as configurações do processo de captação de novas oportunidades para o desenvolvimento de produtos numa indústria multinacional de origem brasileira fabricante de Motores Elétricos Industriais, ganhadora do prêmio FINEP de inovação. Numa abordagem qualitativa, foi estudada a evolução do processo em níveis estratégicos e táticos, desde sua fundação em 1970, buscando investigar oportunidades de aprimoramento à luz dos modelos teóricos. Os resultados demonstram a necessidade de um novo paradigma organizacional que possibilite novas orientações à captação de oportunidades. A saúde financeira e a capacidade técnica da empresa lhe asseguraram posição de destaque no cenário internacional. No entanto, as mudanças no contexto oriundas em especial no mercado chinês apontam para a necessidade de uma reformulação do processo de captação de novas oportunidades. Considerando o modelo teórico adotado, constataram-se as seguintes oportunidades de melhoria: (i) aprimoramento da fase inicial para uma etapa mais criativa, abstrata, multidisciplinar e com perspectiva de longo prazo; (ii) desenvolvimento de habilidades multifuncionais pelos departamentos de pesquisa e desenvolvimento; (iii) análise do potencial tecnológico dos concorrentes com base em práticas de tear-down para todos os segmentos de negócio; e (iv) indicação *a priori* de macrodiretivas pelo grupo diretor.

Palavras-chave: Front-end; Captação de novas oportunidades; Desenvolvimento de novos produtos; Gestão da inovação.

1 Introduction

Complex organizational relationships require decision makers to understand the environment clearly and chose alternatives suitable to the context in which the decision is being made by using their own or shared criteria. When facing unstructured problems, the search for efficiency and effectiveness presents decision makers with a range of information that is

outside their control. Increasingly, decision makers face uncertain and unpredictable environments, making decision making at minimum risky.

Among countless organizational choices, one concentrates on maintaining a competitive advantage that protects current customers and reaches new markets. Ansoff (1957) reinforced the “attack or

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defend” position when he suggested that firms that achieved success in the past may not be in the same position in the future unless they continuously innovate and compete. Given this dynamic iteration between attack or defend, it becomes reasonable to develop new solutions for products and services to support sustainable competitive advantage.

To advance this perspective, it is necessary to understand risks and properly address uncertainties. On one hand, firms yearn to evolve and advance in developing new products. On the other, firms fear failures and their financial impact. To overcome this paradox, organizations strive to reduce uncertainties and strengthen their ability to evolve. The response has been to learn and verify the multiple internal and external factors that can influence the different phases involved in new product development (Cooper, 2008).

The front-end process for new product development can represent a promising strategy for maintaining competitive distinction. Previous studies, however, have focused on a broad perspective, not considering the peculiarities of each sector and complexities of this process. Some studies (Khurana & Rosenthal, 1998; Cooper & Edgett, 2008) have focused on a generic model aimed at products used only by final consumers and not by other firms. Furthermore, the front-end process has not been largely investigated in a business-to-business context (Gov & Salle, 2008; Laplaca & Katrichis, 2009).

In this vein, the purpose of this article is to examine the procedures a Brazilian firm that manufactures electric motors, alias Sabre, has used in its front-end processes according to the model suggested by Florén & Frishammar (2012). The model is named the comprehensive framework of the Front End of New Product Development. The fictitious name of Sabre is used to assure firm privacy concerning information and conclusions.

The present paper is organized as follows. First, the issue and objective are introduced and explained. Second, the theoretical and practical issues are reviewed regarding the front end as a process. The paper then describes methodological procedures, as well as the dynamics of the sector and the front-end process Sabre adopted. Finally, a comparison of the procedures Sabre used and the theoretical model suggested by Florén & Frishammar (2012) is presented followed by final considerations.

2 New product developments

The uncertainties of the constantly changing global market stimulate firms to improve, maintain, or eliminate their internal processes, whether in a deterministic or voluntary manner. Countless aspects

can undergo change in the face of this difficult context, but one in particular appears to summarize the effort of the firm: New Product Development (NPD) (Cunningham, 1942).

2.1 Capturing opportunities: the *front end*

The term *front end* was constructed to describe the initial phase of NPD in which firms understand market needs and capture opportunities for new development. It is understood to be the embryonic phase of NPD, with crucial importance for the success of new products (Khurana & Rosenthal, 1998).

According to Florén & Frishammar (2012), the front end was previously understood as an informal activity at firms. Due to its fuzzy characteristics, this phase is typically understood to be an irregular decision-making process, considering its high complexity and uncertainty. The front end is also considered to involve a complex crossing of tacit information and knowledge permeated by organizational conflicts and pressure (Murphy & Kumar, 1997; Khurana & Rosenthal, 1998). Given these premises, it is possible to describe the front end as the initial phase of product development, a phase in which the firm comprehends the complete flow of ideas and engages in activities aimed at supporting this development. In addition, the FE can be considered a “slippery slope,” which can result in devastating consequences and create difficulties for high performance companies (Florén & Frishammar, 2012). Bacon et al. (1994) observed that the FE is characterized by low investment, combined with changes in the characteristics of the product. The decisions considered in this phase have severe implications for investments that will be made in the future amidst other NPD activities.

