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Contents

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Editorial

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PRESENTATION

Revista de Negócios is located in Blumenau, state of Santa Catarina, Brazil, in the campus of Uni-versidade Regional de Blumenau—FURB, post-graduate programme in Business Administration. Revista de Negócios is published quarterly in January, April, July and October on the website furb.br/rn.

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MISSION

Revista de Negócios advances the knowledge and practice of management learning and education. It does it by publishing theoretical models and re-views, mainly quantitative research, critique, exchanges and retrospectives on any substantive topic that is conceived with studies on emerging countries. Revista de Negócios is an interdisciplinary journal that broadly defines its constituents to include different methodological perspectives and innovative approach on how to understand the role of organizations from emerging countries in a globalized market.

SCOPE AND FOCUS

Revista de Negócios aims to create an intellectual and academic platform, under the perspective of Strategic Management Organization, to promote studies on Emerging Countries. The Journal looks and reviews for contributions to the debate about researches on two specific topics: innovation and competitiveness and strategic organization in emerging countries. The topic of innovation and competitiveness covers all studies and researches related to how organizations can sustain their competitiveness, particularly focusing on innovations, entrepreneurship and performance. The second topic covers studies and researches on strategic management of organizations, more specifically on how companies can or should act at strategic level looking mainly but not only to external context, supply chain, competitive strategies in international market, and marketing approach. The editorial policy is based on promoting articles with critical perspectives seeking for the understanding of the differences and similarities among emerging countries and in comparison with experiences and theories on strategic management in developed countries. It intends to promote specific contributions of how theoretical and empirical studies on emerging economies may contribute to the advance of theories related to innovations and competitiveness and strategic management of organizations. It is welcome scholars particularly working on such topics to submit theoretical essays, empirical studies, and case studies. The Revista de Negócios is open to different methodological perspectives and innovative approaches on how to understand the role of organizations from emerging countries.

TARGET AUDIENCE

The target audience of Revista de Negócios is the Brazilian international academic community in related fields of knowledge on business management.

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Editorial Letter

In the current issue we are presenting four articles with several empirical and theoretical contributions to the topics of knowledge management, information system strategies, and high education management. The authors share the common understanding that the topics are challenging organizations from different industries, and with different market positioning. The articles have adopted multiple methodological procedures that reflect in large extent the complexity of the topics and themes discussed in the context of emerging economies.

The first article: **Knowledge management at Unilever South America – enabling conditions and their interaction with the SECI model**, authored by Jorge Tenório Fernando, Silvio Popadiuk, Neusa Maria Bastos Fernandes Santos, has as a main objective to describe the organizational knowledge taxonomy, and portray the theoretical path of the field with emphasis on some oppositions such as tacit-explicit and exploration-exploitation and their impact into the organizations. Based on a case study, the results pointed to advances in the efforts for the dissemination of knowledge by the top management of the company; however, it also shows that some team integration is missing, so that knowledge is shared due to the working structure rather than for individual or collective initiatives.

The second article: **Information Systems for Early Supplier Involvement in Brazilian Automotive Supply Chains**, authored by João Batista de Camargo Junior, Paulo Marcelo Caetano da Silva, Ana Rita Tiradentes Terra Argoud, Pedro Domingos Antoniolli, Silvio Roberto Ignácio Pires, has the aim to identify whether in an automotive industry context with structural, technological and regulatory problems, information systems help the new product development (NPD) process to achieve development time reduction, cost reduction and product quality improvement. Results suggest that information systems have been widely used as tools for collaboration among the SC members, with expressive gains in competitiveness.

The third article: **The Academic Master's Program in Management: is it relevant to professional practice?**, authored by Victor Meyer Jr. and Priscilla Veiga Bueno, has the purpose to provide an analysis of the relevance of an academic Master's Program in Management to professional practice from the viewpoint of graduates and professors, under three perspectives: "academic", "social" and "institutional. This article contributes to the field by identifying critical points of the degree program that require a better alignment of capability, knowledge and resources with the expectations and demands of the productive sector and society.

The fourth article: **Entrepreneurial education: entrepreneurial mindset and behavior in undergraduate students and professors**, authored by Ricardo Schaefer and Italo Fernando Minello, has the objective of analyzing the dimensions of the entrepreneurial mindset and the characteristics of the entrepreneurial behavior in undergraduate students and professors of a higher education institution that develops entrepreneurial education activities and projects. The article provides contributions to the understanding of how the entrepreneurial mindset and behavior can be developed in professors and students from a proposal of entrepreneurial education.

Before concluding this Editorial, as always, we want to express our gratitude to all reviewers that helped us to achieve this current issue. We thank you and hope we can continue to count on your contributions to our Journal in future issues.

To our readers, we hope you will enjoy reading the articles, and expect you to contribute with our Journal in future issues on business strategies and emerging economies.

Mohamed Amal

Editor

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Knowledge management at Unilever South America – enabling conditions and their interaction with the SECI model

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KEYWORDS

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ABSTRACT

This paper describes the organizational knowledge taxonomy, comprising management of an existing knowledge and creation of a new knowledge, portraying the theoretical path of the field with emphasis on some oppositions such as tacit-explicit and exploration-exploitation and their impact into the organizations. It presents the case study of Unilever South America by analyzing the company's enabling conditions for knowledge creation and the integration with the SECI (socialization, externalization, combination, internalization) process, in which we identify how the company manages to cope with knowledge creation and sharing as a strategic resource for the product innovation activities of marketing and R&D project teams, thereby portraying features of organizational knowledge as a strategic resource and its use dimensions in the product development process. The results pointed to advances in the efforts for the dissemination of knowledge by the top management of the company; however, it also shows that some team integration is missing, so that knowledge is shared due to the working structure rather than for individual or collective initiatives, which leads us to conclude that the strategic objectives and efforts of the organization to extend the reach the generated knowledge within the business does not reflect completely in the reality of the working groups.

PALAVRAS-CHAVE

Criação e compartilhamento de conhecimento,
Processo SECI,
Inovação de produto,
Interação P&D-marketing,
Unilever.

RESUMO

Este artigo descreve a taxonomia do conhecimento organizacional, contemplando a gestão do conhecimento existente e a criação novos conhecimentos e mostrando o percurso teórico desse campo de estudos com ênfase em oposições como explícito-tácito e exploração-explotação e seu impacto nas organizações. Apresenta o estudo de caso da Unilever América do Sul, analisando as condições capacitadoras da empresa para criação de conhecimento e sua interação com o processo SECI (socialização, externalização, combinação, internalização) em que se identifica como a empresa trabalha com a criação e compartilhamento de conhecimento para realizar inovação de produtos pelas equipes de marketing e P&D, evidenciado as características do conhecimento organizacional como recurso estratégico e suas dimensões de uso no processo de desenvolvimento de produtos. Os resultados demonstraram haver avanços nos esforços de disseminação de conhecimento pela alta administração da empresa; no entanto, revelaram também faltar alguma integração entre as equipes, de modo que o conhecimento é compartilhado mais pela estrutura de trabalho do que por iniciativas individuais ou coletivas, o que leva à conclusão de que os objetivos e esforços estratégicos para estender o alcance do conhecimento gerado dentro da organização não se refletem completamente na realidade dos grupos de trabalho.

1 Introduction

Knowledge has been object to frequent discussions in society, so expressions like "knowledge era", "knowledge society", "knowledge worker" are seen in mass-circulation papers in South America, and there are several books available bearing titles such as "knowledge management" and "organizational learning". In the organizations and management schools, the continuous learning of professionals beyond a single area is encouraged so they are better prepared to meet the market challenges. Nonaka (1991, p.41) states that "new knowledge always begins with the individual". In an organization with several professionals, this statement presumes a set of accumulated knowledge pieces that gravitates towards the different departments and which, used individually or collectively by the professionals, contributes to help the organization achieve business goals. When considering the professional's knowledge separately, some questions can be raised: what are individual and organizational knowledge? How far does this knowledge reach? Is it possible to grasp individual knowledge if the professional leaves the organization? How can this individual knowledge be replicated in a broader sphere? How can new knowledge be created? Such questions are in the organizations' agenda, and they try to use mechanisms to formally register the activity of their professionals in reports, meetings, presentations and data management systems. This explicit record of knowledge certainly covers some key actions, but an important part is not captured by such tools, as they are only in people`s minds – it is the tacit knowledge.

This work describes the taxonomy of both individual and organizational knowledge, and then presents the case study of Unilever, a global fast-moving consumer goods (FMCG) industry, to examine the enabling conditions for knowledge creation, distinguishing its main components and occurrences in the operational level, namely, in product development projects in the South American region. The justification for this research lies in the interest to capture the various concepts related to the knowledge creation and management in the form of a case study, giving them a better outline in their applied dimensions. In other words, it aims to echo the current discussions seeking to the understand the peculiarities of knowledge creation and knowledge management theories – thereby offering some contribution from an academic standpoint – seeking also a concrete meaning by identifying the mechanisms that help disseminate knowledge in different organization levels accordingly. In sum, the paper will portray a panorama of the main theories connected to knowledge creation and management providing examples that can facilitate application in management courses as well as presenting tools that are likely to be used by practitioners in a real organizational setting.

This study is structured as follows: first, further to this introduction, we present the theoretical background, raising most concepts and difficulties associated to knowledge creation and management as a strategic resource; then, we describe the research problem, objectives, and methodology as well as the detailed construct items on enabling conditions for knowledge creation and its application through the SECI process; after that, we present the Unilever case discussion, showing the empirical research findings; and lastly, we make our final considerations.

