

Creating organizational environments that stimulate innovation: An explanatory model

Criando ambientes organizacionais que estimulam a inovação: Um modelo explicativo

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Abstract: This article aimed to identify qualitatively and quantitatively the main ways the organizational environment can stimulate innovation in a multinational pharmaceutical industry in Brazil. To this end, we established two specific objectives: to raise the perception of leaders and subordinates regarding the strategies to encourage innovation adopted by the organization and to develop and statistically validate a structural model that explains the capacity of the organizational environment to stimulate innovation. We conducted semi-structured interviews with 22 leaders, including Corporate Vice-President, Quality Vice-President, directors, and managers, and applied questionnaires to 334 subordinates, including supervisors, specialists, analysts, and technicians. The investigation pointed out that Strategic Leadership is a second-order construct that comprises Motivation and Leadership. The Firm's Strategy positively impacts Strategic Leadership, and Strategic Leadership positively impacts the

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Challenge to Innovate. The proposed explanatory model can explain approximately 60% of the Challenge to Innovate in the organization. We expect that the findings of this research will contribute to the advancement of knowledge regarding organizational innovation, especially concerning its antecedents, allowing theoretical reflections and practical and managerial benefits in the search for effective innovative strategies.

Keywords - Innovation environment; Strategic leadership; Organizational culture.

Resumo: Este artigo teve como objetivo identificar qualitativa e quantitativamente as principais formas pelas quais o ambiente organizacional pode estimular a inovação em uma indústria farmacêutica multinacional no Brasil. Para tanto, estabelecemos dois objetivos específicos: levantar a percepção dos líderes e subordinados sobre as estratégias de incentivo à inovação adotadas pela organização e desenvolver e validar estatisticamente um modelo estrutural que explique a capacidade de o ambiente organizacional estimular a inovação. Realizamos entrevistas semiestruturadas com 22 líderes, entre Vice-Presidente Corporativo, Vice-Presidente de Qualidade, diretores e gestores, e aplicamos questionários a 334 subordinados, entre supervisores, especialistas, analistas e técnicos. A investigação apontou que a Liderança Estratégica é um construto de segunda ordem que compreende Motivação e Liderança. A Estratégia da Empresa impacta positivamente a Liderança Estratégica, e a Liderança Estratégica impacta positivamente o Desafio de Inovar. O modelo explicativo proposto pode explicar aproximadamente 60% do Desafio de Inovar na organização. Esperamos que os resultados desta pesquisa contribuam para o avanço do conhecimento sobre a inovação organizacional, especialmente no que diz respeito aos seus antecedentes, permitindo reflexões teóricas e benefícios práticos e gerenciais na busca por estratégias inovadoras eficazes.

Palavras-chave - Ambiente de inovação; Liderança estratégica; Cultura organizacional.

Introduction

The flows of goods, services, financial capital, and knowledge go beyond national borders, making the competitive environment of organizations even more complex (Jiang, Guan, Chen, & Bian, 2023; Hoskisson, Hitt, Ireland, & Harrison, 2009). Based on their internal and external environments, organizations develop strategies to obtain new resources and competencies and achieve their objectives (Iqbal & Piwowar-Sulej, 2023; Zen & Fracasso, 2012). Understanding all the nuances of organizational environments is one of the first steps in formulating a strategy, allowing the organization to establish a long-term mission (Garlet, Savian, Ribeiro, & Siluk, 2024; Barney & Hesterly, 2011).

Environmental changes lead organizations to adopt new strategies and structures (Bushe & Lewis, 2023; Chandler, 1999). Although organizations strive to formulate efficient strategies, failing is common (D'Costa, Holl, & Ribaudó, 2024). In Brazil, for instance, only 40% of companies remain in operation five years after opening (Brazilian Institute of Geography and Statistics [IBGE], 2017). Companies often fail due to their inability to innovate and make the necessary changes. Thus, thriving in a highly competitive environment is a primary challenge for most organizations (Mamytov, 2023; Hoskisson et al., 2009).

