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SUBJECT AREA: ORGANIZATIONAL STRATEGY AND BEHAVIOR

# Characterization of Brazilian Industrial Companies' Processes and Challenges as to Innovation Management

*Caracterização de Processos e Desafios De Empresas Industriais Brasileiras na Gestão da Inovação*

*La caracterización de los procesos y desafíos de las empresas industriales brasileñas en la gestión de la innovación*

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## ABSTRACT

The goal of this study is to investigate the use of product innovation management practices and the challenges faced by organizations when increasing their innovative performance. To this end, we analyzed the relationships between internal organizational elements, as well as the influence of contextual factors (size, field and source of capital) in the characterization of innovation management systems and of barriers to innovation faced by each company. We chose this topic due to the fact that management processes that leverage innovative performance are not yet fully understood, and because of the lack of empirical studies that analyze the reality of the practices proposed in the organizational world, especially in Brazil.

As a conceptual basis, we presented modern approaches to innovation, which recognize that this should not be seen as an isolated event but as a process. Exploratory qualitative research was carried out by means of a multiple case study. In it, we studied the innovation management systems of four companies which present relevant product development activities in Brazil. As well as a detailed study of the elements of innovation management, this article includes contributions referring to the characterization of organizational challenges faced by organizations when managing their innovation process.

**Keywords:** Innovation management. Innovation management systems. Product development.

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## RESUMO

O objetivo deste artigo é investigar a adoção de práticas de gestão da inovação de produtos e os desafios enfrentados pelas organizações para aumentar seu desempenho inovador. Para tanto, são estudadas as relações entre os elementos organizacionais internos e a influência de fatores contextuais (porte, setor e origem do capital) na caracterização dos sistemas de gestão da inovação e dos obstáculos à inovação enfrentados por cada empresa. A escolha deste tema se justifica pelo fato de que processos de gestão que potencializam a performance inovativa ainda não estão totalmente desvendados e pela carência de trabalhos empíricos que analisem a realidade das práticas propostas no mundo organizacional, em especial no Brasil. Como base conceitual, são apresentadas abordagens modernas para a inovação, que reconhecem que esta não deve ser enxergada como um evento isolado, mas sim como um processo. A realização de pesquisa exploratória qualitativa é efetuada por meio de um estudo de casos múltiplos. Nele, os sistemas de gestão da inovação de quatro empresas com atividade relevante de desenvolvimento de produtos no Brasil são estudados. Além do estudo detalhado dos elementos da gestão da inovação, o artigo traz contribuições ligadas à caracterização dos desafios organizacionais enfrentados pelas organizações para gerir seu processo inovador.

**Palavras-chave:** Gestão da inovação. Sistemas de gestão da inovação. Desenvolvimento de produtos.

## RESUMEN

El objetivo de este trabajo es investigar la adopción de prácticas de gestión y los retos de innovación de productos que enfrentan las organizaciones para aumentar su capacidad de innovación. Por lo tanto, se estudió la relación entre los elementos internos de la organización y la influencia de los factores contextuales (tamaño, sector y fuente de capital) la caracterización de la gestión de la innovación y las barreras a la innovación que enfrenta cada empresa. La elección de este tema

se justifica por el hecho de que los procesos de gestión que aprovechan el desempeño innovador aún no están completamente desenredado y la falta de estudios empíricos que analizan la realidad de las prácticas propuestas en el mundo de las organizaciones, especialmente en Brasil. Como base conceptual, se presentan enfoques modernos a la innovación, donde se reconoce que esto no debería ser enjergado como un hecho aislado, sino como un proceso. La conclusión de la investigación exploratoria cualitativa se realiza a través de un estudio de caso múltiple. En él, se estudian los sistemas de gestión de las empresas con actividad innovadora de las cuatro de desarrollo de producto de referencia en Brasil. Además del estudio detallado de los elementos de la gestión de la innovación, el trabajo aporta contribuciones relacionadas con la caracterización de los desafíos organizacionales que enfrentan las organizaciones a gestionar sus procesos de innovación.

**Palabras clave:** Gestión de la innovación. Gestión de sistemas de innovación. Desarrollo de producto.

## 1 INTRODUCTION

The growing importance of innovation to competitiveness has been intensively recognized in the academic, social and organizational spheres. Many writers have tried to highlight that organizations must innovate in order to attain any sustainable success in the markets in which they operate, or even as a way of reinventing these markets.

Literature focused on this topic was for a long time fragmented, with surveys carried out in different fields with relatively little interaction between them (TIDD, BESSANT, PAVITT, 2008). Over the last decade, however, there was a significant improvement in organizational theory focused on innovation, with the emergence of integrated models of innovation management. Studies by Tidd, Bessant and Pavitt (2008), Bulgerman, Maiiqu and Wheelwright (2001)

and Quadros (2008) are milestones in proposing systemic constructs for this challenge. In this conceptual progress context, it is crucial to understand in what way innovation management practices have been used, and to investigate the effectiveness of these practices and how they (or their absence) refer to the obstacles faced by organizations when enhancing innovation.