Developing the front-end process has been accompanied by intense academic research that has analyzed and mapped various models, without concern for the type of industry or even the characteristics of the project as Verganti affirmed (1997 apud Nobelius & Trygg, 2002). One organizational segment that remains understudied, despite its strong economic relevance, is the industrial segment (Laplaca & Katrichis, 2009; Lichtenthal & Mummalaneni, 2009). Few studies have aimed at NPD beyond consumer products (Frishammar et al., 2012). The industrial or business-to-business (B2B) segment entails a type of transaction between two or more organizations, in which the final consumer does not participate. Such product supply companies are in the middle of the production chain with a demand-pull. In this type of exchange, companies appear to have limited action in understanding, and consequently, capturing opportunities and trends.

2.1.1 Types of capturing opportunities: front end

Companies have adopted various models for the front end to manage the uncertainties of the initial process of capturing, selecting, and choosing new products (Reinertsen, 1994; Cooper & Kleinschmidt, 1995; Murphy & Kumar, 1997). Such models vary in terms of scope and vision, but generally seek to provide a related sequence of activities and recommendations regarding how to proceed with the pertinent elements of capturing and choosing the most promising opportunities.

The classic model of capturing new products developed in the mid-1980s has undergone modifications and adjustments that allow better adherence to corporate reality. Companies have adjusted to create viable flexibility, adaptation, governance and in particular to support proactive front-end action (Cooper, 2009). In light of these advances, and based on extant theoretical research, it is possible to condense front-end models to three macro-proposals. The first purports a functional approach, describing the phase of capturing new product opportunities as a linear sequence of steps, which can be applied generally and universally in any company. The second proposal adds strategic questions to the process, advancing to product planning. Finally, the most contemporary proposals consider, beyond the factors mentioned, questions related to social and political aspects, such as legitimizing opportunities and aligning opportunities to the company.

Koen et al. (2001), in recognizing the existence of an abundant quantity of terms related to the front end, suggested homogenizing the definitions of the key elements and terms used in the initial product development phase. By conducting an empiric study, these authors distinguished five elements that can operate in a nonsequential form (Figure 1).

Identifying opportunities is the first element required for capturing opportunities with a still unknown degree of innovation (incremental or radical), which are realized in a still poorly structured manner. The second element is analyzing those opportunities that can be translated into opportunities that represent tangible business. The third element is the genesis of ideas, which is considered to be an evolutive and interactive process, which ranges from the birth to the maturation of the opportunity into a tangible idea. The fourth element considers selecting previously captured ideas and deciding which to pursue based on evaluating the potential value of the business they can generate. The fifth element involves technological and conceptual development. In this step, the business plan is developed and is supported by estimates of market potential, market needs, investment needs,

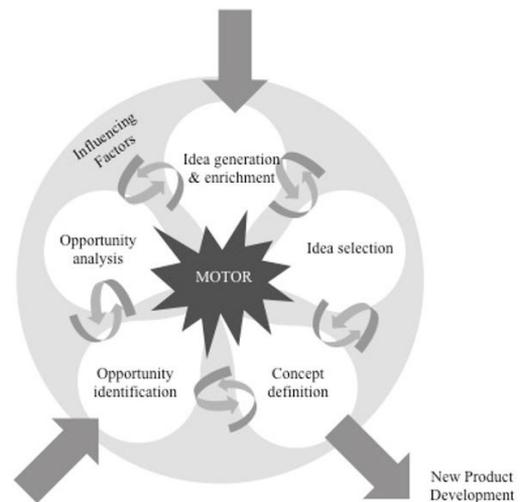


Figure 1. Key Front-end factors. Source: Koen et al. (2001).

as well as conducting a competitive analysis and evaluating project uncertainty.

Florén & Frishammar (2012) proposed a model that diverged from previous proposals by including not only functional, but also social network perspectives and political characteristics related to capturing new opportunities. Their proposal recognizes complexity and uncertainty, which are permeated by tacit knowledge, organizational conflicts, and processes that make the front-end process quite complex. The authors also recognize that before initiating product development, it is necessary for companies to address three challenges: 1) have a clear understanding of the outcome of the front end; 2) have a clear understanding of the activities that must be performed in the front end; and 3) have knowledge of the potential countermeasures to avoid pitfalls during the process. The model presented on the figure 2, suggests that firms develop a corroborated product definition underlined by core activities: (1) idea and concept (I/C) development; (1a) I/C refinement and (1b) I/C screening; (2a) I/C internal alignment and (2b) I/C external alignment; and (3) I/C legitimization.

This proposed structure is segmented into large groups. The first group is the final result sought, which clarifies for everyone in the company what the result of this innovation management process will be, as materialized by means of a “corroborated product definition.” Montoya-Weiss & O’Driscoll (2000) supported the idea that although the process is important, the design of the expected outcome also contributes to a more effective flow in new product development.