Innovation is a complex construct with different conceptions, dimensions, and application contexts, investigated under different approaches in various knowledge fields, branches of activity, and industrial sectors and considered fundamental in the search for competitive advantage (Zhao, Wu, & Ye, 2023; Cao, Hua, Tong, & Wang, 2023; Block, Hansen, & Steinmetz, 2023; Tidd & Bessant, 2012).

According to Cassiolato and Lastres (2005), innovation is a systemic phenomenon that involves cultural, social, political, economic, and institutional aspects intrinsically connected to a set of actors. Martins and Terblanche (2003) emphasize that innovation manifests itself through organizational strategy. Thus, strategic goals and objectives represent the axiological profile of an organization. Since organizational strategies can stimulate or inhibit innovation, it is beneficial to understand the antecedents and consequences of effective innovative strategies (Martín-Peña, Sánchez-López, Kamp, & Giménez-Fernández, 2023; Tidd & Bessant, 2012; Martins & Terblanche, 2003).

Considering the theoretical-empirical evidence that organizational innovation is relevant for effective strategies, this study was guided by the following question: *how can the organizational environment stimulate innovation?* To respond to this problem, the objective of this research was, therefore, to identify, through qualitative and quantitative analyses, the main ways in which the organizational environment can stimulate innovation in a multinational pharmaceutical industry, analyzing the perception of internal agents (leaders and subordinates) regarding the ability of the organizational structure to promote innovation.

To achieve the primary objective, we established two specific objectives: (a) to raise the perception of leaders and subordinates regarding the innovation promotion strategies adopted by the organization and

(b) to develop and statistically validate a structural model that explains the capacity of the organizational environment to stimulate innovation.

Theoretical Framework

According to the Organization for Economic Co-operation and Development (OECD, 2005), innovation involves implementing a new or significantly improved product or process. For Schumpeter (1957), one of the seminal authors on the subject, innovation is the process of generating the new and destroying what is becoming obsolete, the company's ability to overcome perfect competition, establishing a temporary monopoly by creating a new market for its products. In the economic sphere, innovation occurs when a commercial transaction involves an invention that produces wealth.

Innovating is identifying a way to do something better. At the Japanese automaker Toyota, globally recognized for its ability to systematically progress and outperform competitors, innovation comprises three pillars: inventiveness at work, pursuit of perfection, and adaptation to society. Such principles are linked to creativity, persistence, and purpose more than technology (Bessant & Tidd, 2019; Freitas, 2018; Komatsu, Buriti, & Saad, 2008). In the corporate world, innovation is associated with satisfaction and value, not necessarily with a new device. The customer craves solutions, not necessarily products and services. Therefore, due to the technological pace, it is usual to lose focus and become trapped, seeking more “what” than “why” (May, 2007).

For instance, other American restaurants already produced McDonald's main product. However, when it sought to solve its problems regarding delays in service, quality, and lack of standards, the performance of resources drastically increased, thus creating a new market (Fontenelle, 2007). Success, therefore, was a function of observations and a search for opportunities to innovate. Creativity, therefore, does not depend solely on inspiration but also on study and courage (Drucker, 1998).

Unlike the inventor, the innovator systematically thinks, considers the current state, finds solutions, and designs a future state capable of absorbing them (Hisrich, 2004). That requires learning about cause-and-effect relationships. Thus, in an environment of fierce competition, the weight of innovation falls on organizations and the individuals that make them up, from whom more commitment and adaptability,

faster progress, better execution, and firmer decisions and thoughts are expected (Chedli, 2014). The environment demands that individuals manage risks well and achieve established objectives within a scenario characterized by restrictions, rigid structures, inadequate programs, information privilege, political dissimulation, and limiting rules (May, 2007).