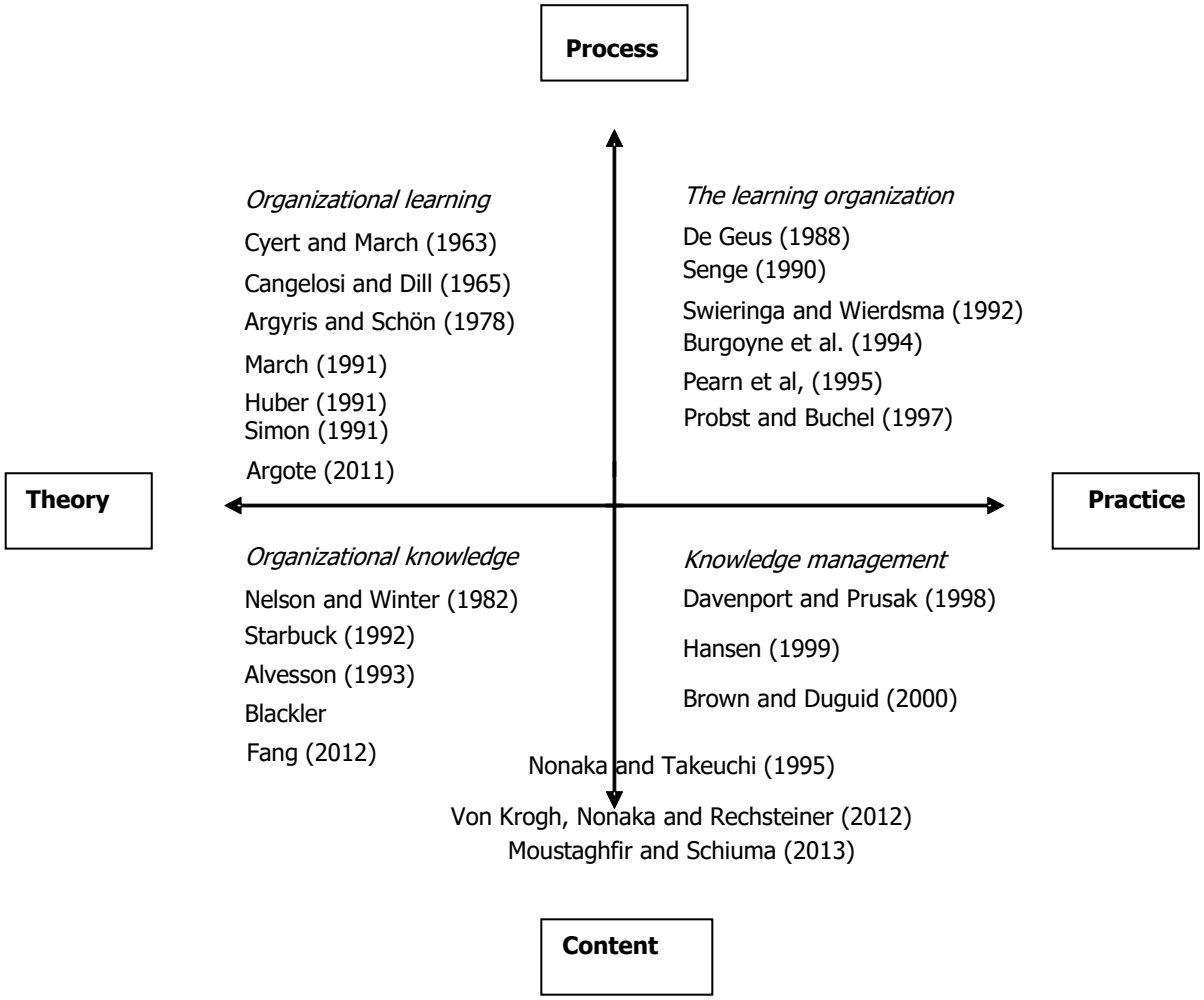
2 Theoretical Framework

2.1 Organizational knowledge and knowledge management

Lyles and Easterby-Smith (2003) provide an overview of the main studies published about knowledge in the organizations, encompassing the individual and organizational dimensions. They emphasize the influence of classic works like those of Penrose (1959) and Polanyi (1966), whose concepts were used by different researchers of organizational knowledge, making distinction among four major streams. Under *organizational learning*, the studies of the learning processes were grouped to understand and critique what happens within the organization, as done by March (1991) and Simon (1991). In *the learning organization*, scholars like De Geus (1988) and Senge (1990) claim the organization can learn and they seek to understand, in practice, how to create and improve such abilities for a better performance. The studies focusing on *organizational knowledge* aim to conceptualize the nature of the knowledge held by organizations, addressing individual and group

knowledge and the tacit-explicit knowledge distinction, such as Nelson and Winter (1982), who present the concept of tacit knowing as the basis of individual and organizational competence, and Nonaka and Takeuchi (1995) as the major influence of that stream. At last, the studies dedicated to *knowledge management* portray a technical and practical view of how to create mechanisms to disseminate knowledge for organizational performance improvement, as did Nonaka (1994), and major consulting companies that focused on ICT tools for knowledge management in the organizations. Figure 1 presents the main authors distributed across these four research fields.

Figure 1. Main areas of knowledge study in the organizations



Source: Adapted by the authors from Easterby-Smith; Lyles (2003)

Those streams show some relevant distinctions. One is that there are sub-themes of a more theoretical nature, while others are essentially more practical. Another is that some sub-themes are more process-related, whereas others refer mainly to the content. Anyway, it is understood that such dichotomies are created for educational purposes, given that the reach of the questionings is likely to go beyond the limits set by the quadrant and are chiefly used for theory discussion and practical application.

2.2 Knowledge as a strategic organization resource

Penrose says that "a firm is basically a collection of resources" (Penrose; 2009, p.68). Resources comprise the material and the human tools and capacities that enable a firm to produce singular products and services compared to other firms. This Penrosean view was further discussed

by Wernerfelt (1984, p.180) when he refers to knowledge as one of the organization's most valuable and inimitable resources and a driver of competitive advantage as the firm can "exploit the current assets, as well as develop new ones". The authors' viewpoints converge on the importance of knowledge as a predominant factor for the generation of resources that are unique to one organization.

Tsoukas (1996) conceptualized organizations as knowledge systems, claiming the professionals employ both the existing and the factual knowledge (know what), using also the collective knowledge to create new knowledge. This view outlines the degree of complexity achieved by knowledge in three important dimensions: the *use*, ranging from individual to collective; the *exploitation*, which can be deliberate or not; and the *dynamics*, given the numerous possibilities of knowledge creation.

Alavi and Leidner (2001) advocate that understanding the knowledge taxonomies is fundamental, given the myriad of theoretical approaches and types of knowledge that came up. Most authors, however, work with the perspective of the use of knowledge, not with knowledge per se: Prahalad and Hamel (1990, p.82) call core competences the "organization collective learning" associated with manufacturing skills; Kogut and Zander (1992, p.391), name combinative capabilities the "intersection of the capability of the firm to exploit its knowledge and the unexplored potential of the technology". Grant (1996, p.377) speaks about organizational capabilities, defined as "a firm's ability to repeatedly perform a productive task by integrating the specialized knowledge". Spender (1996), however, claims four types of organizational knowledge: *conscious* (explicit and individual); *objectified* (explicit and organizational); *automatic* (pre-conscious and individual) and *collective* (depending on the context and expressed in the organizational practice).

Therefore, this draws attention to a key distinction between individual and organizational knowledge. In that regard, Kogut and Zander (1992) outline the path of knowledge, firstly unfolding the concept as information and know-how and then emphasizing its transformation, which ranges from the personal to the social level, in four steps: individual, group, organization and network. They claim the personal knowledge grows gradually in complexity by moving towards the broader and more strategic spheres of the organization, so that "once the organizing principles replace individual skills, they serve as organizational instructions for future growth" (Kogut; Zander, 1992, p.390). In other words, the knowledge grows with the routines and is cumulatively shared among groups until it becomes a strategic repertoire that is unique to that organization. Knowledge is identified as an element of crucial importance in the development of organizational strategies, considered the catalyst element of competitive advantage for those who possess and use it properly. Moreover, the discussions lead to two reflections, the first asserting the relevance of the individual who, ultimately, is the only knowledge holder, especially the tacit one; the second highlights the efforts of the organization to make effective use of this very knowledge within its boundaries, sometimes in a quite disorderly manner, as we will discuss further.

2.3 The creation of organizational knowledge and its difficulties

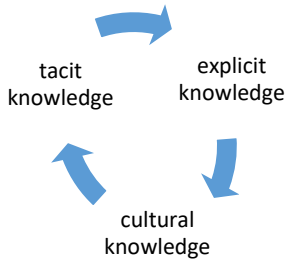
Penrose (2009, p.48) makes a distinction between the objective knowledge, "one kind that can be formally taught, can be learned from other people or from the written word", and experience, which "also is the result of learning, but in the form of personal experience"; she points out that the experience helps increase the objective knowledge through the tasks performed, but it is intrinsic to the individual and may not be transmitted to others. She also highlights the firm expansion limits due to the inexperience of some group members who need time to acquire the necessary skills to perform their tasks, generating a gap in the firm growth while that knowledge is not fully incorporated.

Nelson and Winter (1982) discuss the organizational routines in their conception about the firm changes from an evolutionary perspective, understood as rules and procedures resulting from learning which are bound by a unique code that helps compose the organization's "memory". Regarding knowledge incorporation, they assert (1982, p. 99) that "the routinization of an activity is the most important way of storing operational

knowledge that is unique to the organization." Therefore, the routines incorporate the organization`s tacit and implicit knowledge, being important to analyze how that knowledge is stored, applied and changed.

Choo (2002) advocates that the creation of knowledge is triggered when some knowledge gaps are detected which hinder an organization from solving a problem, creating a new product or benefiting from an opportunity. Then knowledge is created by the conversion of tacit into explicit knowledge, combination and integration of knowledge and its acquisition and transfer across the organization, as shown in Figure 2.

Figure 2. Knowledge Creating – Process and Dynamics

Model	Process	Dynamics
Knowledge creating	Knowledge gap ⟹ Knowledge conversion, integration, transfer ⟹ new knowledge ▪ Knowledge conversion ▪ Knowledge integration ▪ Knowledge transfer	 Knowledge creating

Source: Choo (2002)

Nonaka (1994), asserts that new knowledge is built through the interaction of two dimensions: the tacit and the explicit. Tacit knowledge usually refers to the experience acquired individually, being difficult to codify and transmit to other people. Explicit knowledge is codified and can be transmitted, as represented in Figure 3.

Figure 3. Modes of knowledge conversion

		to *Tacit*	**to** *Explicit*
from	*Tacit*	SOCIALIZATION - interaction between individuals; - shared experience	EXTERNALIZATION - through metaphors, analogies, concepts, hypotheses or models
	Explicit	INTERNALIZATION - action of learning by doing through manuals showing the experience from other individuals	COMBINATION - integration of various bodies of knowledge through documents, meetings, computers, etc.

