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OPEN INNOVATION AND COCREATION IN THE DEVELOPMENT OF NEW PRODUCTS: THE ROLE OF DESIGN THINKING

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Abstract: Perfumes industry has been developing due to last decade's technological development, requiring larger investments and creative capacity from fine chemicals industry. Since creative capacity may be maximized through creation strategies and methodologies such as co-creation and design thinking, the aim of this paper is to analyze the role of design thinking in the process of co-creation between competitors. To achieve such aim, a unique case study was conducted in a representative enterprise in the Brazilian perfume industry, which was responsible for a triad co-creation process of a new product, involving two foreign competing companies in the fine chemicals industry. It is possible to assert that the paradigm shift with co-creation and design thinking strategies in such a knowledge and technology intensive industry maximized new products development process.

Keywords: International Innovation, Open Innovation, Co-Creation, Design Thinking.

INTRODUCTION

The development of new products, technologies and services has been accelerated in recent decades due to globalization, connectivity and technological development. With such advances, innovation has become one of the main survival factors of companies in the market, especially in those that are sensitive to the entry of new products. Due to the aforementioned aspects, the process of developing new products has been exponentially costly and fast, which is why the literature on open innovation and co-creation has been deepened in recent years (Huizingh, 2011).

With the practice of open innovation and specifically co-creation, the product development process becomes shared between companies, consumers and/or suppliers, diluting costs and risks and providing greater agility in the process of experience sharing. Such sharing between firms can be done at various levels of openness, according to the needs of

the companies and the project in question (Chesbrough & Crowther, 2006).The literature on co-creation has focused on value creation (Möller & Törrönen, 2003), on consumer participation in new product development (Wikström, 1996), and on the exchange of experiences between a company and its supplier (Prahalad & Ramaswamy, 2004). On the other hand, although the literature emphasizes the partnership between competitors for innovation (Kazadi, Lievens, & Mahr, 2016; Smyth & Phillips, 2001), we note the lack of literature on the co- creation process in the development of new products in triad format, that is, with two competing companies participating in the co- creation process. Because of the lack of studies that report co-creation among direct competitors in a triad format, the purpose of this article is to analyze the role of design thinking as a facilitator of the co-creation process among competitors.

In addition to the main objective, it is possible to define the specific objective of the research to understand the process of mutual transfer of technology and knowledge among competing companies in the process of co- creation. To achieve this goal, a qualitative research was carried out with the single case study, representative of a sector. The data collection was performed through secondary data and semi-structured in-depth interviews with the person responsible for the process in the Brazilian company. Data analysis was performed through analytical induction, where the findings of the empirical research were analyzed in the light of the literature explored.

The results of the research illustrate the advantages for the three companies that participated in the co-creation process for the launch of a new product, thus enabling the academic contribution of exploration of the co- creation process among competitors. This means that the literature on co-operation among competitors (Gnyawali & Park, 2011; Hong & Snell, 2015) dialogues with the co-creation literature (Kazadi et al., 2016; Prahalad & Ramaswamy, 2004; Witell, Kristensson, Gustafsson, & Löfgren, 2011) using methodologies such as design thinking.

The article is structured as follows: 1) Theoretical review of the main concepts that underlie empirical research and results; 2) Description of the methodology used in the research; 3) Presentation of the case; 4) Presentation and discussion of the results of the empirical research, mainly the description of the innovation process and the dynamics between companies; 5) Conclusion of the research, returning to the most relevant points of the findings.

LITERATURE REVIEW

Open Innovation

The practice that organizations have adopted for decades to develop new products and services is a model focused on closed innovation, which has been confronted by an opposite practice called open innovation

(Carolina Zonta & Amal, 2018; Chesbrough & Crowther, 2006). For Chesbrough and Crowther (2006) and Ketchen, Ireland, and Snow (2007), the concept of open innovation focuses on the search for, mainly done by R&D departments, innovations and innovative resources at external sources through the sharing of resources such as skills, knowledge and technology.