Organizations tend to associate creativity with the arts, considering it an expression of original ideas, but innovation depends on creativity and technical skills (Alencar, 1996). In the business world, being original is not enough. A creative idea needs to be appropriate, helpful, and feasible. Besides individual creativity, expertise, and motivation are necessary components in any domain. Expertise, together with creative reasoning, is the way of approaching problems and the ability to bring together existing ideas in new combinations (Amabile, 1999). Motivation, in turn, can be extrinsic or intrinsic, the latter being the most essential to creativity. Extrinsic motivation is money used by organizations in the form of remuneration and benefits for their employees (Deci, 2002). Money itself does not make workers fall in love with their work or find it interesting if, deep down, they consider it boring. Intrinsic motivation, on the other hand, is manifested by genuine passion and interest. When people are intrinsically motivated, they perform the work for the challenge or pleasure (Amabile, 1999).

One fact that inhibits innovation is that we expect most organizational structures and management practices to function well in a stable and predictable world (Gonçalves, 1998). Large organizations incur the so-called “large company syndrome” and rely on weak structures and systems where no clear direction and innovation are required, managed, or measured. Thus, what drives this entire process in a large company may be solely the desire for reward and recognition, instrumentalized in promotions and bonuses (May, 2007).

Companies that intend to innovate need to develop a methodology that creates and maintains a structure capable of stimulating a creative culture that generates results to create value for the company, customers, suppliers, and partners (Tidd & Bessant, 2012). Therefore, an organizational culture aimed at innovative corporate entrepreneurship is necessary, which is not always simple to achieve in organizations (Gramigna, 2007). Skarzynski and Gibson (2008) define organizational capacity for innovation as a formation that includes organizational culture and values, leadership, processes, tools, people, and skills.

According to Martins and Terblanche (2003), we can analyze the capacity for organizational innovation from the perspective of two large blocks, individual and organizational, through the constructs of Organizational climate and culture, Leadership and organizational structure, Organizational processes, Tools for generating ideas and innovations, and People skills. Schein (2009) presented the link between individual skills and organizational business capacity. Vertically, each organization operates in a business environment with opportunities, challenges, and resources.

Based on the external and internal environments, the organization's managers define a vision and create their strategy. Training employees in what the organization considers relevant is insufficient to stimulate innovation and creativity. It is necessary to offer them opportunities to put learning into practice (Skarzynski & Gibson, 2008).

The innovative process is not deterministic and does not follow a ready-made formula. Actors interested in generating innovation construct it. Therefore, we must understand innovation as a series of interactions and exchanges between researchers, users, technicians, scientists, government, and companies, the so-called innovation network. It is necessary to develop means to integrate materials and knowledge in the innovative process (Giget, 1997; Schumpeter, 1997).

Freeman and Soete (2008) distinguish innovation action from innovation process. The first comprises several activities, while the latter follows some steps. The Oslo Manual (1998) classifies the stages of the innovation process into scientific, technological, organizational, financial, and commercial, including investment in knowledge that leads or intends to lead to the implementation of technologically new or improved products or processes.

According to Tesluk, Faar, and Klein (1997), the moral premises and beliefs behind existing organizational behaviors directly impact management policy, structure, and practices. Consequently, organizational culture can impact creativity in the organization, stimulating or inhibiting the development of new ideas. This way, the organization's workers understand which activities and behaviors are valuable and how they should behave in the workplace. Organizational culture is predominant in catalyzing the variables that impact the creative process, even if this culture is not homogeneous. Strong relationships foster creativity. In this way, values, rules, practices, and all cultural elements converge in promoting innovation (Martins & Terblanche, 2003).

López-Ruiz (2007) states that the influence of new technologies and innovative management forms means that traditional and long-lasting work relationships tend to disappear. Consequently, new skills become necessary for the individual. The creative individual must be open to change, flexible, proactive, proposing new ways of solving problems, motivated, and driven towards results (Amabile, 1999). However, we cannot forget that the social situation and the environment in which this professional works directly influence the creative process, positively or negatively. Interpersonal relationships, norms, and communication processes directly impact creative action (Martins & Martins, 2002).