Source: Adapted by the authors from Nonaka (1994)

These dimensions allow for distinguishing between the knowledge creation and transfer - under this perspective, the main challenge of the organizations lays in capturing and using tacit knowledge. Nonaka and Takeuchi (1995) advocate that tacit individual knowledge is mobilized and amplified by these four modes of conversion, a phenomenon they call "spiral of knowledge" which starts in the individual level and goes upward through the groups through interaction, thereby crossing sections, departments, divisions and even organizations.

A concept that helps understanding the tacit-explicit relation is knowledge *exploration* and *exploitation*. For Levinthal and March (1993),

exploration presupposes the pursuit of new knowledge, while exploitation implies the use of existing knowledge. March (1991, p.85), states that "the essence of the exploitation is the refinement and the extension of existing competences, technologies and paradigms. Its returns are positive, proximate and predictable. The essence of the *exploration* is experimentation with new alternatives. Its returns are uncertain, distant and often negative". Popadiuk and Choo (2006) consider *exploration* more related to the creation and use of tacit knowledge, while *exploitation* applies to the use of explicit knowledge. This opens possibilities for other analogies in which, from an organizational standpoint, exploration-exploitation would be means of using tacit and explicit knowledge. That said, we could consider mutual influences, in which the changes in the exploration would be reflected not only in the exploitation, but also in the tacit and explicit knowledge.

Another aspect is the threshold between the concepts. Across the exploration-exploitation concept, as well as on both ends of tacit-explicit there are intermediate derivations, in a subtle line limit, showing that the concepts are not hermetic and require an analysis in their dynamic context. Besides, it is necessary to point out that exploration competes with exploitation for resources within the organizations (March, 1991) and, by analogy, tacit knowledge would compete with explicit, apparently at disadvantage. Thus, the organization emphasis lies mostly on explicit knowledge, which usually can be captured and managed by ICT tools.

Levinthal and March (1993) assert that organizations find it difficult to dedicate simultaneously to exploitation – to ensure the current feasibility of their business, and to exploration – to ensure future feasibility. This suggests that the organizations should pursue some balance not only between exploration and exploitation, but also between the use of tacit and explicit knowledge to achieve the best results in their innovation processes and the overall business targets. In that regard, Alavi and Leidner (2001) highlight the *knowledge management systems* as far more important than a simple repository of ideas. These authors review the concepts related to knowledge management, aiming at establishing a relation between the main taxonomies – creation, storage, retrieval, transfer, and application – and their connection into the management systems. They advocate the need for different approaches to respond to the varied knowledge types, processes, and dynamics, and claim IT can be a key tool to respond to this multiplicity, going beyond the initial storage function.

Nonaka, Toyama and Konno (2000), present knowledge creation with emphasis on top and middle managers as active leaders, and advocate that this process implies a management style beyond common tasks such as the control of the information flow. They claim the need for a widely disseminated knowledge vision across the organization, the creation of knowledge mechanisms, and mid-management promoters in place as an interface to the other levels of the organization as well as to the external environment. In that regard, Matusik and Hill (1998) address the expansion of knowledge retrieval beyond the organization limits, discussing the concept of *contingent work* as an important factor for a company's knowledge creation. Thereby, the temporary incorporation of outsourced labour and the resulting interaction with the existing employees could promote the transfer of specific knowledge from outside the organization, given that "contingent workers are likely to have higher knowledge levels in industry and occupational best practices than are their counterparts who remain in one or a few organizational settings." (Matusik; Hill, 1998, p. 686).

That approach enriches the scope of possibilities for incorporation of tacit knowledge by socialization (Nonaka, 1994). If a firm can recruit an outsourced worker to fill a knowledge gap, this contingent work may become a solution to the limitation of the firm expansion brought up by Penrose (2009), in that the external experience will be applied to the group's benefit, reducing the possibility of growth stagnation for resource inconsistencies. To that point, Prahalad and Hamel (1990, p.88-9), claimed that "the top managers are seldom able to look four or five levels down into the organization, identify people who embody critical competencies, and move them across organizational boundaries". This view of knowledge as lack of experience also finds support in the concept of *bounded rationality* (Simon, 1991, p.132-3) defined as the "limits upon the ability of human beings to adapt optimally, or even

satisfactorily, to complex environments". This author adds depth to the discussion in distinguishing between a problem that is new for an individual or for the organization. On her turn, Penrose (2009, p. 90-1) affirms that "the capabilities of the existing managerial personnel necessarily set a limit to the expansion of that firm in any given period of time, for it is self-evident that such management cannot be hired in the marketplace". Therefore, Simon corroborates Penrose's idea about the individual knowledge: they both state that the individual to whom a new routine is presented will require some time to adapt, and both converge upon the limit for the individuals' performance due to the transactions complexity. One difference in their view is that, for Simon, a "change in the representation [of the corporation's objectives] implies change in the organizational knowledge and skills" and "it is usually cheaper and quicker to import new expertise and dismiss the old than to engage in massive re-education". (Simon; 1991, p.133), thereby claiming as better to recruit from outside the organization, mainly when dealing with some deeper knowledge of a nature beyond the individual's competences and requiring some routine rearrangement which cannot be managed by tacit knowledge only.

Questioning Nonaka and Takeuchi's tacit knowledge approach, Tsoukas (2003) advocates it may not be possible to convert tacit into explicit knowledge, so the concept claimed in management studies would be erroneous. Such an approach, he asserts (2003, p.425), "ignores the essential ineffability of tacit knowledge, thus reducing it to what can be articulated". Being so, if there was effective knowledge transfer, it was not properly tacit – given that is not expressed in words – but only implicit knowledge that was latent, waiting to be codified. This opens for a more profound investigation of tacit knowledge, considering the assumption that a simplification of the concept created by Polanyi (1966) may have occurred.

Another perspective that sheds light over Tsoukas' objection to clarify both viewpoints, while presenting an intermediary solution, is Leonard and Sensiper's (1998). They recognize peculiar characteristics of tacit knowledge that reflect Polanyi's (1966) approach, and remark tacit knowledge as semiconscious or even unconscious, which could lead to decisions based on *insights* resulting from connections between body and mind. Then they propose the application of this tacit knowledge for innovation in problem anticipation, finding, and solving (Leonard; Sensiper,1998, p.114-5). This allows for a better understanding of Tsoukas (2003) questioning. As they put it, tacit could not be converted into explicit knowledge *per se*, i.e. there would be no direct transformation of tacit into explicit knowledge. However, tacit knowledge could be used, as an internal process, in problem solving. However, even so it continues to be tacit knowledge, unique to that person who made use of it. As a result, any attempts to convert tacit knowledge into explicit would be doomed to failure, given that what was ultimately captured could grasp the insight, but not the complex set of semiconscious or unconscious associations that generated, as these are intrinsic to the individual who produced them.

The concepts presented in this section raise some questionings. The first relates to the identification of the difficulties of use and control of the individuals' tacit knowledge by the organizations. Tacit knowledge can be used in the routines crystallized in the organization, or by contingent workers; nevertheless, there may be obstacles to the use of this tacit knowledge, like bounded rationality (Simon, 1991) or the difficulty to retrieve it. In other words, tacit knowledge could be used and shared (socialized) by the individuals within and organization in a certain time and occasion, yet, not necessarily would it allow for replication by other individuals in a different context. The second relates to the choice of exploration and exploitation of knowledge by the organization to achieve certain results. It is necessary to understand the applicability of this balanced use in the organizations, since the pressure for immediate results tend to predominate over long-term projects. The third refers to the essential conditions for knowledge sharing among organization members to promote the "spiral of knowledge". Assuming such conditions as mandatory, it is necessary to verify the occurrence of the phenomenon in the field. Lastly, the coexistence of distinct knowledge management models raises some questioning about the choice, appropriateness, utilization and benefits of a specific model, its peculiarities and applicability to different types of organization.

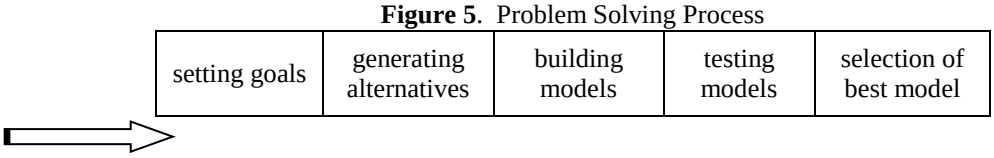
2.4 Knowledge and product development

Clark, Chew and Fujimoto (1987) relate that the product development process occurs in problem-solving cycles where professionals seek to improve performance parameters in an uncertainty environment. The engineers begin with broad objectives, considering the target market, price range, performance levels, customers, and relations to other products, and then measure the project performance through the design quality and manufacturability, as well as the costs and execution time. Additionally, they highlight four key product development activities: concept generation, product planning, product engineering and process engineering. In each, information from a previous activity is used to generate new information for the subsequent action. Figure 4 summarizes the characteristics of each activity, while Figure 5 reveals the processes involved.

Figure 4. Product Development Activities

Concept Generation	Product Planning	Product Engineering	Production engineering
Information about customer needs and problems are converted into a written product concept	Set clear and detailed objectives in terms of product features, performance and cost	Design of detailed product drawings and prototypes	Design of the production process (flow, machinery, operation) and pilot tests

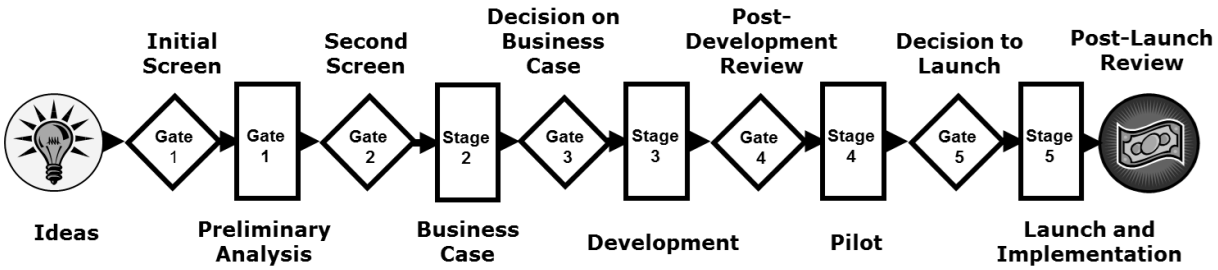
Figure 5. Problem Solving Process



Source: Adapted by the authors from Clark, Chew and Fujimoto (1987)

From a product development process standpoint, Cooper, Edgett and Kleinschmidt (2002) describe the use of the *stage-gate process*, as analysis and decision-making stages for moving or not with a given project. The initial stage is the generation of ideas, and the incorporation of details for their materialization; as the stages evolve, more depth is gained. Over the development project, essential questions related to the economic and operational feasibility of the project, its alignment with the strategy of the organization and the expected return (from a time and finance standpoint) must be answered. For these authors, the use of the system helps to prioritize and select the projects, ensuring the application of resources and the continuation of those that are considered the best for the organization growth. Figure 6 illustrates the process as described by the authors:

Figure 6. Stage-gate process for product development



Source: Cooper, Edgett and Kleinschmidt (2002)

Rogers (1996) emphasizes the opposition between "technological innovation" and "innovation by knowledge". For this author, over the last decades there were considerable changes in the organizations R&D departments, which have gradually evolved from a closed group of members holding a specific technological knowledge to a broad collaborative network including external researchers, as shown in Table 1.