The complexity of organizational innovation systems results in high specificity and dependence on the private or field context when characterizing the challenges of innovation management within an organization. Thus, as highlighted by Hansen and Birkinshaw (2007), each company has its own challenges as to innovation.

In this context, it is necessary to carry out research indicating what factors characterize each company's internal challenges, and the best paths to follow in each different situation. In this way, with a diagnosis of existing obstacles to enhancing innovation, benefits can be found for these companies – and different practices can be suggested with greater precision. Since innovation is crucial to competitiveness, several spheres (academic, field, government) have been mobilized to advance the innovative potential of Brazilian industries.

Based on this fact, this research aims at analyzing the relationship between the innovation management process and challenges faced by industrial companies that are presently active in Brazil. Therefore, its analysis of innovation management is based on the following processes, according to Quadros (2008): 1) Prospecting; 2) Ideation; 3) Strategy building; 4) Resource Mobilization; 5) Implementation; and 6) Evaluation.

In fact, we systematized the theory concerning this topic; this will later orient analysis of innovation systems within the companies investigated by this multiple case study. As well as analyzing each company individually, comparative analysis between cases was also carried out – from whence most of this paper's contributions were extracted.

## 2 INNOVATION MANAGEMENT PROCESSES

An important reference for conceptualizing innovation can be found in the Oslo Manual. This document, published by the Organization for Economic Co-operation and Development (OECD), defines innovation thus: “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations” (OECD, 2006). Based on this definition, the Oslo Manual classifies innovation in four main types: product, process, marketing and organizational. Product innovation, main focus of this study, is defined as the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses (OCDE, 2006).

Modern approaches to innovation recognize that it should not be seen as an isolated event but as a process. This procedural character explains the need to concatenate the various activities and fields involved in this challenge in a structured way. Furthermore, it reinforces the importance of mapping the relationships between fields and developing a set of practices and routines that enhance and accelerate the implementation of any innovative activity (TIDD, BESSANT, PAVITT, 2008).

Importantly, we must highlight certain studies involving innovation management process models that are present in literature over the last decade. The models which contain procedural approaches are the most frequent, with emphasis on the analysis of innovation management strategies at the organizational level.

Adams, Besant and Phelps (2006) established a model with seven categories (of innovation management processes): input management, knowledge management, innovation strategy, organizational culture and structure, portfolio management, project management and commercialization.

Hansen and Birkinshaw (2007), on the other hand, presented the innovation value

chain model, made up of three phases – idea generation, conversion and diffusion – and six connective tasks: collaboration within units, collaboration across units, collaboration with outside parties; idea selection and development; and dissemination of selected ideas.

A complementary view to this procedural approach to innovation is the innovation funnel, initially proposed by Wheelwright and Clark (1992), which looks at the process from the perspective of successive selection of ideas and initiatives, whilst they are matured from the perspectives of viability and attractiveness.

Another approach to innovation management processes is the conceptual one, such as studies by Marinova and Phillimore (2003) on the developmental stages of innovation models, as well as their advantages and disadvantages.

Below – based on Quadros (2008) –, we will present each innovation management process.

## 2.1 Prospecting

Prospecting is capturing and understanding the changing trends in the status quo. Collecting and analyzing information regarding the opportunity to place a new element in the competitive arena are key parts of this innovative process. Indeed, by introducing an innovative product into the market, a new consumer/customer value proposition will be delivered. Since this concerns product innovation, the possibility of introducing innovations can come from several dimensions: (1) the advent of new technologies that offer new solutions and benefits; (2) changing consumers/customer trends and needs; (3) movements by the competition that feed new market strategies; and (4) changes in the microenvironment that can influence field realities (STEFANOVITZ, NAGANO, 2013).

## 2.2 Ideation

Based on the signals collected by prospective analysis, ideation looks for proposed pre-projects that are in line with opportunities identified. Good ideas are the raw material

of innovation. The originality that is basic to innovation requires that there be, right now, a different proposal for solving a problem or seizing an opportunity.

This phase is creative, but it is not based only on inspiration. This process is responsible for generating proposals that break the boundaries between the existing and the desirable. It should include intense analysis of information, crossing signs and trends from different fields of knowledge, joining of fragments, and idea generation and evaluation (STEFANOVITZ, NAGANO, 2013).

Despite the difficulty in structuring creative work in a precise way, it can in fact be minimally disciplined. Among the good practices that are inherent to this challenge we highlight capturing existing ideas; keeping ideas alive and inducing their evolution; imagining new uses for old ideas; and the promising concepts test (HARGADON, SUTTON, 2000).

Amongst practices for generating ideas, we must also highlight brainstorming – in which individuals from different fields interact, proposing new solutions. Thus, ideation does not exercise only individual creative ability: it is collaborative.