The other group in the Florén & Frishammar (2012) model contemplates the capture, development,

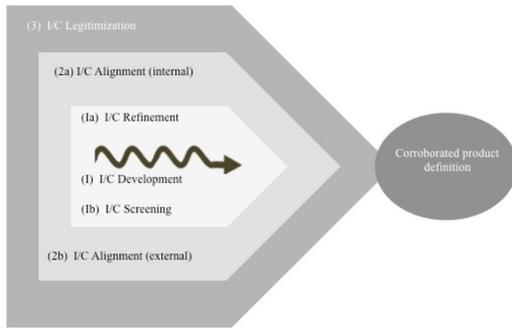


Figure 2. Comprehensive framework for the front end of new product development. Source: Florén & Frishammar (2012).

refinement, and screening of the opportunities. The first subgroup is called I/C development (1) and represents the nexus at which the influences of market needs and technology impulses are forged. The authors consider this as the first activity in the front end. Brem & Voigt (2009) affirmed that there is no correct way to balance the two forces of technology push and market pull, and that the environmental variations of each company, such as industry characteristics or organizational history should be considered when developing the company strategy. The next activity is I/C Refinement (1a). This activity is characterized particularly by creativity and experimentation and is the driving force that catalyzes ideas toward conceiving the product. At this time, researchers can develop simple prototypes to validate the key concepts of the opportunities. Finally, there is the I/C screening (1b) activity, which involves the choice of proposals, which is now more strongly steered toward meeting market needs.

Meanwhile, a third characteristic of Florén and Frishammar's (2012 model) contemplates the internal and external alignment of the opportunities by proposing they adapt the emerging ideas to the organizational and operational strategy. In the internal alignment activity (2a), an effort is made to evaluate development by means of the organization's internal competencies. Danneels (2002) argued that internal competencies are explored broadly by a deterministic vision; nevertheless, if companies want to reinvent themselves, it is recommended that the competencies in NPD assume a voluntary role. The external alignment activity (2b) addresses factors external to the organization, such as competitors. In this activity, according to the authors, companies need to validate how their future product portfolio is presented, through real supply and what points must be adjusted. The authors consider both internal and external alignment crucial to the FE's outcome.

The final activity focuses on the legitimization of the projects (3) to be developed by the firms' groups of interest. This activity stems from the need to have the political powers inherent to companies approve the NPD; indeed, it is understood that these tacit forces either negatively or positively influence whether this development will advance (Weissenberger-Eibl & Teufel, 2011). Florén & Frishammar (2012) justify this activity by considering the need to protect NPD from political and social factors and their problems. Two divergent points are considered in evaluating this activity. The first relates to the possibility that good ideas might be rejected or ignored due to low political support as reflected in low commitment among managers in making the opportunity viable (Griffiths-Hemans & Grover, 2006). The second point opposes the first, given that it considers the potential that bad ideas can advance and thus develop new products simply because individual powers within the organization supports them. This can lead to increased costs and swollen projects.

Thus, it can be concluded that the structure Florén & Frishammar (2012) proposed encompasses relevant factors in capturing new opportunities. In addition to factors related to capturing opportunities and managing risk by screening and testing potential solutions, the model involves themes related to the internal and external alignment of the resources and stakeholders, as well as political legitimization. This allows firms to achieve a broader proposal, given that it addresses both rational and tacit factors, giving potential to their applicability in the present study.

3 Methodology

The present research is of a qualitative nature, because it is based on description and interpretation. These tasks were conducted by analyzing documents, conducting interviews, and observing participants, complemented by the researchers' experience. The goal was to holistically understand the process of capturing new opportunities for product development at the Sabre electric motor company.

Sabre, the object of this study, was selected because of its prominence in the Brazilian industrial context. It has been awarded by FINEP (the Federal Research and Project Finance Agency) as one of Brazil's most innovative companies. Attesting to its prominence, the company originated in Brazil and now has factory operations in the United States, Europe, and Asia.

The surveyed interviewees were employees who have at least two years of experience in the process of capturing new opportunities for industrial product development. Ten employees were interviewed who had the equivalent of graduate level education and hold a specialization (master's and doctoral degrees)

and who hold the position of specialist, leader, manager, or director. A specialist is an employee with no subordinates, a leader has up to five subordinates, a manager up to 30 subordinates, and a director has up to 50 or more subordinates. The interviews were conducted among the research participants in August 2013, in an exclusive meeting room and lasted an average of 60 minutes.

The statements collected in the interviews were recorded, transcribed, and grouped according to the dimensions analyzed (development, alignment, and legitimization) found in Florén & Frishammar's (2012) proposed model. Statements were then subject to content analysis. The dimensions of development, alignment, and legitimation were subdivided into categories to group the statements and prepare a summarized text (Mozzato & Grzybovski, 2011). The researchers also used Sabre company documents to support the description and interpretation process (project reports, reports of sustainability studies, and meeting minutes), as well as participant observation, because the interviewed individuals worked in the process of capturing new business development opportunities (Bruyne et al., 1991; Triviños, 1992).

4 The Sabre company

4.1 Overview

Sabre's production accounts for nearly one quarter of the global market share and in 2012 was the global leader. It has approximately 12,000 employees in factories spread throughout Europe, the Americas, and Asia. Its products are sold in more than 80 countries. Its global directive is to maintain its leadership in technology; therefore, it allocates approximately 5% of its net income to research and development, encouraging employees to develop patents for new technologies. Its financial reports indicate that more than 50% of its income comes from products created in the past four years (incremental innovations), characterizing it as an innovative company (SABRE, 2012).

4.2 History of the front-end perspective at Sabre

Sabre was founded in the 1970s, born from the efforts of Brazilian home appliance manufacturers to supply its domestic market rather than using imports. During this period, a European supplier mostly supplied the Brazilian market. The company was created by a partnership with the European supplier, which granted Sabre a concession to use its technology to manufacture electric motors. With the technology in hand, a factory was built in the 1970s, allowing the organization to begin supplying the domestic market

and later advance to countries in Latin America and North America.