Table 1. Comparison of R&D generations, per organizational features

[Generation/ Features]	N.1 Technology as the Asset	N.2 Project as the Asset	N.3 Enterprise as the Asset	N.4 Customer as the Asset	N.5 Knowledge as the Asset
Core Strategy	R&D in isolation	Link to business	Technology-business integration	Integration with customer R&D	Collaborative innovation system
Change Factors	Unpredictable serendipity	Interdependence	Systematic R&D management	Accelerated discontinuous global chance	Kaleidoscopic dynamics
Performance	R&D as overhead	Cost-sharing	Balancing risk/reward	"Productivity paradox"	Intellectual capacity/impact
Structure	Hierarchical; functionally driven	Matrix	Distributed coordination	"multidimensional communities of practice"	Symbiotic networks
People	We/they competition	Proactive cooperation	Structured collaboration	Focus on values and capability	Self-managing knowledge workers
Process	Minimal communication	Project-to-project basis	Purposeful R&D portfolio	Feedback loops and "information persistence"	Cross-boundary learning and knowledge flow
Technology	Embryonic	Data-based	Information-based	IT as a competitive weapon	Intelligent knowledge processors
	Customer retention		Customer satisfaction		Customer success

Source: Rogers (1996)

3. Research design

3.1 Research problem

The main objective of this study is to examine the mechanisms for knowledge creation and sharing among the individuals involved in the product development process at Unilever South America. Although the theory indicates that knowledge is a valuable resource for the organizations, and secondary research about the company confirms that assertion, there is an interest to identify how the company handles tacit knowledge, which theory highlights as a key element for the companies to maximize their resources. Unilever reports show that the company considers the knowledge management paramount for the development of products, being aware of how important this relation is for the business profitability. However, based on the documents analysed so far, it seems that although the organization presents itself as concerned with the knowledge management, their efforts lie mostly on information technology tools to promote the knowledge creation and sharing aiming at new product development. This leads to the following research question:

Which elements of knowledge creation can be observed in the product development projects of Unilever South America?

Two other related questions are raised:

1) Does the organization foster the generation and sharing of knowledge?

2) Do their activities show the sharing and exploiting of socialized knowledge by the organization members in their new product developing working activities?

3.2 Research objectives

3.2.1 Identify, in the organizational sphere, the presence of the enabling conditions that contribute to the knowledge creation, more specifically**:**

a) understand how the organization promotes the knowledge creation in the corporate level, and

b) get to know the organization's initiatives for the knowledge creation by the product development group.

3.2.2. Indicate characteristics of the knowledge creation in the context of the SECI model among members of the product development project groups of the organization, namely,

c) discuss the efforts for knowledge creation by the members engaged in a project, based on the organization's instructions; and

d) understand how the members interact in the knowledge creation, storage, retrieval, transfer and application in a product development project.

3.3. Methodology

Qualitative research is used in this piece of research, though a case study of an interpretative approach. Yin (2005, p.20) points out that "the need for case studies emerges from the wish to understand complex social phenomena", particularly to examine contemporary events, allowing direct observation and contact with key persons related to the object. Stake (2005) complements that, in qualitative research, the reality perceived by the people within and outside the case studied should be echoed in the social, cultural, situational and contextual reality.

Earl (2006, p.31-2) advocates the use of case studies for recognition of a specific organizational questioning, to: understand whether the research problem is relevant; verify if the questions are researchable and try to refine the methodology; ensure the echoing of the questions into the organizational reality; and collect examples of questions and paradoxes.

The case study is, then, quite appropriate for this research piece, considering that finding relations that underlie the knowledge creation in groups of product development in the organizations is a topic lacking exploration. Furthermore, it is a field full of subtleties, some quite subjective and which can be registered in an interview but unlikely to be captured by impersonal questionnaire.

3.4 Research constructs

The constructs in this research are the *knowledge enabling conditions* and *knowledge creation*. The mechanisms enabling knowledge creation include *organizational intent; autonomy to individuals; fluctuation and creative chaos; redundancy; requisite variety; and trust and commitment.* Begoña Lloria and Moreno-Luzón (2005), based on Nonaka and Takeuchi (1995), pulled together the items of the enabling conditions for the knowledge creation, as listed in Figure 7:

Figure 7. Items for Evaluation of the Enabling Conditions of Knowledge Creation

INTENTION OR COMMON GOAL	REDUNDANCY
▪ Existence of guidelines that express the firm's main proposal; ▪ Expression of the guidelines in a phrase or slogan; ▪ Diffusion of the guidelines within the firm; ▪ Practical use of the guidelines.	▪ Competition between different teams; ▪ Existence of programs of rotation of personnel; ▪ Existence of work that overlaps different areas; ▪ Meetings to share knowledge and ideas.
AUTONOMY	**VARIETY**
▪ Team independence in decision making on the tasks they carry out; ▪ Independence of qualified personnel in decision making in the tasks they perform; ▪ Motivation of teams to create, apply, and absorb new information. ▪ Motivation of skilled personnel to create, apply, and absorb new knowledge.	▪ Contact of teams and units with the environment; ▪ Adaptation of the firm's organization to deal with complexities in the working environment; ▪ Restructuring and modification of organizational structure to deal with diverse problems and situation; ▪ Rotation of personnel to deal with diverse problems and situations
FLUCTUATION AND CREATIVE CHAOS	**TRUST & COMMITMENT**
▪ Breakdown of routines and habits in the workplace; ▪ Deliberate communication of tension; Motivation of individuals and teams after the breakdown of routines and habits in the workplace; ▪ Challenge to the working environment.	▪ Mutual trust explicitly laid down as a value in the firm's objectives; ▪ A commitment to common objectives explicitly laid down as a value in the firm's objectives; ▪ Mutual trust as a shared value; ▪ Commitment to common objectives as a shared value.

Source: Begoña Lloria and Moreno-Luzón (2005)

The analysis of knowledge creation in the product development projects was based on the SECI model (Nonaka, 1994; Nonaka and Takeuchi, 1995), applied specifically to the everyday work of a product development group, their activities and processes. Figure 8 lists the main items for investigation.

Figure 8. Items to assess the SECI process in working groups

SOCIALIZATION	EXTERNALIZATION
▪ Sharing of technical skills, professional and/or intellectual ideas among members; ▪ Promotion of informal meetings – objectives and contents; ▪ Free exchange of ideas in the group; ▪ A trust relationship among the members exists and is guaranteed; ▪ Frequent channels to learn about the firm's news and events; ▪ Open-mindedness and encouragement to exposing new ideas (one's own, others) ▪ The occurrence and the effect of a team members change; ▪ The existence and the role of a mentor to guide the group; ▪ Understanding and acceptance of the colleagues' behaviour.	▪ Explanation of complex ideas and concepts to the group; ▪ Adjustment of concepts discrepancies among the members; ▪ Manners of clarifying the themes under discussion in the group; ▪ Actions to generate collective reflection in the group; ▪ Confirmation of the understanding of ideas and concepts; ▪ The importance of imagination and intuition in the group; ▪ Actions to promote the solving of contradictions; ▪ Actions to integrate a specific idea to the whole of the project; ▪ Actions to help a colleague clarify his/her point of view.

COMBINATION	INTERNALIZATION
▪ The occurrence and effects of the different ideas combination in the group; ▪ Treatment to the existing information in the creation or development of new ideas; ▪ The role of databases in the project; ▪ The importance of the contact network in the generation of knowledge; ▪ The role of the formal project records; ▪ Treatment of the knowledge held by individuals; ▪ Concrete tools used to materialize an idea.	▪ The group's learning process; ▪ Understanding of new ideas by the project team; ▪ Ways of the group acquiring knowledge and gaining experience; ▪ The promotion and frequency of real practical trainings; ▪ The occurrence, use and effect of new ideas or concepts.

Source: Authors.

3.5 Data collection

Data collection was divided into two parts. The first part consisted of document analysis, particularly of annual reports. We browsed these documents for clear or indirect references about knowledge creation and management, especially in the sections connected with new product development, innovation, and people. As an example, in many occasions they mentioned One Unilever, a transformation programme seeking to leverage the way they were managing innovation and impacting employees on a global basis This document analysis was carried out using Bardin (2011) guidelines and techniques and helped making initial links with the theory besides assisting in adaptation of the questions language to the company vocabulary. The study focused on groups located in the cities of Valinhos, Brazil and Buenos Aires, Argentina, comprising projects for the home and personal care categories in the Latin American region and some global. As subgroups within the business units, the departments of 1) research and development and 2) marketing were the object of study. Key members of the organization, such as vice-presidents and directors, were contacted to generate specialized material. On a second moment, interviews were conducted with representative elements of the organization's departments. Semi-structured interviews were prepared for the discuss the topics raised in the theory, test the questions generated, and improve the concepts that were the basis for the field research.