## 2.3 Strategy building

In this process, the challenge is to effectively build an innovation strategy for the organization. This moment can be divided into three parts: analysis (deeply understanding the alternatives), selection (choosing which options to allocate resources to) and planning (deciding how to make innovation happen) (TIDD, BESSANT, PAVITT, 2008). The prospecting and ideation actions described above bring numerous possible answers to the question “what can be done?”. Multiple paths can be glimpsed and a whole range of possible next steps is opened.

The raw material for the strategic analysis process is information. At this stage, ideas generated must be evaluated, categorized and compared. To this end, there should be an informational context serving as a backdrop,

made up of the understanding gathered in the prospective processes. Thus, a fundamental part of the strategic decisions to be made is a minimal consensus regarding which image the organization is going to project for the future of the industry in which it operates. It is here that we must seek the effective convergence of the strategy with the trends identified. An important tool for this conception of an evolutionary scenario is the creation of roadmaps. Through them, one can try and map cadence and time perspectives for technologies and products (PHAAL, FARRUKH, PROBERT, 2004).

In an attempt to capture the greatest number of opportunities available within the marketing and technological complexity in which they operate, companies undertake multiple simultaneous efforts. This range of initiatives, however, makes use of the same resource base. Thus, the need to make strategic choices is latent. In this context, portfolio management emerges as a dynamic decision-making process through which a range of projects is constantly updated and prioritized (COOPER, EDGETT, KLEINSCHMIDT, 2001).

#### 2.4 Resource mobilization

This process – between building the strategy and implementing it – is considered an important step in defining what resources will be responsible for implementation. This step also corresponds to the decision-making process that leads to internalizing research and development (R&D), when there is a technological development activity involved. The background of this decision-making status is the organization's skills strategy, which must result in mapping of internal and external expertise, as well as in a plan to cover any gaps and develop future partnerships (STEFANOVITZ, NAGANO, 2013).

The diversity of knowledge required by innovation within highly complex industries, the difficulty in gathering them internally, and the speed with which they evolve make collaborating with external stakeholders an increasingly strong imperative (POWELL, 1998).

#### 2.5 Implementation

The initial phase of implementation includes the strategy, the ideas and the resources mobilized. This process can be considered the heart of the innovation process. Its results are the developed products and a market that is prepared for launching (TIDD, BESSANT, PAVITT, 2008). One of the objectives at this point is meeting strategic assumptions for the product/market in the shortest possible time.

The implementation process is characterized – in both the technical and market dimensions – by several attempts at problem solving. All dimensions of the organization that are connected to the product (R&D, Marketing, Production, Customer Care, Procurement, Sales, Quality) are involved. It is at this stage that most of the time and financial resources are necessary. Thus, considerable cross-functional coordination and implementation capacity efforts are demanded (STEFANOVITZ, NAGANO, 2013).

Under the approach of a gradual reduction of uncertainty by means of searching, selecting, testing and problem solving activities, this challenge can be seen as turning an idea into a successful product. This view of process is well represented by the abovementioned “development funnel” designed by Wheelwright and Clark (1992).

The implementation of innovations is guided by two main processes: product development and technology development processes. The typical structure of these processes is based on the stage-gates methodology developed by Robert Cooper – which is the use of “gates” in important stages of the project, and their review based on defined criteria. Only in case of project approval will it be allowed to move to the next stage – if not, it should be aborted or redirected (COOPER, 2009).

Over recent years, one can find significant improvements resulting from studies that address these processes as innovation. Among these developments, we highlight a deeper understanding of the technology development process; the advance of approaches that promote

cross-functional integration; early supplier involvement in the process; the maturing of decision making processes; and the characterization of these processes according to their degree of innovation (COOPER, 2009).

**2.6 Evaluation**

In order to manage innovation effectively, it is also essential to monitor innovation performance. Through analysis of results and diagnosis of advances and shortcomings, the organization can continuously improve its innovation process (CORDERO, 1990).

The need to monitor innovation from the process management perspective, and not only through the metrics of its end results, is defended by Adams, Bessant and Phelps (2006). To identify the bottlenecks “hidden” within the complex web of innovation it is essential to monitor the performance of the company’s entire innovation value chain (HANSEN, BIRKINSHAW, 2007).

The evaluation process involves two main dimensions: one with emphasis on projects developed, on evaluation of results and on the incorporation of lessons into the organization’s body of knowledge; another that monitors the operation of the innovation management system as a whole, seeking systemic improvements for

innovative performance (STEFANOVITZ, NAGANO, 2013).

The first dimension encompasses practices that include the project design review stage after its release. These practices enable the organization to learn from mistakes, to avoid “reinventing the wheel” and to accumulate the experiences gained in the projects. The second dimension refers to the definition of metrics that allow for monitoring of the innovative performance. This is a complex activity, since this measurement is strongly affected by the presence of relationships between cross-functional work, cadence and perceived value (THAMHAIM, 2003).

**3 METHOD**

In this research, we employed the multiple case study method. The case study is recognized for its suitability to the challenge of theory building in exploratory research (EISENHARDT, 1989). A set of variables to be investigated in this study is shown in Table 1.