Open innovation, although punctually practiced by companies long ago (Huizingh, 2011), has been driven by two main factors: 1) globalization, facilitating the flow of information and knowledge and the mobility of human capital; and 2) the speed of technological change, making the product life cycle shorter and, together with the exponential complexity and cost of new product development, makes open innovation a viable alternative to improve competitiveness (Velu, Barrett, Kohli, & Salge, 2013). There are several advantages of adopting an open innovation model, according to Powell and Grodal (2005) and Chesbrough and Crowther (2006), but they intensify and stand out in aspects such as the creation of a network that interconnects companies with common interests mainly through interaction in mutual projects (Monticelli, de Vasconcellos, & Garrido, 2017). The sharing between companies occurs largely with their consumers, with their suppliers and companies from other industries.

Although the literature points to open innovation mainly among suppliers, consumers, academia and other companies (Huizingh, 2011), it is possible that the model also occurs between two competitors in the same industry, working together to the service of a strategic client that values collaboration, the sharing of business with stakeholders and the competition as traditionally occurs (Gnyawali & Park, 2011; Hong & Snell, 2015). Despite the reduction of costs and the increase of innovative capacity of the company that practices an open innovation model, Ketchen et al. (2007) emphasize that such a model requires strategic planning of the company at several levels, such as competencies, processes, organizational culture and structure. Preparation is necessary so that the company can circumvent possible unplanned results and create trustworthy links of commitment between partner companies or consumers.

However, Huizingh (2011) clarifies that the polarization of "open and closed innovation" does not reflect the observed reality. The authors states that there is a matrix of possibilities between the innovation process and the result of innovation. This matrix enables innovation to be considered in four different types, as can be seen in Table 1.

Table 1
Types of Innovation Matrix.

Innovation Process	Innovation Result	
	Closed	Open
Closed	Closed Innovation	Public Innovation
Open	Private Open Innovation	Open Innovation

Adapted by the authors from Huizingh (2011).

According to Huizingh (2011) and Slowinski and Sagal (2010), strategic planning and follow-up by companies that seek to adopt the open innovation model allows for results to be achieved according to the assumed benefits.

The authors state that open innovation has been applied in an increasing range of sectors, especially those involving high added value and technological sensitivity, in addition to the exponential use by chemical industries, one of the objects of analysis of this research.

In short, it is possible to emphasize that the closed innovation model has been replaced by open innovation models, as shown in Table 1. The cited authors affirm that, considering due legal care in the sharing of knowledge and technology, open innovation in its various manifestations has proven to be the most efficient strategy for the development of innovations in products and services.

The process of co-creation

The practice of co-creation, one of the strategies of open innovation to include agents external to the company in the process of innovation, has the objective of adding value or content to the product or service. The benefits of co-creation practice vary according to contractually signed partnerships, with a focus on sharing knowledge and technology (Prahalad & Ramaswamy, 2004).

Open innovation and co-creation share the assumption that firms do not have all the knowledge they need for innovation. In this sense, co-creation appears as a strategy to apply such assumption, with external agents actively participating in the development phases of the product or service and significantly increasing the possibilities of meeting their needs and expectations (Witell et al., 2011).

Co-creation partnerships are considered by Chesbrough and Schwartz (2007), according to the current marketing context, the most effective way to innovate the business model with the goal of enhancing a company's innovative capacity.

With co-creation, agents involved in the development process create partnerships around a common goal: to innovate in each product,

technology, service or business model. With this in mind, Prahalad and Ramaswamy (2004) present four main blocks that must be worked on by co-operating partner companies.

The four blocks, forming the acronym DART, allow companies to focus their efforts on the development of interactions based on: 1) Dialogue among the agents to understand the purpose of the co-creation; 2) Access to information between companies, such as resources and technologies; 3) Understanding the risks and benefits of the co-creation process; and 4) Transparency of information on the development of the product, technology or service among the agents involved in the co-creation.