For the elaboration of the interviews protocol, organization documents were analysed, following the qualitative research guidelines of Denzin (2001), Denzin and Lincoln (2005) and Yin (2005). The approach of the interviewees was initially made by telephone to explain the objectives of the research and confirm their willingness to take part in the study. Next, an email was sent with the study explanation and an interview request. The interviews were conducted by telephone and face to face, lasted in average fifty minutes, and were recorded with the interviewees' verbal authorization. Ten people were interviewed in total, namely an R&D director, a senior marketing manager, a regional marketing manager, a regional R&D manager, three R&D coordinators, and three marketing coordinators. The data were initially collected using relatively broad questions, which were reduced in scope as the interviews progressed and similar themes emerged frequently in a modus operandi that followed Alvesson's (2003) suggestions. This author recommends an approach that goes beyond the neopositivist view - which often identifies in the interviewer the holder of absolute control over the respondent and the content - or the romantic view, who sees the interview as a simple meeting for the co-production of knowledge. Instead, the researcher must take into account that it is "critically interpreting specific interview situations and accounts", since "people are not reporting external events but producing situated accounts, drawing upon cultural resources in order to produce morally adequate accounts". (ALVESSON, 2003, p.31). We identified to have reached a degree of redundancy as we noticed responses became recurrent in terms of content and nature, which was deemed as being sufficient to grasp the phenomenon, more so considering that it was a single case study of a company within a regional scope, and was clearly intended to identify the particular characteristics of the subjects, not seeking the generalizing aim that is typically pursued in research of quantitative nature.

3.6 The case - Unilever

Unilever is described in its annual report (2015) as one of the leading global suppliers of fast-moving consumer goods (FMCG) in the food, personal and home care categories. The company informs its businesses were reorganized to simplify the organizational and management structure, and to improve their capabilities in marketing, customer management and R&D, aiming to promoting better resource allocation, decision-making processes and lower costs. This change was called One Unilever. As a result, the company, which traditionally had two presidents, one for the British Headquarters and another for the Dutch Headquarters, from then on had one single president. Additionally, in a press release (2008) Unilever presented the alignment, under one single management, of its areas of research and development for food, hygiene and cleaning. In 2010, the company introduced the Unilever Sustainable Living Plan (USLP), which sets sustainability commitments and targets until 2020 and states that a profitable business at the company would necessary imply a responsible and sustainable path to grow.

Jones (2005) advocates that since the 1960s Unilever has been building a competitive position ahead of competitors, translated into significant market share and successful brands globally. For this author, such advantage was the outcome of knowledge, given "the organization's cumulative learning, tacit and multifaceted". (Jones; 2005, p.15). Nevertheless, he also notes the knowledge use difficulty in the company's product development, reflected by some fragmentation and lack of communication and trust across different areas. The company presents itself as a global leader also in research and development, growing through *innovation* – new products and combinations – and *renovation* – the strengthening of existing brands by range extensions. They highlight over seventy innovation centres worldwide, including Latin America, house of both regional and global category development.

Unilever's website in Brazil shows that their food division has an innovation centre for Latin America in the city of Valinhos, responding for the development of products such as mayonnaise, ketchup, margarines and culinary products, whose activities include the development and testing of new formulas, packaging, process materials and equipment, consumer insights analysis for new product creation and optimization, and management of technical information. Table 2 shows the main product categories developed by Unilever in Latin America.

Table 2. Unilever R&D in Latin America

Category	Country	Reach
Deodorants and hair care	Argentina	Latin America
Bar bath soaps	Brazil	Global
Powder laundry detergent	Brazil	Latin America
Culinary products, margarine, beverages	Brazil	Latin America
Oral hygiene	Brazil	Latin America
Teas	Chile	Latin America
Cleaning and skin care	Mexico, Brazil	Latin America

Source**:** company's documents

Jones (2005, p.265), emphasizes that "knowledge circulates around the 'Unilever world' through countless webs of personal networks" and that "this core corporate culture coexisted with numerous subcultures in the operating companies, enabling Unilever to function across so many product groups and countries". Von Krogh, Nonaka and Aben (2001) discuss knowledge management strategies based on Unilever practices, being the first the creation of Knowledge *Workshops* with experts from various countries, impacting positively on investment decisions, best practices dissemination and cooperative innovation across units. Table 3 summarizes the strategies adopted by Unilever in its projects for the development of culinary products:

Table 3. Knowledge management strategies applied to product development at Unilever

Strategy	Definition	Impact
Leveraging	Transfer and share knowledge across different groups in the same organization	Improvement in the product development process
Expanding	Refine, deepen, and build upon existing data, information, and knowledge.	Creation of a new development process from a current knowledge domain
Appropriating	Transfer knowledge from partners, thus building a new knowledge domain	Knowledge gains from external sources for future development processes
Probing	Build up a new knowledge domain from scratch	New knowledge creation that may drive for breakthrough innovation

Source: Adapted by the authors from Von Krogh, Nonaka and Aben (2001)

Unilever seems to be aware of the possibilities of knowledge exploitation for product creation based on internal sharing and on the use of external resources. It is also clear the distinction given by the company to the information technology as an aid in the processes of knowledge retrieval, dissemination and storage. Lastly, their attempt to promote tacit knowledge sharing, mainly through communities of practice. The extent and reach of such approaches have been verified in the field research.

4. Analysis of results

4.1. Enabling Conditions

From the *organizational intention* viewpoint, the research reveals that Unilever shares aspirations with members in a clear and broad manner, as well as the required knowledge and capabilities to materialize them. As to the *autonomy* dimension, the results demonstrated the organization would grant autonomy to members to a certain degree, according to the area and hierarchical position; also, there seems to be frequent fostering to new knowledge creation among members.

Regarding *fluctuation and creative chaos*, interviewees revealed that there are "natural" ruptures and tension mechanisms or routine breaks that are structural rather than intentionally caused by the organization, such as when a key member leaves the project unexpectedly, producing a connection gap; such changes do cause some discomfort, so members must make an additional effort to build group relations again.

Concerning *redundancy*, the research pinpointed a degree of competition among the teams, sometimes unrevealed. Besides, it was affirmed that job rotation occurs frequently, as well as the existence of formal mechanisms to share knowledge, both pushed by the organization. On the other hand, the research did not confirm that there was an overlap of functions or tasks, except in the local-regional aspect, although this is seen in a relatively negative manner by the interviewees.

As for *variety*, the research shows that the members recognize themselves as prepared to face he challenges that may arise in the external environment, by having dedicated resources to capture the movements of the market, as well as the mechanisms to ensure the use of such knowledge internally.

When it comes to *trust*, the research reveals that this is encouraged among members by the organization through specific training, as well as in the day-to-day work through personal interaction rather than just virtual contacts.

Regarding *commitment*, the interviewees assert that having an inspiring leader that encompasses the business values is the most

effective way to convey the common objectives from the organization to the groups.

Lastly, it was found that personal initiatives do not occur in any point of the organization, despite the existence of formal and open tools for idea sharing. Additionally, it was revealed that there is no leader rotation since each professional manages his/her specific tasks, except in marketing, whose members are normally the project leaders.

As for sideways communication, the research demonstrates an openness, including physical, for information flow and sharing at Unilever. And it was said that as a coordination mechanism, multifunctional teams are required for the project advance, since development depends on different areas, although this implies a longer negotiation process with all the parties involved. In conclusion, success based on the cross-fertilization of knowledge is a recurrent view but linked to some factors, such as mutual commitment, frequent communication, an attitude towards sharing and an inspiring leader. Table 4 summarizes the results of the research on the occurrence of enabling conditions.

Table 4. Occurrence of enabling conditions in the organization

Enabling Conditions	Description	Summary of the results
1.Sharing of Organization's Intention or Purpose	Dissemination of organization main objectives to members	- Promotion of global, regional and local forums, cascading from top to middle management to align objectives. - Dissemination of contents via intranet portal, workshops, meetings and internal newsletter with real cases on how the objectives are being met.
2.Members autonomy	Teams' decision- making process.	Distinct autonomy levels: 1- members, restricted to his/her area of expertise; 2- work group, broader about the project moves; 3- corporate committee, power to make deep changes during the project.
	Organization's encouragement for members to create new knowledge.	- Innovation centres that search/foster new technologies. - Specific expert forums across different groups in organization.
3.Fluctuation and Creative Chaos	Work routine rupture	- Introduction of a person from another business area or different innovation centre. - Member from a different culture (e.g. from the Far East) as leader.
	Tension generation	Group diversity (different people, ages, life experiences, countries, expertise, company time)
4.Redundancy	Work teams' competition	Groups competing for resources, for project prioritization, for management recognition.
	Personnel rotation	- Peer circulation across distinct business units in the same country or same unit in different countries; - Move to different area from individual's original qualification (scientist moving from the food to work home care category, or accountant moving from finance to marketing)
	Function or task overlapping	Among local and regional professionals, in some cases with negative aspects: 1- work duplication without proper peer communication, resulting in different performance projects; 2- decision power loss
	Formal idea/knowledge sharing mechanisms	-Frequent meetings to exchange ideas about current projects; -Forums to share executed projects and launching plans.

5.Variety	Efforts to prepare members to handle the complex external environment	Distinct groups monitoring the environment (economy, consumer, raw materials, legislation, competition). Documents available on Intranet. To encourage use, teams must write their strategic view of future based on such documents.
6.Trust and Commitment	Ways to establish mutual trust among members	- Training sessions where members are put in situations promoting interaction and partnership. - Encourage personal (face-to-face meetings) rather than impersonal contacts (e-mail, telephone) to build and deepen relationships.
	Concrete ways to transmit commitment values and common objectives	Leader that inspires by example, translates the company moves to the team and helps drive the group to meet targets.

Source: Field research.

4.2 Knowledge Creation in the Context of the SECI model

From the perspective of socialization, the research presents several evidences of its occurrence as a process of interaction among the members of the projects group. Since the team is a multifunctional group, with people coming from different areas of the organization – each of them responsible for a part of the project and all of them for its completion – it is necessary to integrate different knowledge pieces into each area and which need to be made common.

Another highlight were the observations referring to changes of people among the project groups. Clearly, there is a valuation of the tacit component of knowledge as a distinguishing element of newcomers into the group, beyond their technical expertise. Noteworthy is it also the mechanism of establishing a mutual trust relationship among the members of the project group, which results from a convergence of factors, among which the permanent exchange of information between the leaders, in addition to an informal work environment and the use of a tool that ensures tasks accomplishment.