To avoid any analytical inconsistency problems, Yin (2001) proposes establishing a case study protocol as a development of the conceptual research model adopted. Table 2 presents the study protocol of cases in this study.

**TABLE 1** – Variables investigated in the study

| Variables   |
|---|
| Innovation management processes, based on Quadros (2008): 1) Prospecting, 2) Ideation, 3) Strategy Building, 4) Resource Mobilization, 5) Implementation and 6) Evaluation. |
| Characterization of the organization (origin of capital, size, field of activity and competitive strategy)  |
| Challenges and obstacles faced by organizations to enhance their innovative performances  |

**Source:** The author

**TABLE 2** – Case study protocol

| Element                 | Characterization  |
|-------------------------|---|
| Main question           | How have companies which develop products in Brazil articulated their processes so as to manage innovation?<br>What is the potential relationship between the elements of their innovation management systems and their challenges to innovation?   |
| Goal                    | Analysis of the relationship between innovation management dimensions in the company and the challenges encountered to enhancing the innovative performance   |
| Time limit              | 2010  |
| Analysis place and unit | Four companies with new product development activities in Brazil<br>Analysis of fields responsible for innovation in companies investigated – R&D departments   |
| Internal validation     | Through the use of multiple data sources (interviews, document analysis, direct observation)  |
| Case study questions    | How are the companies' innovation processes characterized, based on the proposed integrated model?<br>What is the degree of maturity of the innovation management system context in these companies?<br>What are the main obstacles and challenges to increased innovative performance?<br>How does the innovation management system deployed relate to the innovation challenges identified? |

**Source:** The author

The first step to choosing the companies consisted in defining selection criteria, namely: to belong to the industrial field; to present relevant product development activity in Brazil; and to be a leader in the industrial field in which it operates.

Another selection criterion was to ensure that the companies were part of the most innovative fields in Brazil. According to the latest Innovation Survey (Pesquisa de Inovação – Pintec/IBGE, 2013), the fields with the greatest innovative dynamism correspond, in order of importance, to the one manufacturing office machinery and computer equipment (68%); basic electronic materials (63%); precision and

optical instruments; and industrial automation equipment (60%). These fields have technological leadership, serving as innovation diffusers to other fields or companies. Thus, companies A, B, C and D belong to the appliances, school supplies, industrial automation equipment and optoelectronic equipment fields, respectively.

Through the researcher's professional contacts, employees with expertise concerning the organizations' innovation potential were contacted. The list was created with companies that agreed to participate. Due to confidentiality, the names of the organizations are not published here. Table 3 presents these companies in general terms.

**TABLE 3** – Characterization of selected companies

| Company                            | A               | B               | C                               | D   |
|------------------------------------|-----------------|-----------------|---------------------------------|---|
| Type                               | Multinational   | Multinational   | National                        | National  |
| Field                              | Appliances      | School supplies | Industrial automation equipment | Optoelectronic devices for medical and aerospace purposes |
| Field's technological intensity    | Medium          | Medium low      | High                            | High  |
| Field's type of technological path | Scale intensive | Scale intensive | Science intensive               | Science intensive   |
| Number of employees (in Brazil)    | 15 000          | 2 700           | 850                             | 500   |
| Annual revenue (in Brazil)         | R\$ 6 billion   | R\$ 408 million | R\$ 90 million                  | R\$ 70 million  |

**Source:** The author

The case study method requires special care when data collecting, and it is strongly recommended that multiple collection procedures be used in order to obtain more robust results (EISENHARDT, 1989). This research used

four instruments: document analysis, direct observation, participant observation and interviews.

Table 4 describes the collection of information carried out in each case.

**TABLE 4 – Data collection instruments used in each case**

| Instrument              | Company A   | Company B  | Company C   | Company D  |
|-------------------------|---|--|---|--|
| Document analysis       | Unrestricted access to internal documentation concerning the company's processes and projects | Access to documentation concerning the company's innovation management processes | Access to documentation concerning the company's product development processes                              | Access to documentation concerning the company's product development processes |
| Direct observation      | Researcher's participation as project portfolio manager                                       | A visit to the R&D Department  | A visit to the R&D Department   | Two visits to the R&D Department   |
| Participant observation |   | This tool was not used   | This tool was not used  | This tool was not used   |
| Interviews              | This tool was not used  | Two interviews carried out with the two new projects portfolio coordinators      | Four interviews carried out: R&D director; R&D manager; R&D Department quality coordinator; product manager | Two interviews carried out: project office manager; R&D project manager        |

Source: The author

Participant observation followed the following steps: first, lasting ten days, employees were informed about the research; the goal was to obtain a broad overview of the study site before focusing on any specific aspect. Gradually, there was participation through observations, a period in which there was interaction with the observed group during six months. Last but not least, there was reflexive observation, summarizing the total number of observations in a logical sequence, during about eight months. Participant observation did not carry out interviews at company A, because prior systematization (prepared script) and the observer's contact period with the analyzed group allowed for satisfactory interpretation possibilities. Also, familiarity with language used in the experienced situation resulted in interpretations that are extremely close to reality.