In the 1980s, demands for energy efficiency began to be incorporated into Sabre's portfolio of products, and the company began to manufacture a second model, but still used imported technology. The first product using new energy efficient technology was conceived at the end of this decade. In the same period, the company advanced toward globalization and opened a North American office. By the end of the 1980s, Sabre had manufactured 50 million products (SABRE, 2007).

In the 1990s, the company diversified its portfolio by developing new and related products. This led to downward vertical integration by initiating the development and sale of some electrical components, fulfilling its product portfolio. Until this time, these components were imported or purchased from other suppliers. To make this strategy viable, the organization built a new factory in a city close to its headquarters. In the same period, perceiving the global environmental trend, the needs of product manufacturers, and international regulations (e.g., the Kyoto protocol), Sabre launched products that could be used without chlorofluorocarbons (Shehan, 2012). This decade was also marked by acquisitions of other factories in Europe and a joint venture in Asia (SABRE, 2009).

In the first decade of 2000, a new management style was adopted by Sabre. The company was purchased by one of its U.S. clients, with the objective of assuring a sustainable growth platform through financial efficiency and expanding the group's financial capacity. To sustain this strategy a career executive, with bold and objective characteristics, were indicated as a CEO. With this new management, the company shed radical and unrelated opportunities that do not have the clear visibility of future financial return. At least three projects were eliminated from the company's roadmap (i.e., its development portfolio) that was born from a process of capturing new opportunities, which had been a bit turbulent. These movements appear to be catalyzed by radical changes in the external environment, such as financial crises, financial stagnation of the main consumer regions, and advances by Asian competitors.

Based on a historic survey, it became clear that Sabre's handling of new product development underwent a change in positioning. In the past, strategic movements focused on verticalization and territorial expansion. In recent years, however, a greater effort has been made in conducting diversification not characterized by radical innovation. These facts appear to be related to external events (competition and market saturation), as well as a change in the executive leadership.

4.3 The process of capturing new opportunities at Sabre

This section presents the process of capturing opportunities and a summary of the main arguments collected during the interviews conducted with managers.

4.3.1 Dimension 1: I/C development

In the initial phase or the development dimension, the organization supports two processes: 1) *regional workshops*; and 2) *preliminary-workshops*. The objective of these tasks is to list and prioritize the opportunities the organization has captured. The *regional workshop* consist of consulting all the sales engineers and technical assistants who have contact with the clients to collect potential opportunities that they notice during their work routines. In this activity, meetings are held by video- or audio-conferencing, which last approximately two hours, in which the mediator (from the marketing department) asks where new opportunities can be found. To encourage discussion, the mediator provides the staff with statistical information about the market and trends and movements by competitors that are refuted or corroborated. The mediator concludes the meeting by listing potential gaps in the market to be evaluated in the short- and long terms. Given this survey, the mediator summarizes each opportunity, listing the market need, potential volume, financial return expected and the general scope of the project. Finally, the mediator, by means of an ordinal rank, suggests a score for the four dimensions evaluated: urgency of market demand; financial return; leadership of the product; and ease of implementation, varying from 1 for weaker to 5 for stronger. The scores given to each opportunity are multiplied; resulting in a preliminary prioritized list regarding which opportunities should be addressed first and investigated further in a dedicated business plan.

A *preliminary-workshop* for the products evaluates the ideas' technical opportunities and reviews the notes about each individual opportunity. The research and development department investigates the technical viability of the opportunities, which after a week of work conducted independently, responds to the company about what is possible to do and what is not. With this technical assessment, the marketing department once again brings together the directors to review, in a negotiating meeting, the notes for each opportunity. With the scope of the project refined and the notes revised, the list of company priorities is established. Based on this list, the research and development department determines the company's ability to absorb new demands, considering current projects and the general complexity of each opportunity.

After this activity, the marketing department meets with the strategic planning department to assemble the material to be debated in activity 2, that is, the internal and external alignment.

4.3.1.1 I/C refinement (1a)

The objective of the refinement category according to Florén & Frishammar (2012) is to identify and model the ideas and opportunities, based on sweeping, searching, and exploring new technologies and market needs that remain underexplored. This is a descriptive phase of capturing opportunities. In this direction, according to those interviewed:

E1: [...] the first moment (refinement) was constructed during the meeting; the points were raised and then corroborated or refuted by the participants...

E2: [...] in the capturing phase, I saw lots of chances, because lots of things came from sales and technical assistance that were not very clear...

E7: I perceived many issues for adjustments, where some members foresee future movement by competitors. At these times some projects wind up being passed over in detriment to others for various reasons, even in an initial phase.

In this phase, the administrator sought to capture potential new developments, without judging them, as seen in the commentary of respondent E2.

4.3.1.2 I/C screening (1b)

The purpose of the category screening is to evaluate the ideas and opportunities and select them, with the goal of assuring that the clients' needs are met and evaluating if they should advance in the process of capturing opportunities. Ideas and concepts are filtered such that good ideas proceed and that poor ideas are abandoned. According to those interviewed:

E1: [...] in the confrontation of ideas, a common point was reached....In this phase, there is considerable conflict, with different points of view. [...] What I think is very interesting is that this year scales were constructed, different from last year (which from what I understood, involved shouting)

E2: [...] what I saw was very much a negotiation between the confrontation of R&D and sales/marketing [...]