Based on a systematic literature review, Pioner, Eckert, Panizzon, and Benato (2023) have proposed a framework with antecedent factors of organizational innovation, identifying internal and external organizational factors. External factors include the company's external legitimacy, recognition of opportunities, relational capital, orientation towards entrepreneurship, and the market. Among the internal factors, there are factors related to human resources (knowledge, skills, communication, intellectual stimulation, engagement, commitment, creation, and application of new ideas), related to leadership (trust in the team, openness, flexibility, support, appreciation of subordinates, diversity, and decentralization of decisions), and concerning organizational characteristics (knowledge management, quality of internal communication, culture, physical structure, internal procedures, internal legitimacy, and orientation towards technology).

Wijaya, Misbahudin, Baha, Yanti, and Pasaribu (2023) analyzed the effects of human resource management practices on organizational innovation performance. Among other findings, the authors concluded that the learning culture in the organization affects innovation performance.

Negano, Stefanovitz, and Vick (2014) investigated organizational contexts that enhance innovation performance, highlighting the culture of innovation, the organizational structure, governance for innovation, and relationships with the external environment. The authors recognize that well-structured processes are not enough for innovation to occur but also a context that promotes innovative activity.

Souza Neto, Dias, Sano, and Medeiros (2019) developed a study on the antecedents of innovation in the Brazilian public sector. The authors concluded that the following factors influence innovation: environmental antecedents (environmental pressures, participation in networks, and competition with other organizations), organizational antecedents (available resources, leadership style, degree of risk

aversion, incentives and rewards, conflicts, and organizational structure), innovation characteristics (ease of use, relative advantage, compatibility, and testability), and individual antecedents (worker autonomy, training, knowledge, skills, creativity in problem-solving, commitment, job satisfaction, and innovation acceptance).

At last, Souza and Bruno-Faria (2013) listed factors that facilitate and hinder organizational innovation. Among the facilitating factors, we can mention the support of senior management, the support of middle management, the support of work groups and employees, the diversity of skills, the dissemination of information about innovation, strategies for incorporation of innovation into organizational routines, the participation of external collaborators, recognition of the value and need for innovation, the systemic perspective of innovation, and interaction between organizational units. In turn, among the factors that hinder innovation identified were disbelief concerning innovation, difficulties in inter-organizational integration, excess of activities and lack of time, lack of support from senior management, limitations in terms of people, limitations in terms of financial resources, limitations in terms of technological resources, obstacles arising from the external environment, and resistance to innovation.

Having presented the theoretical-empirical framework, the methodological procedures adopted in the research will be presented next.

Method

The present investigation is a descriptive, exploratory, and explanatory case study, mixing qualitative and quantitative approaches. According to Yin (2001), the case study is an empirical investigation of a contemporary phenomenon within a real-life context, and the limits between the phenomenon and the context are not clearly defined. We sought to understand the cause-and-effect relationships between organizational strategies to encourage innovation and the individual's innovative behavior.

We chose to intertwine different sources of evidence to enhance the reliability of the study: semi-structured interviews, electronic questionnaires, and observations. The convergence of results from diverse sources offers higher reliability to the investigation (Roesch, 1996).

In the first phase, following guidelines from Marconi and Lakatos (1996), we carried out semi-structured face-to-face interviews using a script consisting of 12 predefined questions, with the flexibility to include other questions during the interviews. Interviews are relevant sources of information for a case study, identifying different ways interviewees perceive the same phenomenon (Duarte & Barros, 2006).

We interviewed the entire strategic level of the organization (Corporate Vice-President, Quality Vice-President, and Directors) and part of the tactical level (Managers). The objective of interviewing these levels of the organization in person was to faithfully capture the vision of the leaders responsible for formulating strategies regarding the capacity for organizational innovation, taking into account the organizational climate and culture, leadership, organizational structure, organizational processes, and tools to generate ideas and innovations (Martins, 2002).

In the second phase, we applied a self-administered survey questionnaire with a five-point Likert scale sent via email to subordinates from the organization. With this procedure, we sought to produce quantitative descriptions from this group, allowing a cross-analysis with the semi-structured interviews with the leaders. That is appropriate when the objective is to identify relationships between variables (Lima, 2008).