All in all, eight interviews were carried out; all of them were recorded, with the consent of

respondents. After the interviews, dozens of emails and phone calls were made with respondents to clarify doubts and seek further details or relevant information not discussed in person.

## 4 CASE STUDIES

### 4.1 Descriptive summary of innovation management in each company

#### *Company A*

Company A designs and manufactures electromechanical products that increasingly incorporate electronic technology. Competition in the Brazilian market has expanded with increasingly intense presence of global competitors. This is a large multinational organization, present in dozens of countries, which includes decentralized R&D, different R&D centers for each of the company's businesses on every continent. Thus,



it faced the historic challenge of implementing systems to control and coordinate efforts between the teams and the different regions.

As a result of this scenario, and concerning innovation, it became extremely mature in many of the innovation processes, and successfully established structuring of joint efforts, with clear responsibilities for different fields involved, and monitoring and decision making forums with the presence of the company's leaders.

In its organizational structure, we highlight the high maturity with which it coordinates cross-functional work through the solid formation of project teams and the existence of cross-functional management committees. Moreover, the governance of innovation initiatives is consistent due to a corporate innovation group and to the deployment of innovation indicators in individual and collective annual performance goals.

It interacts with a broad range of external stakeholders and makes use of advanced tools for interacting with individuals and organizations in the environment in which it operates. However, because of its size and complexity, it has not always been able to articulate internally to absorb the most relevant information in the environment.

Regarding the culture of innovation, the organization has a well-structured list of formal human resources policies, valuation of meritocracy and strong results orientation. However, it finds it hard to instill an environment oriented towards inventive activities, where there is less anxiety concerning short-time results. We identified its difficulty to deal with uncertainty and risk as the main obstacle to innovation.

### *Company B*

Company B competes in a scale intensive field and, in Brazil, holds one of the group's most important R&D centers. The school supplies field, and especially the one concerning pencils, is technologically influenced by expertise in applied chemistry, and its industrial conversion is strongly connected to controlling the life cycle of wood.

The company has a highly structured innovation funnel, with criteria for development of initiatives clearly established. The maturity of its

innovation processes is advanced, with emphasis on the level of strategy building systematization.

It interacts with a considerable range of external stakeholders and has recently intensified some of its innovation strategy interfaces; we highlight, in particular, the schedule of workshops geared towards innovation with suppliers, as well as increased partnership with research institutes.

Despite the relative maturity of its innovation processes, Company B has an organizational context which is still poorly oriented towards supporting innovative activity and giving vent to process that are established in a fluid way. Relying on strong orientation towards manufacturing, its innovation system lacks an organizational culture which is more innovative activity oriented and less subject to pressure for assertive, extremely short-term results.

Furthermore, and perhaps partly because of this background, its style of leadership is not always receptive to proposals that are more risky, or prepared to stimulate inventive activity. Thus, we felt a lack of creative effervescence within teams. Therefore, one of its biggest challenges to innovation is the difficulty to deal with uncertainty and risk. Part of this scenario is due to the absence of an intense sponsorship of innovation on more strategic levels.

### *Company C*

Company C operates in a high technological intensity B2B field. It has R&D successes in its history, supported by important national innovation awards. Its technological challenge is to integrate electromechanical, software and hardware subsystems to design flexible, integrated and accurate automation solutions for various industrial fields such as oil, sugarcane and pulp and paper.

Its organizational context has strengths and weaknesses in supporting innovation. If, on one hand, it has high patronage and directors' and the president's dedication to pursuing cutting edge technology, and also features people management elements that seek to stimulate inventive activity, on the other, it has a hard time articulating cross-functional efforts and designing an integrated

innovation system with clear roles for each team. In the cultural dimension, the company shows little maturity in structuring formal policies for managing human resources, but, in this issue, we must highlight it for its design of an environment where there is little control and a lot of autonomy in the R&D department.

The level of maturity of its innovation processes is low, and there is not a structured view of the progress of initiatives in an innovation funnel or any similar tool. Much of the burden of managing activities concerning innovation is placed on the board, especially on the R&D director. Its main challenge is the difficulty it has in carrying out the cross-functional coordination of innovation work. The absence of integrating structural elements and the low procedural maturity – which make responsibilities unclear and hinder the monitoring initiatives and projects – are part of this difficulty.

#### *Company D*

There is in Company D a high scientific orientation and an environment that is marked by flexibility and by the effort to be at the technological forefront. The level of maturity of its innovation processes is low, and there is not a structured vision of the progress of initiatives in an innovation funnel or any similar tool. Much of the burden of managing activities concerning innovation is placed on the R&D director.

Its organizational context has strengths and weaknesses in supporting innovation. We highlight the high patronage of its senior leaders; backed by it, teams are able to pursue state of the art technology, a flexible and organic environment in the R&D department, and the historical establishment of solid relationships with the scientific and technological community referring to its field of activity. On the other hand, the lack of more structured innovation management processes places strategy and coordination of activities on the shoulders of directors – especially on the R&D director – and hinders the articulation of cross-functional efforts, making responsibilities unclear.