In a practical bias, Chesbrough and Schwartz (2007) affirm that the elaboration of a business model based on co-creation requires three main steps in order for the process to be able to enhance the innovative capacity of all the companies involved and to create a product, technology or service.

The first step, according to the authors, is to define the objectives of the partnership and the starting point where it is possible to define the needs of the business model and consequently the contribution of each party involved.

The second step is detailed internally for each agent, where there is a need to understand the possible contributions of each research department involved. It is possible to observe the presence of the concept of "core business", where companies must understand their main competences and the best way to maximize their use. The authors classify the competencies to be analyzed by the agents in three main types: 1) Core competencies, the source of differentiation of the company to add value to a product, technology or service; 2) Critical skills, essential for the development of the target object of co- creation, but do not involve the core of the companies; and 3) Contextual competencies needed to complete the product development cycle, but are not relevant to their value aggregation. The third step, according to Chesbrough and Schwartz (2007), is to understand the competencies of all the agents involved together, where it is possible to align the two previous steps: the objective of co- creation, the contributions of each agent and what competences will be used together.

The authors emphasize that the analysis of joint competences is essential for the success of a co-creation, since the contextual competencies of one company can contribute to the core competencies of another, for instance.

As observed in the researches of Hong and Snell (2015) and Gnyawali and Park (2011), the process of co-creation and technology transfer, when performed ethically and agreed between the parties, plays a relevant role in maximizing benefits for companies individually or jointly.

Design thinking as co-creation methodology

Innovation, co-creation and design thinking are three concepts that, through working together, result in innovative products and services in a radical or incremental way from experiences and tacit or explicit knowledge allocated in different parts of the world.

Both the research, co-creation and prototyping stages can occur in different places, geographically decentralized and focused on the required solution, through the management of open innovation with the role of leading the "locus of creation".

The methodologies that work the creative process appropriate theories that explain the different stages, characteristics and roles that must be assumed by the people in each one of their phases, whose actions and behaviors will vary according to the situation. These phases are also identified by psychoanalytic theory in the stages of inspiration and elaboration, the first being performed by the preconscious system and the second by the conscious (Kubie, 1958).

In this article, the methodology of design thinking was chosen to fulfill the objectives of the research because its person-centered approach and to contemplate the stages of research, co-creation and prototyping, followed by continuous rework based on information obtained during feedback loops and information exchange between those involved in the creation.The design thinking methodology has been used in a variety of ways, adapted according to the context and the user's needs without, however, failing to follow the three main steps: research, co-creation and prototyping, all people-centered. The scope of the methodology allows its use for the development of different solutions, be they products, services or strategic management, for example. In general, it refers to the designer's way of thinking, that is, the strategies used by designers to solve challenges (Brown, 2009).

Lockwood (2010) defines design thinking as "an essentially human-centered innovation process that emphasizes observation, collaboration, rapid learning, visualization of ideas, rapid prototyping of concepts, and concomitant analysis of economic and financial aspects of business".

Brown (2009) characterizes design thinking as an undisciplined process of creation, that is, there is no indication of the best way in which such a process can occur, although there are starting points and useful milestones along the way. The author visualizes the process of innovation by design thinking as a system of overlapping spaces, rather than an orderly sequence of steps. Lindberg, Gumienny, Jobst, and Meinel (2010) present a perspective of the design cycle as composed of two large spaces: the exploration of the problem and the exploration of the solution, as can be seen in Figure 1.In both spaces, the workflow begins with a divergent phase in the search for inspiration and diversity and concludes with a convergent phase of synthesizing what has been explored. In the first space, from the motivating element of the search for a solution, a divergent phase allows the broadest possible understanding of the elements that make up the problem and, later, a convergent phase

that synthesizes this understanding, to declare accurately the nature of the problem to be challenged. Already in the second space, from the exploration of the solution, again a divergent phase expands the possibilities and diversities of solutions, while a convergent phase selects those possibilities in the compound that best responds to the initial challenge.