E3: I usually give priority to projects after the quantification phase, comparing the sequence two by two, to see if the list was consistent with my feeling [...]. And it is at this moment that negotiation

comes into play[...]There must be a calibration of the numeric model with the feeling[...]

E5: It is not only a financial index that determines our world[...]we quantify, but not only by financial value but also by other attributes, such as technological leadership[...]

The Sabre company supports its decisions using a numeric scale composed of four criteria: the market urgency, financial return, ease of implementation, and maintenance of the current position. This system allows Sabre to establish priorities and create an ordered list of development. These dimensions are evaluated on a scale of 1 to 5 according to the expected result. The ordered list is obtained based on multiplying scores contributed by members of the responsible committee, which is composed of sales, product development, strategic planning, and marketing. After the priority list is constructed, adjustments are made to evaluate how well (or poorly) the numbers conform to the desires of those interested. With the ordered list in hand, the decision-makers adjust the parameters, raising or lowering the scores attributed to the criteria, seeking to assure that the list represents the interests of the team of directors (respondent E3).

4.3.2 Dimension 2: I/C alignment

The alignment dimension has two components: 2a) internal alignment and 2b) external alignment, which are evaluated during a meeting called a product workshop. Evaluating these two categories occurs in a two-part sequence. First, for internal alignment, the research and development department evaluates two points: i) the capacity or ability of internal resources to absorb new developments and ii) the maximum number of projects that can be absorbed when also considering other projects under development. This establishes a cut-off point for the previously prepared list of priorities as determined by the company's limits. Second, external alignment, conducted by the strategic planning department, summarizes an investigation of three external dimensions: i) the potential movement of future competitors, ii) new regulations that were not observed in previous phases, and iii) the financial impact of the projects in total, considering the investments to be realized, the time required for development, and the expected returns.

Based on this mature prioritized project list, which has been evaluated internally and externally, the directors conduct a meeting during which they criticize and ponder the conclusions constructed, with the larger purpose of seeking technological leadership. After this round of debates, specific corrective evaluations are conducted for phase 3.

4.3.2.1 I/C alignment internal (2a)

The purpose of evaluating internal environment is to verify if the organization has the human and structural resources needed and available to absorb the previously evaluated opportunities. According to those interviewed:

E4: In this phase, the business model predominated, because the market indicated what it needed and the R&D personnel said that this would be part of a future development or not.

E5: The discussion wound up falling into a negotiation, given that everyone was not aware of what was best for the organization[...]With this, the departments were left banging their heads against each other to prove what was most important[...]There were many checks of consistency to evaluate if the development made sense considering the available resources.

E6: There must be a negotiation to accommodate the projects that are outside the main list[...]This is not an internal negotiation, but a broad negotiation to evaluate all the resources that we have available at the company.

E7: There's no point in letting an opportunity enter if we know that it will consume all the resources... What the R&D mediator did after receiving the list was to leave with the list of projects under his arm and negotiate with the departments how to accommodate them.

It is important to emphasize that the organization of the R&D department at the company studied is separated into two divisions based on market segment: domestic and commercial. The domestic market consumes most of the company's internal resources, reaching up to 75%, with the commercial division having the rest. In 2013, due to conflicts over this division and the list of priorities, a new internal division of resources was created. Given this situation, the debate is not limited to evaluating the viability of developing projects. The list of priorities encouraged adopting a new configuration to distribute internal resources, supporting the debates and the negotiations around the business strategy, as reported by respondents E6 and E7.

4.3.2.2 I/C alignment external (2b)

The objective of the external environment is to investigate the relationship between new developments and factors external to the organization's limits. Among the external conditions that stand out to *stakeholders* are competitors and government actions that lead to

new regulations. Sabre uses a color-coding method that measures NPD based on subjective evaluations of how the company's product portfolio will face the competition in the medium- and long-term. This involves a tool titled "Farol" (meaning headlight), which is composed of three viewpoints: short-, medium-, and long-term.

For each of these perspectives, the company portfolio is evaluated and divided into product categories. Given this disposition, each product category receives a color (green, yellow, or red), which represents the category's relationship to competitors and regulations. For example, the category of products X can be green in the short-term, indicating the products are a "go." With the potential movement of a competitor, however, in the medium-term products X can pass to yellow, indicating caution. If nothing is done, this category will become red in the long-term with the deterioration of sales. This valued control panel reaffirms the need for projects to be developed, to place the company in a vanguard position in relation to competitors and regulations. According to those interviewed:

E5: I think that today there's lots of negotiation, but there should be more of a joint focus. This is the fault of marketing and R&D.

E6: The external alignment had a quite satisfactory result, mainly for the sales team...For the external alignment, at the end, it depended on one person, in which the commercial director was able to program with greater ease with his sales team, and in this case, it's not just numbers, but the ease of implementation.

E7: At the conclusion, it was realized that it was necessary to look at the competitors, when I believe that this variable should be part of the first phase[...] At times the information from competitors came, but it was not organized[...]The organization that I want is this, my strategy to reach it is this, and everything that I am saying is in agreement with this strategy.

It was found that the sales department indicates in the short-term the more fragile parts of the product portfolio, by means of the Farol tool, which tacitly reveals the focus that should be considered, according to the statements of respondents E6 and E7.