The company has grown steadily over recent years, but it clearly has to improve itself structurally to continue having good results in a new organizational reality. The unstructured way in which it has always carried out its initiatives demonstrates inadequacies and excessive dependence on directors within its organizational routine. In this context, its biggest challenge is the need to better organize coordination between fields and within them, without losing its flexibility nor its inventive and technological vocation.

#### **4.2 Comparative case analysis**

##### *Prospecting*

Amongst all innovation processes, prospecting is the one that presented the greatest homogeneity among firms. There are prospecting actions in all of them, but there is no structured process for capturing and analyzing signals. There is a lack of role and routine formalization for prospecting – a fact which, in many cases, places its occurrence under the responsibility of specific actions by employees who are in contact with the external environment.

Monitoring competitors is more structured in Company A, in which there is a team focused on evaluating products launched by competitors, using tools for estimating their costs. Nevertheless, there is no structured process, with routines at defined times, for global evaluation of competitors' trends and next steps. In companies B, C and D, there is no structured routine nor any team focused on this issue, and the capturing and analysis of competitors' signals does not occur in a very systematic way.

##### *Ideation*

Great heterogeneity was found in the maturity levels of companies' ideation processes. In company A, the process proved quite structured, with clear roles and governance and use of tools, while in companies C and D no formal ideation practices were identified. One possible cause for this difference is structural: in company A, the corporate innovation team is formally responsible

for this process, but in the others governance is distributed among marketing and R&D teams.

Because it is a process that involves several fields, the existence of a “non-functional” group for its management is consistent, in order to orchestrate the tasks for execution, accumulate experience about the tools available and ensure sharing of best practices between business units.

Regarding the generation of ideas, the use of various tools was identified in company A, such as cross-functional brainstorming, playful group dynamics and activities for immersion in the world of consumer activities was identified. Company B is at an intermediate stage, with annual cross-functional events but only beginning to use tools.

With regard to the management of ideas, only in company A was a bank of ideas identified – in B, there is a plan to create a flow of management ideas. Only in A and B were formal channels to capture ideas from the university and suppliers.

### *Strategy building*

The process of strategy building proved quite diverse among the companies. In it, we observed the strong influence of organizational structure elements and of the level of procedural systematization, in the way activities occur in the reality of the organizations.

With regard to the influence of structure on this process, we suggest analysis of strategy building from the perspective of the organizational *locus* in which it is effectively created and validated. At Company A, due to its complexity and the range of different product categories in which it operates, the strategy (maximally represented here by the creation of the product plan) is created at the level of the strategy manager and the general marketing manager. Thus, it is created at an intermediate organizational level, and must be validated by the board and the president, in a bottom-up process. The high turnover of professionals in the field and the lack of a clear process for this validation are challenges to the stability of the plans created, a fact attested by the frequent revisions in the product plan over the years.

A different process occurs in companies C and D. There, the strategy of products and technologies is fully outlined by the directors and the president, and then deployed among the managers for resource mobilization and implementation. There is in this way a less far-fetched process of decision making, with adherence and sponsorship of senior management intrinsically guaranteed from the origin of the plan. Company B is at an intermediate level between these groups, which reflects the intermediate complexity of its structure. Here, strategy is originated at the level of the marketing managers of each of the business units, but the lesser internal complexity and the existence of a clear prioritization funnel make the process less volatile than in Company A.

### *Resource mobilization*

The process of mobilizing resources presents significant heterogeneity among the studied companies. Among them, we highlight the low use of resources other than internal R&D to develop technologies and products. In the four companies, no structured efforts to search and mobilize external sources of technology to complement the role of internal competencies were identified.

In company B there is a more structured routine for the resource mobilization process. In companies A and C there is structure, but with greater difficulties in the continuous monitoring of project allocations. In D, the process is rather immature, since its management is carried out with little formality and is heavily concentrated in the hands of the R&D director.

### *Implementation*

The way technologies and products are developed proved quite diverse among companies. This difference can be explained by the influence of organizational structure elements and by the level of procedural systematization in each company.

The first variable that distinguishes this pattern of action refers to how the different functions interact to develop new products.

At Company A, the fact that there is a general management for managing projects that is separated from functions that support this process (R&D, marketing, manufacturing, supplies etc.) allows for incorporation, within the organization, of a more holistic view of the process and for creation of a formal *locus* so that the multifunction orchestration may happen. In the other companies, the coordination of product development lies within R&D, which hinders the incorporation process of other fields.

The way project teams are formed is also an important factor for functional integration. In companies A and B, there is formal composition of project teams with representatives from each functional field. In companies C and D, teams are internal to R&D, with little formal involvement from other fields. In Company D, the project office staff promotes integration.

Another structural element which strongly influenced the present level of integration are the cross-functional committees for project monitoring and decision making. Present in companies A, B and D with different formats, these forums have the mission of promoting visibility and generating plans for the removal of obstacles in the projects. In their absence, the involvement of functional leadership is difficult and there is no regular forum for discussing how projects are being developed.