As to externalization, the research revealed that the main tool for knowledge to get explicit is through the formal record of all the development process. The guarantee that a correct understanding by the members of the group was achieved is provided by the innovation funnel meetings in which all the members review the last activities recorded, clarify possible questions, and define the next tasks to be accomplished individually by the group members.

Concerning combination, the results pinpoint the recurring use of formal register mechanisms aiming to incorporate new knowledge by the organization. This is carried out not only with new ideas that come up internally, but also with external information, such as that coming from a supplier or a university, for example. An important detail refers to the retention of individual knowledge: Unilever attempts to have more than one person engaged in the same task so that the work can be further executed even if someone happens to leave the group.

At last, the research confirms the process of internalizing explicit knowledge thorough learning by doing, given that a new member is quickly engaged into the teams, trained in key company processes, integrated into the projects most likely to provide the best learning, and gets committed to carry out specific tasks, which ultimately also serves to evaluate individual performance as well his or her capacity to make decisions under pressure. Table 5 summarizes the instances of knowledge creation in the context of the SECI model at Unilever.

Table 5. Occurrence of creation of knowledge in the context of the SECI model

Socialization	• Integration of knowledge that is characteristic to each area, given that the project team is multifunctional and has diversified qualifications, being mandatory to share specific knowledge with all the members of the group to ensure the job execution; • Relatively frequent change of the members of the group, whose outcome is the need for "resocialization" through the sharing of basic information about the project; • Informal work environment, with permanent information sharing.
Externalization	• Formal register of all the stages of product development in a company's system, which helps to monitor the execution of tasks, without which the project cannot move forward; • Regular "innovation funnel" meetings with the members of the project to review status, actions, next steps and accountabilities.
Combination	• Formal register of new internal or external ideas (suppliers, universities); • More than one person engaged in a same task and the formal register of activities helps to avoid ruptures, ensuring the continuation of the work in case a member leaves the project.
Internalization	• Learning by doing: The new member is quickly integrated to the group and is assigned individual tasks and responsibilities that impact the collective work, being his/her ability to make decisions and under pressure working constantly tested.

Source: Field research.

5. Final Considerations

Knowledge creation is a subject with ample reach, giving rise to uncountable inquiries in the academy and in the society. As a construct, it still carries some conceptual malleability: knowledge management and creation are confused and sometimes indistinguishably used. It remains a relatively fuzzy field which requires some refinement, and this can be considered a difficult task due to the abstraction of concepts that bear many similarities, which sometimes does not allow separating them in their use in the literature.

The empirical research demonstrates that the organization seems to be aware of the benefits and the importance of building and making available the mechanisms that favour the knowledge creation by its members. The findings at Unilever show that, in the organizational sphere, efforts are made so that the knowledge should be disseminated and shared across the different areas of the company; however, facts show that there is much to be done to ensure this knowledge flow, reason for which structural changes were implemented, aiming at a better integration of the teams and their respective knowledge. It shall be emphasized, as two of the most recurring ways of transferring and sharing knowledge, the physical transfer of individuals across the areas, regions or countries, and the establishment of strong interpersonal relations.

At the department level, it is noted, as revealed by the research, that knowledge sharing occurs mainly due to the tools made available by the organization; in other words, it is not a prerogative of the members promoting this sharing spontaneously. This happens rather due to the working structure than for personal initiative. It can be assumed, then, that the strategic objectives and efforts of the organization to broaden the reach of the existing internal knowledge are not completely reflected in the reality of its work groups.

As possible limitations of the study, we firstly point out the time of the empirical research, since the interviews at Unilever were conducted in 2008 and 2009. Despite that fact, knowledge creation and management topics continue vivid, finding a recurrent interest in academia and organizations, and most of the discussions raised here still echo positively on both sides. Secondly, we consider the relatively small coverage for the study. In other words, even though Unilever South America should predominantly replicate global alignments, each country or region has its peculiarities, and such diversity is certainly reflected on the local business dynamics and daily activities.

Therefore, this study opens possibilities for some unfolding. One of them is to study the knowledge creation and sharing in project groups within the same organization, focussing on a) other

categories than that of home and personal care; b) other regions, like Asia, or other emerging countries; c) virtual teams, which poses an additional challenge to knowledge management. Another possibility would be work on a single enabling condition (ex.: members' autonomy) or one of the dimensions of the SECI model (ex.: socialization) to understand its impact in the use of the groups' tacit knowledge and its importance over the remaining dimensions. Lastly, a further research path would be studying which personality traits could possibly favour the knowledge creation and sharing in the project teams and the role and influence of the leader in that process.

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Information Systems for Early Supplier Involvement in Brazilian Automotive Supply Chains

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ABSTRACT

The aim of this paper is to identify whether in an automotive industry context with structural, technological and regulatory problems, information systems help the new product development (NPD) process to achieve development time reduction, cost reduction and product quality improvement due to an easier and more accurate data exchange or only because they allow faster information sharing among chain members. The research was developed using a qualitative and descriptive methodology and adopted as focal company a Brazilian auto parts company in order to evaluate its relationships with three suppliers and its three largest customers, composing three different supply chains (SCs). Results suggest that information systems have been widely used as tools for collaboration among the SC members, with expressive gains in competitiveness because it makes data exchange faster. Nevertheless, significant shortcomings still exist, especially regarding system integration and the consequent integration level among SC members.

PALAVRAS-CHAVE

Gestão da cadeia de suprimentos,
Envolvimento antecipado de fornecedores,
Sistemas de Informação,
Indústria automotiva.

RESUMO

O objetivo deste artigo é identificar se, em um contexto da indústria automotiva com problemas estruturais, tecnológicos e regulatórios, os sistemas de informação auxiliam no processo de desenvolvimento de novos produtos (DNP) para redução do tempo de desenvolvimento, redução de custos e melhoria da qualidade do produto devido a uma troca de dados mais precisa ou apenas porque permitem o compartilhamento mais rápido de informações entre os membros da cadeia. A pesquisa foi desenvolvida utilizando uma metodologia qualitativa e descritiva e adotou como empresa focal uma empresa brasileira de autopeças para avaliar suas relações com três fornecedores e seus três maiores clientes, compondo três diferentes cadeias de suprimento (CSs). Os resultados sugerem que os sistemas de informação têm sido amplamente utilizados como ferramentas de colaboração entre os membros da CS, com ganhos expressivos de competitividade, pois fazem com que a troca de dados seja mais rápida. No entanto, ainda existem deficiências significativas, especialmente em relação à integração de sistemas e ao consequente nível de integração entre os membros da CS.

1 Introduction

Supply Chain Management (SCM) has been developed in a particularly intensive way in the automotive industry. Among the SCM processes, this paper focuses on the New Product Development (NPD) process, which is critical in terms of both strategic and operational perspectives of automotive Supply Chains (SCs) (Toledo et al., 2008; Matos, 2014).

NPD in the automotive industry is complex, as it requires the active participation and coordination of several chain members with different organizational structures, human and technological resources, and knowledge that must be aggregated with the project to generate a safe and competitive product (Toledo et al., 2008). In this sense, Early Supplier Involvement (ESI) is one of the SCM practices that has been growing and becoming common in organizations, partly due to the adoption of an open and innovative approach, and also due to the growing trend of using external sources in NPD (Schiele, 2010; Terpend et al., 2008; Hernández-Espallardo et al., 2010).

As in other SCM processes, NPD must occur in an effective way, which requires continuous information flow (Pires, 2016) and support from appropriate information systems among SC members (Prajogo & Olhager, 2012). Studies have suggested better SC performance resulting from partner involvement in NPD processes, mainly through developed capabilities to handle changing environments (Mishra & Shah, 2009; Lau, 2011; Feng & Wang, 2013). Through better Supply Chain Integration (SCI), enterprises can absorb and share specialized knowledge more effectively (Flynn et al., 2010). Effective integration among suppliers to develop new products can provide cost reduction, quality improvement and development time reduction (Majumder et al., 2017; Eisto et al., 2010; Luo et al., 2010; Cerra et al., 2011; Dalvi & Kant, 2015). These benefits are particularly important in environments such as Brazil, a country that faces several challenges in developing its automotive industry.

Nowadays, the automotive industry in the country faces structural, technological and regulatory problems. The structural challenges are related to the nation's infrastructure, as the country still needs to develop its internal logistic infrastructure. The technological issues are related to the cost of accessing and developing new technologies, including hardware and information systems. As far as regulatory problems go, automotive executives are asking for more transparency in the guidelines/rules on the subject (Keese et al., 2014; Pascoal et al., 2017).

Therefore, the aim of this paper is to identify whether in the automotive industry context with structural, technological and regulatory problems, information systems help the NPD process to achieve development time reduction, cost reduction and product quality improvement, and if this occurs due to easier and more accurate data exchange or because they enable faster information sharing among chain members.

One justification for this research is the automotive industry's importance to the Brazilian economy, which in 2015 accounted for 22% of the industrial gross domestic product (GDP) and 4% of Brazil's GDP, generating about 1.3 million direct jobs and indirect jobs (Anfavea, 2019). An important part of this industry, the auto parts sector has been recording worrying deficits in the trade balance since 2007, with a peak in 2013 of around 10 billion dollars negative. In 2014 the negative result was about 9 billion dollars and since then it keeps a deficit of 5 billion dollars each year. This deficit is due to the great increase of imports, much higher than that of exports. This threat to the national automotive industry is a consequence of Brazil's low competitiveness compared with the global market, and it is due, among other factors, to the country's macroeconomic situation, especially its high production and distribution costs (structural issues), high capital costs leading to difficulties with accessing new technologies (technological issues), high tax burden and inflexible employment legislation (regulatory issues) (Sindipeças, 2018).

Another justification for developing this study is that, according to Feng and Wang (2013), little empirical evidence shows how different SC partners' integration (SCI) degrees influence NPD performance process. In this sense, some authors argue that studies have investigated NPD performance through separate efforts, for example: through a focus on customer involvement (Fang et al., 2008; Svendsen et al., 2011), supplier involvement (Lakemond et al., 2006; Johnsen, 2009) and internal involvement (Troy et al., 2008; Love & Roper, 2009), but not considering enterprises' internal and external resources in SCI along the SC.