Finally, the researchers performed observations in the company, allowing them to understand the complexity of psychosocial environments and a more competent dialogue regarding non-verbal attitudes (Zanelli, 2002; Gil, 1999). The observations focused on the daily performance meetings held in the organization. In these meetings, leaders and subordinates discuss results compared to plans, daily problems, and possible solutions, an environment rich in experimentation in which employees put strategy, purpose, and values into practice.

In this study, we adopted a non-probabilistic sampling to choose the individuals to participate in the research, a sampling method according to which all individuals who are part of the research population have the same chance of being chosen (Mattar, 1996). Thus, it was possible to obtain perspectives on the topic throughout the organization and intertwine the perceptions of leaders and subordinates (Table 1).

Table 1.
Sample composition

Organizational level	Position	N	Method
Strategic	Corporate Vice-President (CPV)	1	Semi structured interviews
	Quality Vice-President (QVP)	1	
	Directors	4	
Tactical	Managers	16	Semi structured interviews and Observations
Operational	Production Supervisors, Analysts, Specialists, Operators, and Technicians	334	Electronic survey questionnaires

Source: Authors

We adopted the Content Analysis technique for the semi-structured face-to-face interviews with the 22 leaders. In analyzing the transcribed textual corpus, we sought to create a posteriori categories based on the topics covered in the speeches. Content Analysis is not restricted to describing content but also considers contextual details. In this sense, the aim is to understand the antecedents and consequences of the message (Bardin, 2011).

Each interview lasted 50 minutes on average, totaling an audio file of approximately 19 hours of recording. With the authorization of the interviewees and under a confidentiality agreement signed between the researchers and the organization, we recorded all interviews. We used the Atlas.ti 10 software to perform the Content Analysis.

Regarding the analysis of quantitative data from the survey questionnaire applied to 334 subordinates, we performed Structural Equation Modeling (SEM) through the Lavaan (Rosseel, 2012) and semTools (Jorgensen, Pornprasertmanit, Schoemann, & Rosseel, 2021) packages of R software (R Core Team, 2021). Considering that we must treat the data from the Likert scale as ordinal and they did not present a normal distribution, we decided to use the Diagonal Weighted Least Square (DWLS) method. SEM uses several measures to indicate how much the theory proposed by the researcher fits the observed variables. The Goodness of Fit (GoF) indicates how much the specified model reproduces the covariance matrix between the observable items (Hair, Black, Babin, Anderson, & Tatham, 2009). The primary

adjustment measures are the chi-square (χ^2), the degree of freedom (df), the Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), the Standardized Root of the Mean Residual (SRMR), the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI), and the Relative Non-Centrality Index (RNI).

Structural equation modeling is a multivariate statistical analysis technique used to analyze structural relationships. This technique combines factor analysis and multiple regression and analyzes the structural relationship between the constructs (Hair et al., 2009). We chose this method because it estimates multiple and interrelated dependence in a single analysis. In this analysis, we adopted two types of variables: endogenous and exogenous. Its use is not limited to the simultaneous dependence analysis of data but also provides a transition from exploratory analysis to a confirmatory perspective (Bentler, 1990).

We also chose the Structural Equation Modeling technique for its ability to solve research problems involving causal relationships between latent constructs measured by multiple observed variables. It seeks evidence that the collected data behaves like the theoretical model underlying the research problem (Reisinger & Turner, 1999).

In the next section, we will present the main empirical results of the study, starting with the qualitative analysis of the interviews carried out with the 22 leaders and, subsequently, with the quantitative analysis of the questionnaires applied to the 334 subordinates.

Results

Qualitative analysis

The semi-structured script for interviews with the company's 22 leaders consisted of 12 questions related to the following topics: role of the company's strategy in innovation; role of company values and ambition in innovation; role of leadership in innovation; role of valuing behaviors in innovation; obstacles to innovation; role of the environment in innovation; role of motivation in innovation; role of rewards in innovation; current perception about innovation in the company; future vision about innovation in the company; challenges related to innovation in the company; and suggestions related to innovation in the company.