4.3.3 Dimension 3: I/C legitimization

The dimension of legitimization seeks to approve the previously made decisions at different strategic levels and to attest to two points: i) alignment between the opportunities captured and the company's macro-strategy and ii) the search for impartiality

and verification of the decisions' good standing in relation to the company's sociopolitical environment. For the employees making these assessments, this step could be described as maximizing the projects' financial returns and considering additional volumes or minimizing loss of volumes to competitors through clear, objective, and impartial goals. This dimension differs from the others because it does not have smaller analytical categories to consider, as indicated by the model of the comprehensive structure (Figure 2). According to those interviewed:

E1: It was more of a sample of what was already a consensus among the directors.

E2: I think that to justify their decisions (the directors) use the model with satisfactory outcome, because other points were considered beyond the financial results.

E3: I think that legitimization is a phase in which no decision is made[...]The numeric criteria must, in some way, express what the validator (president) has as a premise[...]If we do not present the ingredients that the decision maker will consider, the result can fail.

E4: The deal was already well-prepared, and it was basically a presentation and validation.

5 Discussion

To facilitate understanding of front-end processing of NPD, an illustrated figure is presented with the elements of the theoretical model parallel with the empiric model used by the Sabre company in the process of capturing new opportunities. Indeed, the company studied captures new opportunities in a manner related to the model presented by Florén & Frishammar (2012), but with its own nomenclature and in a slightly different form in some dimensions, as indicated in Figure 3.

Unlike the model suggested by Florén & Frishammar (2012), Sabre uses remote product workshop meetings to debate emerging issues related to NPD in a limited forum. The Marketing department chooses these themes to align the short-term actions that influence new product development (development, alignment, and legitimization).

This discussion of the results encompasses the strategic, historic, and procedural spheres. In strategic and historic terms, the company evaluated, pseudonym Sabre, has been in business 50 years with a recognized image and international legitimacy in the market in which it operates. The decision Sabre has made until this time has guaranteed a sustainable financial operation that appears to meet investor expectations.

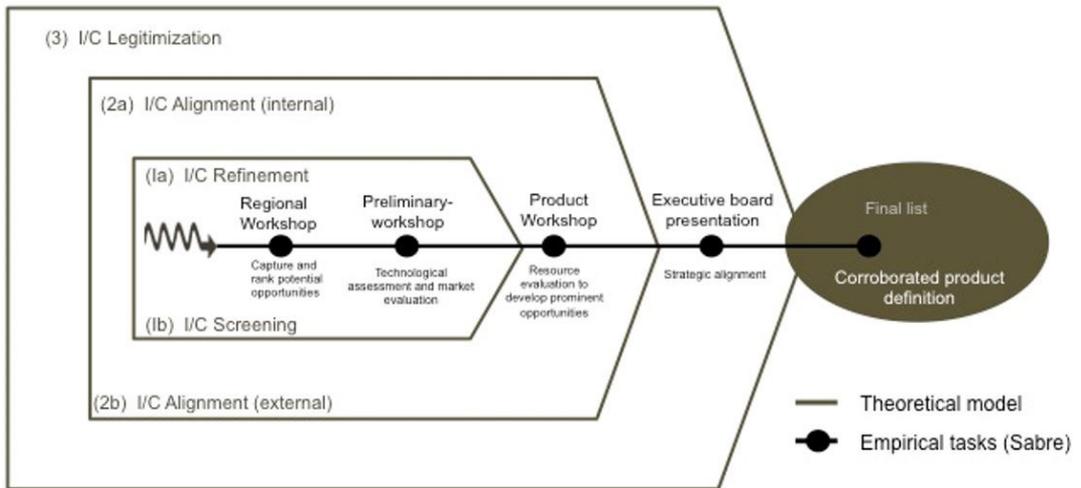


Figure 3. Merger of the theoretical model (Florén & Frishammar, 2012) and empiric tasks at Sabre.

The growing general profit margin attests to its sales prerogatives. Various events related to decision-making demonstrate that the company perceived changes in the external environment and changed its approach to selecting new products in order to assure its sustainability. Among these facts, it is possible to perceive: i) the change in routine for approving opportunities; ii) different corporate governance models; iii) a hotly disputed political arena and; iv) cases of failure in capturing new opportunities.

Note that the organization became global after three decades of operation, leveraged by backwards verticalization and by a related portfolio diversification (Mintzberg, 1988). This transformation became sharper in the last decade when one of the company's U.S. clients purchased the business. Because of this merger, an "Anglo-Saxon" management model was established as the interorganizational standard. Before 2010, decisions concerning capturing new opportunities were made randomly, and in the past three years, the company migrated to a more cyclic and formal mode to meet the agenda of the U.S. matrix. Moreover, by becoming part of a group with international capital, it is also observed that English's terms were adopted, with the use of terms dedicated to a publically traded company.

In the first four decades of Sabre's operation, the market was shared between the company studied and at least five competitors within the United States and Europe (UFSC, 2008). The international competition, regional saturation, and the search for inexpensive labor led these concentrated players to move to Asia, where they trained local suppliers to

manufacture quality parts. This move strengthened the rise of large Chinese companies (UFSC, 2008).

Finally, the company endured a learning curve and has scars from failures in developing commercially infertile ideas and concepts. In the past five years, the company had at least two cases of unsuccessful developments, provoked particularly by a rudimentary vision of business in capturing new opportunities. These failures entailed: i) a motor of extremely small external dimensions, conceived for refrigeration applications in large environments, although without a clear proposal of value for the final client, and ii) a product aimed at the final cliente, in a business-to-customer (B2C) concept, designed to assist air-cooling of large trucks used in highway transport.