2 Theoretical Framework

2.1 SCM and New Product Development process

SCM has been increasingly recognized as the key to efficient and effective companies' integration in their SCs and business processes (Lambert & Schwieterman, 2012). The SCM concept includes planning and coordinated management of the processes and activities of a SC, which integrate offer and demand management with the flow of money, materials and information within this chain (Mentzer et al., 2001; CSCMP, 2019).

Among the SCM models available in the literature, one of the most important is described by Lambert and Enz (2017), detailing eight SCM processes: (1) customer relationship management; (2) supplier relationship management; (3) customer service management; (4) demand management; (5) order fulfillment; (6) manufacturing flow management; (7) product development and commercialization; and (8) returns management.

Thereby, the NPD and commercialization is a key process for company and SCM success, demanding interaction between chain links for joint creation of goods that can generate a competitive advantage (Lau, 2011; Feng et al., 2010; Matos, 2014). Feng and Wang (2013) argue that two kinds of SCI exist: II (Internal Involvement) and EI (External Envolvement). Regarding EI, Mentzer et al. (2001) argues that it arises from customer and supplier integration. Mishra and Shah (2009) and Feng and Wang (2013) specify II as the result of internal coordination to share information and resources to develop costly and time-efficient NPD, whereas EI concerns the degree to which a company can involve its more relevant SC members in the NPD process.

Zhang and Li (2010) also consider that customer and supplier integration is essential for filling gaps related to the technical resources and capabilities needed in the NPD process. Gimenez and Ventura (2005), however, point out that due to the nature of organizations and people, conflicts can arise from joint work. Therefore, enterprises must act in a synergic and collaborative manner to solve internal problems before initiating joint work with SC external partners. Otherwise, these conflicts can become more complex and difficult to solve (He et al., 2015).

The product development and commercialization process systematize the introduction of new products into the market, together with customers and suppliers, and if properly conducted, it may represent a significant competitive advantage for companies. This is because it coordinates SC activities required for efficient materials and information flows from marketing, manufacturing, logistics and other areas reducing time to market, which is critical for company's success in long term (Rogers et al., 2004).

From the standpoint of product project, developments are classified into four types: new product platforms, derivatives of existing product platforms, incremental improvements to existing products and new products. Development strategies must consider these differences among the four types and also the growth trend of incorporating services into the product, which is an important differentiation source and value added to the product (Rogers et al., 2004; Lambert & Schwieterman, 2012).

NPD in the automotive industry is, in general, performed according to the advanced product quality planning methodology (APQP), which a set of values, notably the cross-functional team and concurrent engineering, guides. Diverse organization sectors involved in a project form the cross-functional team, and participation of customers and suppliers should ensure it. Concurrent engineering recommends carrying out development activities in a parallel way with the aim of reducing time and development costs and increasing the product quality. APQP involves data and information exchanges among SC companies, especially in product drawings, engineering specifications, mathematical data from product modelling, assessment reports and approval of products and processes, which requires compatibility among customer systems, suppliers and subcontractors. The APQP demands SC links involvement in product development process and considers, besides the product design, aspects related to production process and logistical issues. In this way, it is aligned with SCM concepts, especially regarding ESI (IATF, 2008).

2.2 Early Supplier Involvement

ESI is a SCM practice that proposes suppliers' involvement in early stages of product

development and incorporation of their skills into the process (Pires, 2016). The degree of supplier involvement in NPD is part of decision-making process of "making or buying". Le Dain et al. (2010) point out that both academia and business environment treat this as a binary process, but its complexity is greater. This complexity is due to decisions as design internally, buy the project, involve supplier in the various stages of development or even develop the project together with what can be called project chain. The automotive sector is one of the most dedicated to structuring the decision-making process of "designing or buying the project," as it has traditionally been inefficient, mainly due to the lack of synchronism between design and purchase decisions.

The interaction between customer and supplier in NPD can occur at several points of project: (a) idea generation: customer voice; (b) preliminary business/technical assessment; (c) product/process/service concept development; (d) product/process/service engineering and design; and (e) prototype building, testing and piloting/ ramping up for operations (Petersen et al., 2005). The degree of each supplier's involvement in a specific project depends on factors such as the supplier's responsibility level in project, and associated development risks (Hudnurkar et al., 2016). The higher the development risk and the greater the supplier's responsibility in process, the more intense and earlier the supplier's involvement in NPD must be (Quiescenti et al., 2006; Petersen et al., 2005; Schiele, 2010).

ESI benefits have been widely reported in both qualitative and quantitative studies. Suppliers' integration allows for performing activities in parallel, advances the preparation of customer orders, provides extra personnel and reduces the internal complexity of projects that might shorten the critical path, resulting in development time reduction (Petersen et al., 2005; Le Dain et al., 2010; Eisto et al., 2010; Cerra et al., 2011). Incorporation by suppliers of technical process knowledge into product design, along with proposed changes in materials and geometry lead to improved product manufacturability and reduction of scrap and rework rates, thus positively impacting product quality (Mcivor & Humphreys, 2004; Eisto et al., 2010). Suppliers' contributions to solutions that increase process productivity and improve manufacturability allow for cost reduction (Mcivor & Humphreys, 2004; Luo et al., 2010). Proving these points, Kanapathy et al. (2014) conducted a survey with 146 manufacturing companies in an emerging economy and demonstrated that supplier involvement has a significantly positive impact on NPD project performance in terms of quality objectives, design objectives, cost objectives and "time-to-market" objectives.

Dekkers et al. (2013) address the interface between product design and manufacturing and highlight the importance of supplier involvement and articulation through information and communication technologies (ICT), both hardware and software. Early involvement, knowledge sharing and supplier strategic focus on innovation have a strong impact on product development and in SC. The authors emphasize that especially information systems feature, like interface among design, engineering and manufacturing, needs to be further explored.

2.3 Information System in New Product Development

Supply chain materials flow must be backed by information flow that is supported by an appropriate technological infrastructure aimed for sharing information with other chain members. Information systems' integration thus involves technological and management aspects. Both information and material flow integration are important for SC integration, having significant effects on quality, flexibility, delivery and cost performance. Moreover, building good communication and trust for information sharing are essential in SC integration (Prajogo & Olhager, 2012; Qrunfleh & Tarafdar, 2014; Aguiar et al., 2015).

Information flow plays an important role in NPD because it facilitates and influences decision-making throughout the process. An example is the use of information about customer needs, available technologies and production costs in decisions concerning establishment of product specifications during concept phase. Product specifications are used in making decisions during project detailing and prototype design (Yassine et al., 2008).

Nambisan (2003) discusses the contribution of information systems to NPD, mapping four major potential contribution areas: (a) process management; (b) project management; (c)

knowledge management and information; and (d) collaboration and communication. The information systems stand out as support for product data exchange between companies, due to their potential for use as visual modelling tools and to their ability to facilitate concurrent product development and engineering.

One information systems used for NPD in automotive industry is Computer-Aided Design (CAD). Fernandes et al. (2005) point out the importance of CAD systems in the simultaneous engineering implementation. Managing large amounts of data and information exchanged between multidisciplinary teams was a bottleneck without involvement of advanced tools, such as CAD systems. CAD systems are widely applied in the geometric definition, in engineering analysis and product documentation, and in information exchange with other information systems among SC members, serving as main integration tool among different product development systems (Figueiredo & Romeiro Filho, 2011).

However, the existence of many CAD systems on the market, despite causing a large amount of sector competitiveness and providing more choice to users, causes difficulty in integrating data among various systems used throughout the SC, and even inside an organization, because most of these different systems do not recognize directly the data that other systems generate. To get around this limitation, translators and neutral formats for exchanging geometric data were developed, such as STEP, IGES, DXF and SAT, which allow a system's files to be converted into another system format, first passing by a neutral format. File conversion provides significant time saving and quality because it avoids the need to reshape product in each system used throughout process, which, besides being costly in terms of both time and resources, may lead to discrepancies between original model and its versions. Nevertheless, conversion process is not perfect and often results in information loss, which generates rework and can, in extreme cases, cancel data conversion benefits (Madenas et al., 2015; Kim et al., 2008).

In addition to CAD systems, other important systems that, together with CAD, form the concept of Computer-Integrated Manufacturing (CIM) are the Computer-Aided Manufacturing (CAM) and Computer-Aided Engineering (CAE). These systems, when mainly used together with data shared by SC members, provide a significant competitiveness increase for involved companies (Figueiredo & Romeiro Filho, 2011) and can truly represent a shift paradigm in NPD (Kanapathy et al., 2014).

3 Methodology

Literature review was foundation for methodology definition, since research objective arose from it and allowed creation of two propositions:

P1: Information systems provide a high level of integration among SC members, making data exchange easier and more accurate, which results in development time reduction, costs reduction and product quality improvement in the NPD process.

P2: Information systems can help companies' NPD, especially concerning the ESI practice, and positively impact the development time reduction, cost reduction and product quality improvement because they allow faster information sharing among chain members.

These propositions resulted in three analysis categories: product quality, development time and product cost. This paper is based on case study protocol and conducted through a qualitative and descriptive research type, with an intentional and non-probabilistic sample.

Case study is considered a good research strategy because it helps understand a specific social reality that would be very difficult to capture through other procedures (Yin, 2015). Although case study method has limitations toward results generalization and can present issues such as self-evident findings and bias in data collection process, this approach was considered suitable due to focal company importance.

Brazilian automotive industry, besides its importance to Brazil economy, is considered very meaningful to automotive industry in general. With several multinational brands operating in a country with structural, technological and regulatory problems, it is very important to identify how to improve its productivity and overall product appeal (Keese et al., 2014; Pascoal et al., 2017) that could be used in other markets. The chosen focal company is relevant in this context because it is an auto parts company that fulfills the main Tier 1 suppliers and automakers in Brazil. The analysis unit is meaningful and methodologically relevant since the company is an integral part of several

Brazilian automotive SCs, with a unique insight into NPD in the sector. Therefore, the company represents a critical case, following Flyvbjerg's (2006) definition. A critical case permits logical deductions as valid or not valid and allows researchers to understand important lessons about proposed topics.