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After coding, we organized the material into categories and subcategories and inserted them into the software. This way, Content Analysis facilitated searching and retrieving information, quotes, and speeches from the interviewed leaders. We transcribed, analyzed, and coded all audio content of each interview according to the topics covered by interviewees. In the end, we identified 249 codes associated with organizational innovation. Then, the codes were grouped into families, generating 37 topics (Table 2).

Table 2.

List of topics associated with innovation during the interviews with leaders

N	Topics associated with innovation
1	To align the local factory with global strategies
2	To acquire and incorporate technology
3	Autonomy, respect, and freedom
4	To balance routines and challenges
5	To seek increased productivity
6	To seek cost reduction
7	Consistency between discourse and practice
8	To take controlled risks
9	To create purpose and meaning for work
10	Culture of continuous improvement
11	To develop competences
12	To develop relationships with external actors
13	To develop teamwork
14	To be ready for change
15	To stimulate individuality
16	To stimulate and promote automation
17	To stimulate the use of strategic planning
18	To use quality tools
19	To properly manage mistakes
20	To properly manage resources
21	To properly handle the relocation of people and resources
22	To motivate yourself by the company's ambition
23	To promote diversity
24	To promote quality
25	To promote a healthy environment

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26	To carry out benchmarking
27	To carry out long-term planning
28	To properly reward employees
29	To respect rules and regulations
30	To be agile in responding to demands
31	To have a clear communication
32	To have consistency and focus
33	To have support from leadership
34	To have simplicity in actions
35	To use scientific thinking
36	To value the organizational culture
37	To link innovation to results

Source: Research data

From this point on, the software identified the consonance degree of the topics brought up by the responding leaders, that is, how similar the answers were among the interviewees in each question. Based on the number of times the topic recurred in each question, the software scored the percentage of co-occurrences of each topic. Table 3 summarizes the three topics with the highest co-occurrences for each question.

Table 3.

The three most co-occurring topics per question

Questions		Leadership perception: Main topics		
1	Role of company strategy in innovation	To acquire and incorporate technology (0.38)	To stimulate the use of strategic planning (0.38)	To motivate yourself by the company's ambition (0.33)
2	Role of company values and ambition in innovation	To motivate yourself by the company's ambition (0.54)	To motivate yourself by the company's ambition (0.36)	To have simplicity in actions (0.32)
3	Role of leadership in innovation	Autonomy, respect, and freedom (0.36)	To create purpose and meaning for work (0.25)	To have simplicity in actions (0.25)
4	Role of valuing behaviors in innovation	To be ready for change (0.33)	Culture of continuous improvement (0.32)	To have simplicity in actions (0.25)
5	Obstacles to innovation	To be ready for change (0.30)	To develop competences (0.28)	To promote a healthy environment (0.25)
6	Role of the environment in innovation	To properly manage mistakes (0.38)	To have consistency and focus (0.32)	To promote a healthy environment (0.30)

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7	Role of motivation in innovation	To have consistency and focus (0.35)	To properly reward employees (0.35)	To properly handle the relocation of people and resources (0.29)
8	Role of rewards in innovation	To properly reward employees (0.39)	To have consistency and focus (0.22)	To be ready for change (0.21)
9	Current perception of innovation in the company	To stimulate and promote automation (0.27)	To have a clear communication (0.26)	Culture of continuous improvement (0.25)
10	Future vision about innovation in the company	To seek cost reduction (0.28)	To stimulate and promote automation (0.26)	To develop competences (0.25)
11	Challenges related to innovation in the company	To have consistency and focus (0.34)	To carry out benchmarking (0.33)	To seek cost reduction (0.28)
12	Suggestions related to innovation in the company	To carry out benchmarking (0.38)	To have consistency and focus (0.33)	To properly manage resources (0.27)

Source: Research data

Out of the 37 topics identified in the answers given by the interviewed leaders, the 22 topics mentioned in Table 3 were selected as the most relevant, considering the similarity and relevance of the answers. We grouped these topics, yielding the latent variables to answer the research problem. Based on these variables, we constructed a questionnaire for the research quantitative stage with the 334 subordinates.