The procedural sphere represents the main object of study of the present article, in that it sought to discuss the current construct Sabre adopted in relation to the theoretical model for capturing new opportunities Florén & Frishammar (2012) proposed.

The category refinement (1a) on Figure 3, related to the development dimension, is the genesis of the process. Characterized predominantly by creativity (Mintzberg & Westley, 2001) and experimentation, this phase promotes an open-goal model, in which the abundance of ideas must be cultivated, even if they are sterile. In this phase, there is no commitment to performance indicators, which makes constructing the ideas more malleable. According to Frishammar et al. (2012), during this phase a team seeks to capture opportunities that are still raw, so that they can later be honed with the objective of defining a winning product. In contrast, the recent experiences of failure (Lynn et al., 1996) erect an implicit barrier, confronting

the organization with the challenge of developing abstract abilities.

Thus, this involves a step in which there is a scarcity of information, which requires an additional ability to deal with the risk (Boeddrich, 2004). To minimize this risk, quantification can be an option according to the functionalists, although, it is a tacit straightjacket for a company that needs to develop new paradigms to distance itself from competitors. These influences wind up forcing a migration from a focus of experiences and intuition to an emphasis on absolute quantification (Amaral & Sousa, 2011).

The screening category (1b) on Figure 3, which belongs to the development dimension, is discriminated as a phase posterior to the refinement step and is aimed at filtering ideas and concepts by establishing priorities. Whereas the previous category sought to capture the maximum number of opportunities, in this phase, shared metrics are aligned to company macro-strategies to establish the priorities of projects that should advance or not. This means constructing a cutoff point between what continues in the process and what will remain in a still raw form. At some companies this step is treated poorly, and this phase only serves to eliminate losing projects (Zien & Buckler, 1997). Although this is not a sophisticated phase (Kung et al., 2012), this step should use metrics that adhere the ideas and concepts to the company context.

Considering this prerogative, Sabre developed four holistic criteria (market urgency, financial return, leadership of the product, and ease of implementation), which sought to rank the opportunities using qualitative and quantitative measures. According to Brem & Voigt (2009), in this step the integration between the departments of marketing and research and development usually occur in a competitive manner. Project by project, the departments debate each criterion that will ultimately produce a score for the opportunities. In addition, this process establishes a nearly unconscious race for the project that is most interesting from each perspective. The sector that has the best evidence and power to persuade can change the numerical scores and alter the sequence of new developments.

The dimension of internal alignment (2a) on Figure 3 seeks the disposition between the company's internal resources and the new demands needed to execute the established projects. Some theoretical evidence demonstrates that high performance companies relate the decisions about the product specifications with market needs right at the front-end (Khurana & Rosenthal, 1998). There are some examples of failure in this alignment, in which product development is initiated without the

competence to do so (Prahalad & Hamel, 1990). For example, the company may decide to develop products without the ability to do so. In this sense, it is important that there is a fit between the project development and the company's competencies (Verganti, 1997).

In the cycle of capturing opportunities for the current year, note that the list of priorities will establish a new division of departmental resources within the research and development sector. Until this time, the group objectives of segment "A" were superimposed on the company objectives. There was ambivalence between the organizational directive and the internal division of resources. Although the corporate strategy directed the internal resources to segment "B," segment "A" was the area with the largest number of resources. This configuration was established because segment "A" had greater power within the company.

The category referring to external alignment (2b) on Figure 3 is aimed at verifying the external factors and the company's internal conditions. Sabre adopted a tool called Farol (meaning headlight) that presents a framework that compares its portfolio and the current and future perception of the market. This method uses subjective factors to analyze the current portfolio and forecast its future status (red, yellow or green), considering new developments to be realized. In a pragmatic manner, today a product category might be in the red (no go). Subsequently, it might be compared to the competition and regulations and thus changes to the color green (move forward) in five years considering the development of three new products.

Finally, there is the dimension of legitimacy (3) on Figure 3, which confirm everything prepared up until now. According to a study conducted at the Xerox company by Chesbrough & Rosenbloom (2002), the objective of this step became an administrative redundancy by assuring that good opportunities were approved and bad opportunities were rejected. In this sphere, the company adopted a formal meeting with its main executives, at which the directors defended the portfolio of projects proposed for the future based on a rational model approved by the organizational culture. The step became pro-forma, that is, one in which the decisions had already been made and leaving only the presentation to the president.

The discussion of the elements of the theoretical model of Florén & Frishammar (2012), in parallel to the tasks realized by the Sabre company created opportunities to improve the process of capturing new opportunities in new product development (see Chart 1).

Chart 1. Contrast of the theoretical and the practical and recommendations.