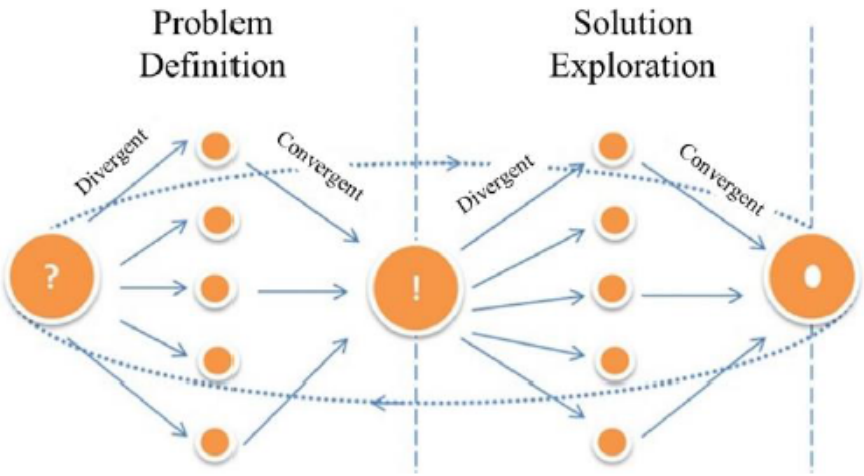

Figure 1
Lindberg Design Thinking Model.
Lindberg et al. (2010).

In short, designers' thinking is implicit in the process of approaching the problem to be solved. This approach involves, first, understanding what the end customers of the product or service need, what bothers them and how they relate to their environment, that is, the process begins by understanding the people involved.

Then, the designer idealizes several solutions that are materialized by fast and rustic prototypes. A striking feature of this stage is the ability of the designer to operate with the whole and the part simultaneously, that is, as a methodology, design thinking appropriates this integrative character, which is something new in cases of culture and structures in which fragmented thinking is present, characteristic of mechanistic organizations.

In the next stage, idealizations are converged with the technological, material, production and commercial distribution aspects, to guarantee the viability of the solution without losing the essence of its creation. A well-finished prototype, sometimes even functional, allows the expansion of the group of people who will evaluate the solution.

The interest for what is implicit in design thinking rests on the possibility of passing through the project to other areas of the organization, based on the skill set of the designers, which allows them to work with initially imponderable problems and still reach concrete and palpable solutions. This ability has the potential to collaborate in transforming organizations that want to change from the repetitive mechanistic model to a way of developing ideas, products and services

more appropriate to the speed of scientific and technological change (Lindberg et al., 2010).

Based on these aspects, the management of open innovation, which has the strategy of co- creation between companies, is a fertile space for the use of the methodology of design thinking as part of the process. The prototyping stage contained in the design thinking methodology facilitates the feedback of the process, thus optimizing product development time due to the centrality in the people and objectivity of the feedback in front of the prototype.

METHODOLOGY

Since the research addresses a contemporary theme to the process of business innovation and with the objective of reaching conclusions capable of guiding organizational behavior, is considered of contemporary relevance (Salomon, 1971). With regard to its methodological process, by addressing the description, exploration and analysis of observable reality through a single case study, it is shown as an empirical research (DEMO, 2000). The search for the in-depth analysis of a specific phenomenon, when carried out through a qualitative methodology, allows a detailed understanding of the process of creation between the companies that are the research scope (Denzin & Lincoln, 1994). Considering the breadth of the object, its subjectivity, contemporaneity for the business field and the lack of control that the researcher has about the phenomenon, the case study is imposed as a way to allow the apprehension of the greater number of aspects of the problem (Yin, 2010).

The selection of the unique case to be analyzed was due to its representativeness in the market in which it operates and the management model that values cooperation in the development of new products. The company has been considered innovative since its foundation more than forty years ago, has organizational practices based on beliefs that value and respect human relationships, collaboration and well-being.

Data collection

Data collection was done through secondary data (public information provided by the three companies involved in the process, both in reports and in their respective websites) and, mainly, from a semi-structured interview with the creative professional who was responsible for development of new products and led the process of co-creation.