Thus, based on the qualitative analysis of the interviews, observations of the organizational environment, and a reflective analysis of the theory, the insights made it possible to organize a model capable of explaining employees' perceptions concerning an environment that stimulates innovation.

To this end, we organized 16 variables into four first-order constructs: four items connected to Firm Strategy (FS), three items related to Motivation (MO), five items concerning Leadership (LE), and three items connected to the Challenge to Innovate (CI). Furthermore, we proposed a second-order construct formed by Motivation and Leadership, called Strategic Leadership (SL). Thus, with theoretical support, we proposed three hypotheses, described below.

H1. Strategic Leadership (SL), as a second-order construct comprised of Motivation (MO) and Leadership (LE), derives from the ability to inspire people (visionary leadership) and direct the organization's efforts (managerial leadership) (Soares, Athayde, & Couto, 2021).

H2. Firm Strategy (FS) positively impacts Strategic Leadership (SL). In this hypothesis, we consider that the elements related to the construction of a consistent strategy in the organization generate positive effects in the constitution of strategic leadership as the ability to generate results while inspiring people (Leite et al., 2013).

H3. Strategic Leadership (SL) positively impacts the Challenge to Innovate (CI). This hypothesis considers the typically human element that makes up innovative creativity in organizations. The challenge of achieving results through innovation touches on strictly human factors enhanced by the ability to exercise strategic leadership in organizations, the ability to guide actions, and inspire people in the organizational environment (Rowe, 2002).

Next, we will present the quantitative analysis that allowed testing of the hypotheses.

Quantitative analysis

When carrying out Structural Equation Modeling (SEM), the model fit indices were first verified, represented with their standardized estimates in Figure 1. To this end, the analysis relied on the indicators proposed by Hair et al. (2014) for a model with 15 observable variables ($m = 15$) and 334 sampled individuals ($n = 334$). The results presented good reference values, namely, $\chi^2 = 267.616$ with p -value < 0.001 ; $DF = 86$; $\chi^2/df = 3.11$; $CFI = 0.961$; $TLI = 0.953$; $RNI = 0.985$; $GFI = 0.990$; $AGFI = 0.982$; $SRMR = 0.058$ and $RMSEA = 0.069$.