Category	Tasks realized	Opportunities for improvement
1a – I/C Refinement	<ul style="list-style-type: none"> • Closed meetings, in workshops and restricted to the emergent themes including in particular the sales and marketing team. 	<ul style="list-style-type: none"> • Meetings dedicated to stimulating the creative process looking at the long term and breaking product paradigms. • In-person workshops, with the participation of external stakeholders; such as clients and suppliers, as well as other interested departments; • Implementation of an information system that allows capturing and rewarding ideas coming from different social groups, such as: government, universities, regulators and the community;
1b – I/C Selection	<ul style="list-style-type: none"> • Use of four holistic criteria (market urgency, financial return, leadership of product, and ease of implementation), which use qualitative and quantitative reasons to rank the opportunities. 	<ul style="list-style-type: none"> • The grades for the criteria should be given not only by the Marketing department, but by the responsible departments and then debated and refined until the more convincing opinions and evidence are established.
2a – I/C Internal alignment	<ul style="list-style-type: none"> • Analysis if the current resources (human and structural) have the capacity to develop the opportunities captured. 	<ul style="list-style-type: none"> • Development of the multifunctional and voluntary abilities that allow the research and development groups to develop projects of different natures;
2b – I/C External alignment	<ul style="list-style-type: none"> • Technological evaluation and cost of competitors, conducted mostly subjectively. 	<ul style="list-style-type: none"> • Analytical evaluation of costs conducted with specific criteria to evaluate particularly to determine if competitors have achieved the technological limit of the respective product or if there is room for new improvements using tear-down practices.
3 – I/C Legitimization	<ul style="list-style-type: none"> • Presentation of the portfolio of projects realized by the directors to the vice presidents. 	<ul style="list-style-type: none"> • Macro guidelines conceived before beginning the process of capturing new opportunities by the vice presidents, indicating which battles should be given priority to reduce efforts and unnecessary evaluations. • Inclusion of at least one member from each region on the legitimizing committee capable of identifying remaining gaps and facilitating the dissemination of the decision-making process. • Annual review of the process.

Source: Authors (2013).

6 Final considerations

The company evaluated, Sabre, has enjoyed global success in its development until now as indicated by its internal reports. Their resource and capabilities give it a prominent international position. Nevertheless, changes in the international context, caused by economic crises and the saturation of consolidated markets, require a process of capturing new opportunities in an unconventional manner.

For Sabre, this process started in 2011 and is now consolidated as a predominantly political and combative decision-making process. These characteristics appear to be motivated by three factors: i) a history of failure in radical and unrelated innovations, ii) rapid advances by competitors with the proposition of new paradigms, and iii) a power struggle generated between the research and development department, which is focused on the long-term, and the business department, which is focused on the short-term.

To deal with this context, the company adopted a process with an instrumental focus and the search for maximization, even in predominantly creative phases, which can represent a straightjacket for new product development.

Considering this competitive arena, in which there are aggressive competitors, saturated markets, and internal resources weakened by memories of failures in NPD, the question arises: How to advance current activities and ensure competitive advantage for the long term? To respond to this question, the present study showed that improvements can be made by improving four actions: 1) adopting a more creative initial phase, 2) developing multifunctional capacities, 3) analyzing the technological potential of competitors, and 4) adoption a priori macro guidelines.

The first of these actions, which refers to expanding the phase of capturing opportunities using a more creative format, is restricted to formal workshops conducted by means of remote meetings at which participating members share regional opportunities. These meetings are closed and do not involve market-based partners (customers and suppliers). Creative dynamics or even brainstorming discussions are not included. Given this formalization, the interaction among the members is limited and the opportunities are only judged when they can be developed and better explored. The second action involves developing multifunctional abilities in the R&D department. This research group has specific knowledge that allows it to work for long periods in correlated projects. Its technical capacities are limited to particular routines, which restricts developing talent in other research fields. This format promotes greater accuracy in research, although it decreases the velocity of development in terms of emerging opportunities and those outside the conventional scope. As a result, there is a restriction of the *dynamic capacity* to be adapted to changes of context. The third action is related to the adoption of technical evaluations of the competitors by means of *tear-down*. The present study found that only some competitors are investigated. These restrictions result in a limited vision of the technological potential of competitors. The fourth and final action involves the a priori indication of the macro technological directives or conditions that restrict the format of the front end, such as, for example, the availability of investment capital for the year under discussion and the possibility of expanding the R&D group. It was found that this information only appears at the end of the process, in the legitimation phase. This discourages the groups involved and discredits the process.

Capturing opportunities that require a review and interaction among the steps of the NPD process represent one route. The first step is taken by constructing a

systematic process dedicated to capturing, selecting, prioritizing, and relating the internal and external resources, and finally to approving the new ideas and opportunities. In general, it seems correct to accept the imperfection of the process of construction of new products by legitimizing uncertainty as a common element that is part of an evolutionary process. To evolve, it is necessary to make mistakes; then, using this knowledge, continue to evolve and develop people. Therefore, to become a creative company, the mistakes must be understood within the process of organizational learning.

Finally, the study presented limitations in the theoretical model and in the collection and treatment techniques used. In the theoretical model the limitations are related, for example, to the failure to address emerging phenomenon such as “open innovation” as well as strategic portfolio management. In addition, the data and information collected by means of perceptions, even if triangulated, can express the subjective impressions of the researchers in collecting and analyzing data and information. The data that emerges from perceptions can also change over time.

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Erratum

In the article “The front end as a process: the case of a multinational Brazilian firm”, DOI <http://dx.doi.org/10.1590/0104-530X1134-15>, published in *Gestão & Produção*, vol. 23, No. 3, pp. 459-472, on page 459:

Where it reads:

Fábio Gama¹, Nério Amboni², **Graziela Dias Alperstedt**², Mário César Barreto Moraes²

It should be read:

Fábio Gama¹, Nério Amboni², **Graziela Dias Alperstedt**², Mário César Barreto Moraes²