In addition to these structural elements, the attitude of the organization concerning procedural systematization varies. In companies A and B, there is a structured process with roles, phases and clear gates, while in companies C and D we did not observe even minimum procedures to guide the projects. This can be explained by the procedural legacy that A and B receive from the global organization to which they belong and by the constant fear, by the leadership in C and D, of “stifling the development process and losing agility”.

This fear in companies C and D can be understood in the historical perspective of companies led by the technical excellence professionals who founded the companies. Lacking experience in successful management and successful in developing technologies in small

teams, they now lead midsize organizations and fear the loss of agility that characterized their success facing industrial giants over the years.

The distinction between the projects for product development and the initiatives for developing technologies proved to be relevant to understand the reality of implementation in these organizations. At Company A, the distinction is clear and formalized, and the development process has two distinct flows, with their specific gates, but in companies C and D this distinction was not identified. Company B is in an intermediate stage: there is awareness of the need for this distinction, the initiatives already follow different flows; however, there still in no structured process for technology projects.

### *Evaluation*

High heterogeneity was found in the level of companies' structuring of the evaluation process. Similar to the ideation process, although ideation is rather cross-functional, orchestration proved key to its consistency. Thus, the presence of the corporate innovation team as responsible for the governance of performance indicators in company A strongly contributes to the robustness of this process.

Regarding the evaluation of innovative performance, company A presents a set of indicators and a framework for governance that was not found in other companies. Company B monitors certain innovation indicators from within the R&D department, but this monitoring has little impact on other fields and is not deployed in formal targets for the different teams. There is no monitoring of innovative performance indicators in companies C and D.

### **4.3 Summary of comparative evaluation in the process dimension**

Summarizing cases studied, Table 5 presents results concerning the level of structuring and use of tools in in each company's innovation processes. Letters PP indicate that the process is partially present; letter P, that the process is present; and letter A, the absence of structuring and use of innovation process tools.

**TABLE 5** – Level of structuring and use of innovation process tools

| Process               | Sub process  | A  | B  | C  | D  |
|-----------------------|--|----|----|----|----|
| Prospecting           | Monitoring of technological trends   | PP | PP | PP | PP |
|                       | Monitoring of consumer trends  | PP | PP | PP | PP |
|                       | Monitoring of competitors  | P  | PP | A  | A  |
|                       | Scenario building  | A  | A  | A  | A  |
| Ideation              | Generation of new ideas  | P  | PP | A  | A  |
|                       | Management of ideas  | P  | PP | A  | A  |
|                       | Capturing of ideas   | P  | P  | A  | A  |
| Strategy building     | Product plan building  | P  | P  | PP | PP |
|                       | Technology script building   | PP | PP | PP | A  |
|                       | Strategic management of project portfolio                                  | PP | P  | PP | A  |
| Resource mobilization | Identification of needs, search and mobilization of resources              | P  | P  | P  | PP |
|                       | Operational management of project portfolio                                | PP | P  | PP | A  |
| Implementation        | Product development process  | P  | P  | A  | PP |
|                       | Technology development process   | P  | PP | A  | A  |
| Evaluation            | Evaluation of project results and lessons                                  | P  | A  | A  | A  |
|                       | Performance evaluation and continuous improvement of the innovation system | P  | PP | A  | A  |

P – Present PP – Partially Present A – Absent

**Source:** The author

Comparative analysis shows that companies have different philosophies concerning the understanding of innovation management as a range of interrelated systemic processes. There is a significant difference in the organization and process discipline concerning innovation in companies A and B when compared to companies C and D.

Since they are multinationals that have had professional management for decades, these organizations have lists of formulated processes, greater clarity in the governance of each one of them and use of indicators to monitor them. Companies C and D, led until today by their founders, who have many stories of technological

success, presently have considerable organizational complexity, few established processes and fear of losing agility and innovative culture if procedural discipline is increased. Thus, they remain poorly organized so as to give vent to initiatives, a fact which makes it hard for them to articulate between fields.

## 5 CHALLENGES REFERRING TO INNOVATION MANAGEMENT PROCESSES

In line with the objective of this study, this section presents the relationship between the

innovation management process in companies studied and the challenges encountered by them. These challenges are highlighted as the main contribution of this research to understanding the current status and challenges faced by innovative industrial organizations.

### *Challenge 1: Procedural systematization deficiencies*

Identified more strongly in companies C and D and clearly illustrated in Table 5, the shortcomings of the systematization of innovation processes and the structuring of organizations for innovative activity have a very direct relationship with the difficulty of coordinating and orchestrating the different fields. Innovation management processes are guides that regulate the flow of activities and govern the various steps involved in the complex web of innovation. The absence of these elements causes lower capacity to harness individual and collective efforts to goals, which, in turn, leads to friction between fields and discomfort as to the low levels of visibility and control, symptoms observed in the abovementioned companies. This finding corroborates studies by Thamhain (2003), which point to cross-functional cooperation as one of the most important factors that influence the work flow of innovation teams.