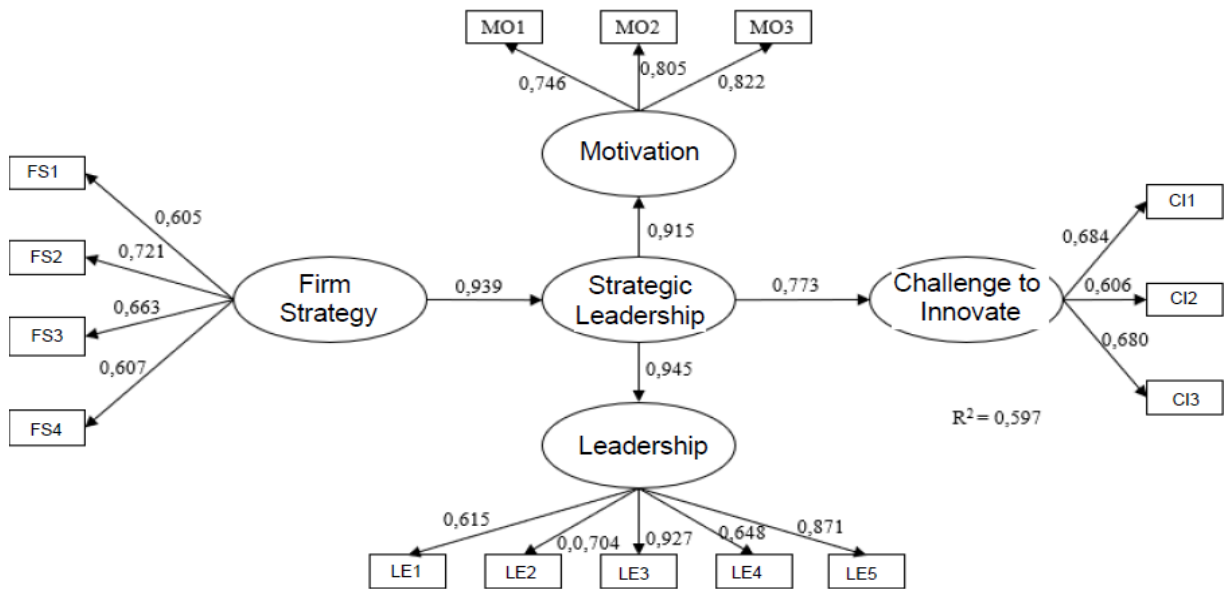


Figure 1. Proposal of an explanatory model for the challenge to innovate

Subsequently, we proceeded with the validity and reliability analysis of the explanatory model. For convergent validity, we analyzed standardized factor loadings. Indicators of a specific construct must converge or share a high proportion of common variance. Hair et al. (2014) propose that standardized factor loadings should be greater than 0.5, ideally greater than 0.7. As shown in Figure 1, all standardized factor loadings are higher than 0.5, 11 of which are higher than 0.7, meeting the guidelines.

Following that, we created the correlation matrix between the constructs. For ordinal data, it is recommended to use polychoric correlations instead of Pearson correlations (Zumbo & Kroc, 2019; Zumbo, Gadermann, & Zeisser, 2007). All constructs were positively correlated, with significantly high values, with the lowest value being the correlation between Motivation (MO) and Challenge to Innovate (CI) (0.707).

Table 4.
Matrix of polychoric correlations between constructs

Construct	FS	LE	MO	SL	CI
Firm Strategy	1.000				
Leadership	0.887	1.000			
Motivation	0.859	0.864	1.000		
Strategic Leadership	0.939	0.945	0.915	1.000	
Challenge to Innovate	0.726	0.730	0.707	0.733	1.000

Source: Research data

Structural Equation Modeling (SEM) supported the first hypothesis (H1). The second-order construct, Strategic Leadership (SL), obtained an estimate of $\beta = 0.777$ and p-value = 0.001 regarding Motivation (MO) and an estimate of $\beta = 0.988$ and p-value = 0.002 regarding Leadership (LE). Therefore, we can state that Strategic Leadership (SL) is a second-order construct comprised of Motivation (MO) and Leadership (LE).

SEM also supported the second hypothesis (H2). Firm Strategy (FS) positively influences Strategic Leadership (SL). The regression presented an estimate of $\beta = 2.736$ and p-value = 0.000.

At last, SEM supported the third hypothesis (H3). Strategic Leadership (SL) positively influences the Challenge to Innovate (CI). The regression presented an estimate of $\beta = 0.418$ and p-value = 0.000.

The proposed model explains approximately 60% ($R^2 = 0.597$) of the variation in the Challenge to Innovate (CI), which can be considered a good value compared to other research in Applied Social Sciences on organizational innovation.

Final Remarks

This research achieved its primary objective, to identify qualitatively and quantitatively the main ways the organizational environment can stimulate innovation in a multinational pharmaceutical industry in Brazil. Furthermore, the study achieved the specific objectives of raising the perception of leaders and subordinates regarding the innovation strategies adopted by the organization and developing and

statistically validating a structural model that explains the capacity of the organizational environment to stimulate innovation.

The investigation showed that i. Strategic Leadership (SL) is a second-order construct comprised of Motivation (MO) and Leadership (LE); ii. Firm Strategy (FS) positively influences Strategic Leadership (SL); and iii. Strategic Leadership (SL) positively influences the Challenge to Innovate (CI). The proposed explanatory model could explain approximately 60% of the challenge to innovate in the organization.

We suggest future studies that apply the explanatory model proposed in other sectors. We expect that the findings of this research will contribute to the advancement of knowledge regarding organizational innovation, especially concerning its antecedents, allowing theoretical reflections and practical and managerial benefits in the search for effective innovative strategies.

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