The choice of the professional interviewed was based on the concept of appropriate judges (Amabile, 1996) since it is a professional who, by position, experience, action or responsibility, experiences creation and knows the development work carried out in the company and by the competitors involved in the process.

The creative professional interviewed is relevant in the sector because it is in a unique position in the structure of companies such as the one researched, bridging three elements: 1) what the market demands; 2) what suppliers of chemical molecules can offer; and 3) what the company wants to build as a competitive advantage through the provision of sensory, smell, and emotional characteristics.

During the interview, the creative professional was encouraged to describe the company's development process for a new product being developed, compare it to the individual creative process and to comment on the innovative experience and benefits of co- creation that involved two competing supplier companies each other.

The recording of the interview was done in three stages: recording and annotation, editing and construction of the research reality (Flick, 2008). The researcher recorded the main points of the narratives and their observations during and shortly after the interviews. From the annotations and recording of the interview, the data were analyzed.

Data analysis

For the analysis, three categories were used, according to Flick (2008): 1) The individual and his/her biography, relevant category for the understanding of the creative competence of the interviewed professional; 2) The company; and 3) The group involved in the co-creation. The script can be seen in Table 2

Table 2
Interview and Analysis Script

Category	*Dimensions*
Individual	Identification Biography Career Highlights
Company	History Brand Innovation Success factors Processes oriented to innovation Innovation-driven people management Innovation-oriented management
Innovation Team	Common values in the team Team integration factors Integration factors between companies Focus on innovation

created by the authors.

With the classification of the content, the data were grouped to construct a specific dataset. The interpretive repertoire technique was used to analyze the data in a consolidated way, considering the observation of the researchers, the speeches obtained in the data collection and information extracted from secondary data (Flick, 2008). Afterwards, the content of the interview was grouped in three stages, using the interpretive repertoire technique (Flick, 2008). The treatment of the empirical data was carried out independently by the authors, for later discussion and reach of consensus regarding the data and the points to be discussed in front of the theory.

CASE DESCRIPTION

The case study, a Brazilian multinational perfumer and market leader, has as competitive differential in both the production of exclusive raw materials in its portfolio and the creative competence to use them in a harmonic and strategic way for the development of its new products.

Since its foundation, the multinational has innovated in the production and marketing of cosmetic products, personal hygiene and perfumery. In its business strategy, it seeks to create value for society and generates results from the integration of economic, social and environmental dimensions, characterizing its concern for sustainable development.

In the supply of raw materials for its products, companies of the fine chemical industry are involved. These raw material suppliers can supply chemical molecules in a single format or already combined in countless possibilities for the formation of a fragrance, which formulation may contain hundreds or thousands of different raw materials in very small quantities (measured in parts per million - PPM), but perceptible to human smell.

In the case study carried out, the two chemical companies involved in the process of developing the new perfume participated with both their technological skills and their creative competencies, represented by professionals in creation - perfumers allocated in different countries.

Thus, the phenomenon analyzed in the research is formed by the Brazilian multinational and two companies competing in the fine chemical sector (one American and the other Swiss-American) for the development and launch of a new perfume. The initiative of the multinational, when forming a team of co- creation with competing companies, represented a novelty in the market and an innovative business model. Perfume, one of the product categories of the portfolio of the company studied, is a complex product that offers the consumer an olfactory sensation, characterized by subjectivity and objectivity from the beginning of the process of identifying market indications for the elaboration of the concept, which is to be transformed in perfume by the professional who interprets it according to their creative competence related to the ability of association.

Technically, for the elaboration of such product, the professional perfumer has at his disposal thousands of raw materials with unique physical-chemical and sensorial characteristics and that, together, establish new characteristics that can transform organically with the passage of time and environmental conditions.