Moreover, companies C and D, despite having much smaller dimensions than international groups such as companies A and B, already have a status with relevant internal complexities to be managed. The recent and successful past, however, and its microstructure, and the composition of senior management, consisting of founders and technical professionals who have grown internally, are challenges to the adoption of more formal process management practices.

Supporters of the philosophy that says that “greater procedural structuring could stifle speed”, members of the senior management of companies C and D have been reluctant to establish process management in a more structured way, with clearer roles and responsibilities, greater use of

indicators for monitoring and decision making, as well as more detailed implementation procedures. The observed symptoms cause great friction between fields in cross-functional activities and a heavy dependence on the board in conducting initiatives. These two elements, probably not very painful when these companies had only around 150 employees, are currently major obstacles to the fluidity and strength of their innovation systems.

### *Challenge 2: Profile of leadership concerning innovation*

Comparative analysis of the cases also allows us to suggest an important factor as a moderator of the characterization of elements influenced by the field of activity and by the type of organization: the profile of the company leadership. “Career executives” occupy key leadership positions in A and B – professionals with proven management skills and strong orientation and preparation for maximizing financial results. In companies C and D, on the other hand, leadership profile is made up of former high-level technicians who have a deep knowledge of the technological paradigms inherent to their fields.

Company A pays great attention to the training of leaders. Management skills are highly valued and there is potential for accelerated growth in the administrative career. The style of the current leadership, although heterogeneous, is focused on results and meritocracy, two of the most frequently raised corporate flags.

In Company B, on the other hand, managers who are leaders devote little time to stimulating and supporting creative activities in teams, and are overly focused on short-term results. Furthermore, the effervescence of the organization concerning innovation does not come from the top, but from the intermediate organizational layer present in the R&D department.

Encouraging innovative activity in company C occurred mainly through the individual influence of the R&D director. Connected to the company for 30 years,

his leadership style shapes the development department in a flexible way. In his words, “a development environment cannot have many rules, as they may stifle creative work”.

The origin and profile of leadership in company D echo in its environment through clear guidance towards science and technology. However, other dimensions of the organization (such as human resource management) have been historically suppressed by the pursuit of cutting-edge technology by leaders. This context permeates the internal environment and shapes relations between professionals. Leadership is concerned about maintaining an environment that stimulates creativity. In the words of the interviewee, “in this company everyone is a little bit of scientist”.

Clearly these differences and challenges unfold in the formation of organizational management systems – due to the level of involvement and sponsorship to product innovation, to the ability to influence decisions in market and technological dimensions or by inducing standards on issues such as the level of control over the system and on individuals. Indeed, more than the analysis of organizational history, this finding suggests special attention to how organizations have recruited and groomed their leadership in key positions referring to innovation.

## 6 FINAL CONSIDERATIONS

This study aimed at presenting a relationship between the process of innovation management in Brazilian industrial companies and the challenges encountered by them. Among these challenges we highlighted deficiencies in the systematization of innovation processes and the structuring of organizations for innovative activity, as well as the profile of leadership towards innovation. We suggest that understanding and concern about these challenges is essential to guiding new product development work and efforts concerning R&D.

The comparative results presented reproduce the complexity of evaluating the

innovation systems of organizations – a fact that mirrors the complexity of these systems. The case study reinforces the importance of not evaluating innovation systems as a homogeneous block of maturity and trend as to innovative performance. Rather, analysis exposes the internal diversity of these systems, with their various elements that, although interrelated, are influenced in different ways by moderating variables – such as the organization's profile, history and field of activity.

Much of the complexity observed in innovation systems lies in the intricate way that cultural and political aspects interact with the way innovation processes actually occur in organizations. Thus, we can state that the main message of this empirical study refers to the need to carry out an in depth evaluation of the relationship between the organizational context and the design of innovation processes in each organization. Since it is a topic that is strongly influenced by the organizational scenarios to which the company is subjected, it is in the intelligent design of routines, in a social fabric oriented towards innovation and configuration of powers and responsibilities that lies the key to the consistency of innovation processes.

We observed that innovation processes are full of moments of decision-making and allocation of responsibilities, and therefore rely heavily on managerial action to fully occur. Thus, the way leaders see, conduct and monitor these processes is one of the fundamental bases for the health of these systems. Furthermore, we can infer that the level of training of these leaders to understand the complexity of the innovation process and to govern it properly substantially shapes the way innovation is managed within an organization.

Thus, by understanding that the characterization of the organization – its size, the origin of its capital and its field of activity – does not directly define its challenges to innovate, one must understand that it is the role of leadership that determines the influence of these factors on the characterization of the innovation system and its challenges, through its strategic proposition and the way it builds its internal context and innovation processes.

Indeed, we suggest future studies regarding for further investigation of the roles and profiles of senior leaders connected to innovation in organizations, as well as the possibility of creating structured maturity models aimed at managing innovation.

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