The complexity of perfume can be exemplified by considering the dynamics of a single molecule in the universe of thousands. The ester, for example, is called methyl acetate and its chemical composition is represented by *CH3- C=(O)-O-CH3*. This specific structure composed of atoms of carbon, hydrogen and oxygen has olfactory characteristics described by experts such as sweet and ethereal. A chemical molecule of eleven atoms, such as methyl acetate, has 27 notes that "vibrate" at

different wavelengths (BURR, 2006), hence the richness of sensations and complexity of the development of this market.

RESULTS AND DISCUSSION

During the interview, the characteristics of individual and collective creation work were explored, as well as a description of the internal process of developing a new perfume, which stages are centered on people (consumers and specialists), co-creation and prototyping: all elements of the design thinking process (Brown, 2009; Lockwood, 2010).

The work of creation, object of study of this article, starts with the creation of a new concept and with the construction of a multidisciplinary team represented by people of the organization or external to it. In this stage the concept of the new product to be developed is based on market research data is created. The creative professional values their inclusion since this stage of the project, as this allows their involvement and stimulates the inspiration necessary for the creation and for the direction and leadership of the work with the other creative professionals involved in the process.

From the definition of the concept, the work begins to create the product that involves a new creative process with the use of a free association technique, which objective is to translate a market demand into a smell and an olfactory sensation in the form of a perfume. The development of the new product occurs through insights generated by the free association of those who participate in the process of verbalizing individual and collective references related to the proposed concept for the new product.

At this stage of the process, it is possible to highlight the first advantage of the use of different creative professionals during a co- creation process: the individual repertoire and the various free association capabilities are potentiated for the development of a new product. The process management, centralized in the Brazilian multinational, ensures the focus of the work of co-creation, increasing the speed of delivery of the product and the assertiveness of the result. Co-creation and prototyping speed development by allowing the reduction of rework, which are traditionally done individually and from individual interpretations, but which in the methodology of design thinking occurs collectively among the members of the co- creation team.

To exemplify the subjectivity of the process and justify the use of design thinking, it is possible to observe in the excerpt from the interview that follows:

> "The initial information was based on the identification of a market opportunity, the result of a research related to the relationship of couples. The product aims at differentiating in the market through a product which concept addressed the characteristics of these relationships in a non-stereotyped manner. As a result of teamwork, it was defined that the perfume would translate a gesture of love that enchants the other by means of a scent."

To define the olfactory path (chords) to be followed, the creative process was initiated through associations following divergent and convergent stages of thinking that initially sought answers to two main questions: "*What enchants a couple*?" And "*What reenchants*? ". The purpose of such questions was to identify the two main olfactory chords to be worked on by the perfumers and the full process is illustrated in Figure 3.

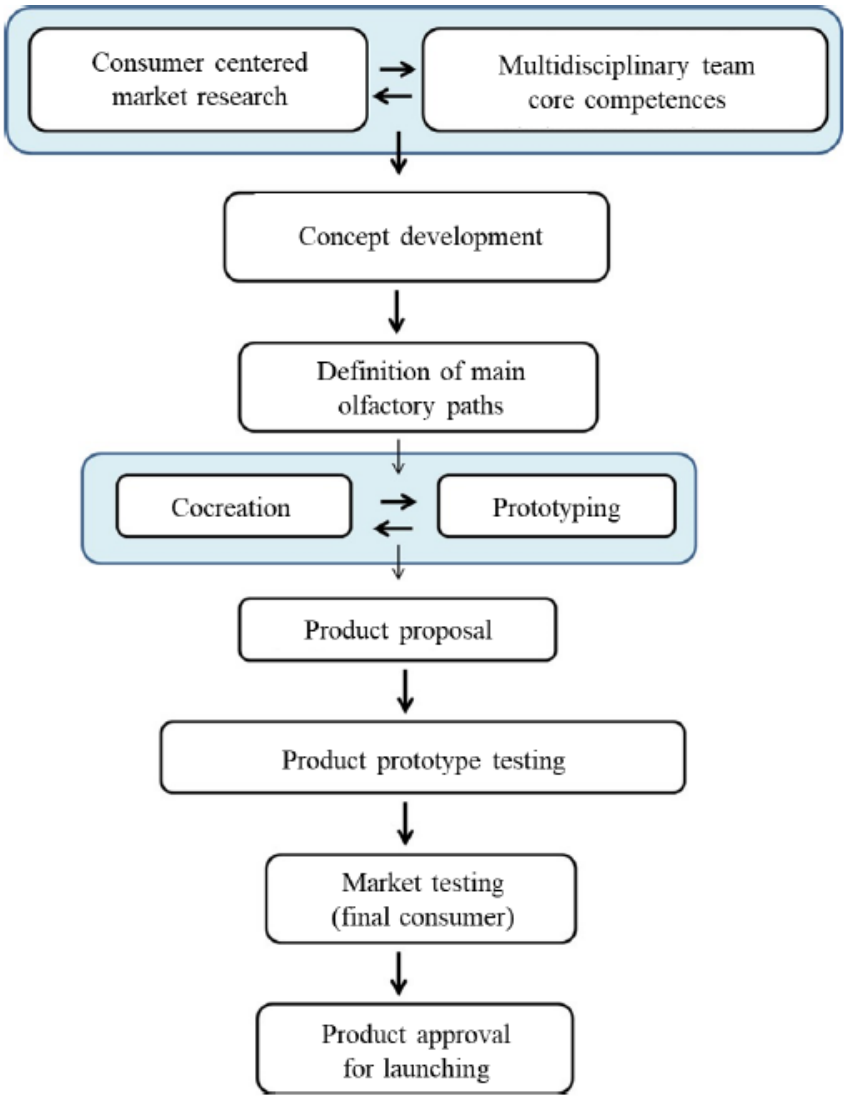

Figure 3
Perfume Development Process.
created by the authors.

This case study points out, among its results, the role of the leadership of the development process, centered on the Brazilian multinational that demanded the creation of the new product, and from the definition of the concept through research results.

This research, based on a case study, represents an innovation in the process of developing a complex product in which the co- creation between the company and two of its suppliers was used in the search for innovative solutions.

Besides, using design thinking also provided greater agility and assertiveness during product development. In the case, the company was disruptive in the fine chemical sector when, with success, put in the same process of co- creation two of the main competitors worldwide of this sector.

FINAL CONSIDERATIONS

Nowadays, organizations are experiencing a high degree of complexity where individual work no longer meets the demand speed imposed by the dynamics of an innovative market, which in turn requires solutions in products, processes or forms of management and business to meet consumer needs.

The development of a perfume is by itself a complex design process that demands tacit and explicit knowledge, creative competence and motivation, that is, creativity according to the concept of Amabile (1996) to transform chemical molecules into sensory experiences that expectations of interested parties.

This research highlighted, through the narrative analysis of the professional perfumer, the role of the collaboration in a process of triad co-creation of a new perfume, whose innovative management is characterized by the joint work of two competing companies in the sector of fine chemicals and both business partners of the company's perfumery unit.

Considering research aim to analyze the role of design thinking as a facilitator of the co- creation process among competitors, the literature raised and the empirical data collected, it is possible to assert that the methodology of design thinking made it possible to explore in a unique way the individual creative competence company and its peers.

Not limited to the advantage of using the methodology, there is also the diversity of core competences made available by the parties involved in the process through collaboration in a customer-led process that has ensured innovation based on their beliefs, mission, vision and strategy.

The research has two types of contribution: academic and managerial. The academic contribution focuses on the theoretical gap observed by the authors regarding the management of a triad co-creation process among competitors of the same industry.

On the other hand, the managerial contribution is made to the awareness of other companies of the benefits of using design thinking as a methodology to enable co-creation between competitors in an open innovation approach.

The limitation of the research, coupled with the scientific methodology used, is in the absence of possibility of generalizing the findings to other industries besides perfumery and fine chemistry. Aligned with this limitation, the possibility of future research is found in the methodological replication in different industries to identify a pattern of results, or the development of quantitative researches to measure qualitatively outstanding benefits in the present research.

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