The research investigates customers' SCs that represent about 90% of focal company revenues, since they are global enterprises and are situated among the greater automakers in Brazil and worldwide, with great power to impose their management practices over their SCs. The focal company's suppliers carry out essential NPD services and three suppliers were considered. The NPD was analyzed regarding interaction between focal company, its three main customers and three service suppliers. Thereby, the research considered three automakers chains that focal company is part of. Data collection occurred through direct and participant observation, and data were also derived from seven semi-structured interviews with focal company representatives of areas:

– Logistics: logistics supervisor;

– Quality: quality manager and quality analyst;

– Engineering: engineering manager and senior tooling designer;

– Commercial: sales manager and NPD coordinator.

The interviews sought to evaluate how the NPD is conducted and managed in focal company, what information systems are used, what kind of interaction there was among the focal company, its customers and suppliers and how, in the interviewees' opinion, information systems assist in this process and impact product quality, development time and costs.

The way NPD is conducted and managed in focal company impacts the three automaker chains that focal company is part of. A semi-structured questionnaire was created from literature review, and examples of the questions that verified these topics are: "what types of information and electronic data are exchanged by the focus company, the customer and the suppliers?"; "how are the exchanged data used by the focus company, the customers and the suppliers?"; "what benefits are obtained and what difficulties are encountered in the process?"; "how are information and data exchanged during the NPD's impact on product quality, development time and product costs?"

Data analysis had a similar structure to that suggested by Miles and Huberman (1984). Thus, after being transcribed, data were organized with respect for topics of the applied questionnaire. Information was then reduced in relation to created analysis categories. As a next step, within each analysis category, data were separated and displayed identifying associations and differences in order to clarify the findings. To avoid self-evident findings and bias in collected data, researchers also used the knowledge gained during observations on company operations. This strategy allowed interviews and data to be compared to company activities alongside comparisons to assumptions pointed out in the literature review. Finally, data verification and a draft of conclusions were created in order to identify main points that could contribute to research objective. At this point, the conclusions and the case's main aspects were confronted against the two created propositions in order to identify similarities and differences. Therefore, the propositions were evaluated through verification of their confirmation/refutation.

Although the study has a clear limitation related to the quantity of interviews made, it is understood that it can contribute to generalization on theory rather than on populations (Yin, 2015). In this sense, according to Flyvbjerg (2006), the research sought to demonstrate that if proposition 1 (P1) and/or proposition 2 (P2) are valid in a context with structural problems that demand investments, economic difficulties to access information systems and regulatory demands that make operations complex, they can be valid in better contexts.

4 Analysis

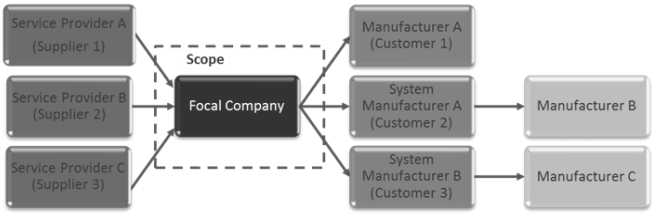
4.1 Case Presentation

This research considers as focal company a medium-sized Brazilian enterprise sited in São Paulo State, which is components supplier to automotive industry. The investigation focuses on use of information systems in NPD process, with particular interest in data exchange and communication among SC diverse links. The NPD and information systems used were identified and mapped by the examination of relevant internal documentation and by interviews with area representatives of the focal company that -

according to its development procedure - are directly involved in the development process.

In order to compare information exchange, a new product design was analyzed for each of the focal company's three main customers. These projects also involved focal company suppliers who participated at different stages of the process. Figure 1 shows focal company and its position in SCs as well customers and suppliers involved in analyzed projects.

Figure 1: Research Scope



Source: Research results

The involved companies' main characteristics are detailed in Table 1 and described below.

Focal Company

The focal company is a 100% Brazilian capital family business that has a solid and respectable reputation with customers, which has been built over a span of fifty years, regarding its deep technical knowledge in productive processes and tooling designs. Its engineering division is equipped to develop tooling design and device projects using technology aligned with best world practices such as CAD, CAM and CAE. The company also has a tooling area qualified to build part of tooling. In the case of a lack of capacity or technical resources for construction, this function is outsourced to previously evaluated and selected suppliers.

Customer 1

Customer 1 is focal company's biggest customer, and it registers a distinctive position in global automotive market, having a well-developed engineering area in Brazil with the autonomy to carry out its own projects or adapt projects arising from its European headquarters.

Customer 2

This is the focal company's second largest customer, standing out in global automotive market and being an important Tier 1 supplier that sells its products to direct competitors of Customer 1. In Brazil, it has its own engineering department prepared to develop the product independently of the American headquarters.

Customer 3

Customer 3 is focal company's third largest customer and, like the other mentioned customers, stands out in the global automotive market. Its engineering department has the ability to develop high-technology products independently of its European headquarter.

Supplier 1

Despite having only a small office in Brazil, it is a world leader in innovation and software development for engineering simulation (CAE). Supplier 1 has a highly specialized team and, in addition to selling software, provides engineering simulation and optimization services to largest industries in Brazil. The focal company, in addition to having a license for its simulation software, uses simulation and optimization services offered by this supplier.

Supplier 2

Supplier 2 provides tooling services to the focal company. It has computerized numerical control equipment and CAM software to define tooling machining processes.

Supplier 3

It provides focal company with machining service products in production phase. During product development phase, this supplier helps focal company with design of its machining devices and uses CAD and CAM systems, not only for tooling projects but also for machining process definition.

Table 1: Analysed companies in research. Company	Product	Region	Size	Location	Capital
Focal Company	Parts for engines and transmission	Brazil	Medium (300 employees)	São Paulo state	100% Brazilian privately held
Customer 1	Trucks and buses	Europe	Large (12.000 employees in Brazil)	São Paulo city	Publicly traded multinational
Customer 2	Engines for trucks and generators	United States	Large (2.000 employees in Brazil)	São Paulo city	Publicly traded multinational
Customer 3	Electronic systems for cars	Europe	Large (2.000 employees in Brazil)	São Paulo state	Publicly traded multinational
Supplier 1	Software and engineering simulation services	Europe	Small (20 employees in Brazil)	São Paulo city	Multinational privately held
Supplier 2	Tooling services	Brazil	Small (20 employees)	São Paulo city	100% Brazilian privately held
Supplier 3	Machining services	Brazil	Small (50 employees)	São Paulo city	100% Brazilian privately held

Source: Research results

4.2 Findings

4.2.1 Product Development Processes in Focal Company

In focal company, products are developed according to an internal procedure based on APQP manual (IATF, 2008) and also based on customer-specific requirements, as required by ISO/TS 16949, which sets quality management standard system in global automotive industry.

Table 2: Current stage of ESI use by focal company and its customers.

Company	Stage where supplier is involved in project	Policies and criteria for supplier's involvement
Focal company	Project's initial stage: supplier involvement occurs as soon as three-dimensional (3D) models and 2D drawing are received.	It has no policy or criteria for supplier involvement. ESI application is due to the nature of projects.
Customer 1	Project's intermediate stage: Focal company is involved after setting 3D model and prior to making prototypes.	Focal company doesn't know about policies and formal criteria for ESI practice. Informally, customer's engineering area communicates to focal company representatives' customers' intention to apply ESI in new developments.
Customer 2	Project's initial stage: Focal company is involved in preliminary stage of product conception.	It has formalized a policy for supplier participation in early stages of development. However, there are no established criteria defining degree of supplier involvement in projects.
Customer 3	Project's intermediate stage: Focal company is involved after setting 3D model and prior to making prototypes.	Focal company has no knowledge about existing policies and formal criteria to ESI practice and doesn't intend to adopt it in the short term.

Source: Research results

The focal company does not make product design because customer is the one responsible for preparing drawings and setting specifications applied to the product. However, involvement with customers and suppliers in NPD is usually an intense and critical co-development type, because neither customer, focal company nor its suppliers have all needed knowledge to develop the product.

The high degree of uncertainty requires strong interaction between SC members. Supplier involvement has been a trend in focal company and has been occurring increasingly in early NPD phases. Additionally, involvement intensity and beginning of interaction vary according to customer and even to developed product. Table 2

shows ESI current stage use by focal company and its customers.

According to interviewees, in a typical project, customer sends to focal company preliminary CAD models, specifications and standards still in product conception stage. The customer requests that focal company, based on its own knowledge of production process, tooling design and engineering simulations, analyze the project and propose product changes, thus obtaining a more reliable product and a more robust production process.

Since there is an intense exchange of CAD files in this development stage, when the customer's CAD system and focal company system are different, it is necessary to dedicate special attention toward avoiding data loss that can severely compromise project quality and final product. This data loss can also compromise integration level among SC members, demonstrating that information systems use needs to be accompanied in order to provide a high level of integration that brings other benefits, as P1 asserts. At this development stage, ESI seems to be difficult and delays process because customer must constantly upgrade its project in line with changes proposed by suppliers and assess the impact of these changes in several of vehicular systems affected.

However, when project progresses, benefits clearly outweigh apparent initial drawbacks because a more robust project tends to avoid late product changes, which may not only compromise launch timetable but also project costs and final product quality. Therefore, it is clear that P1 and P2 were correct when they mentioned that information systems can help in development time reduction, cost reduction and product quality improvement in NPD process.

Once product is defined, tooling design, which had already been started simultaneously with product conception, is completed together with service suppliers. This stage also involves information exchange in electronic format, mainly CAD files. All data exchange among customer, focal company and its suppliers is done after signing confidentiality agreements between involved partners.

4.2.2 Information Systems use in Focal Company's Product Development process

Tables 3 through 6 show interview results, respectively, with focal company's commercial, engineering, quality and logistics areas.

Tables' columns describe information types exchanged between focal company and its customers and suppliers, systems used to generate information, format and media used in exchanging information and benefits and difficulties reported by interviewees arising from use of current systems.

Table 3: Information collected in interview with focal company's commercial area.

Information	Company	System	Format	Exchange media	Benefits	Difficulties
Supply contracts or purchase order	Customer 1 Customer 2 Customer 3	Customer ERP	.doc or .pdf	e-mail	Universal format, without the need for data conversion. Ease of access for all SC members.	Lack of integration with focal company ERP.
	Supplier 1 Supplier 2 Supplier 3	Focal company ERP				
Confidentiality agreement	Customer 1 Customer 2 Customer 3 Supplier 1 Supplier 2 Supplier 3	Text editor				
Schedule development	Customer 1 Customer 2 Customer 3 Supplier 1 Supplier 2 Supplier 3	Project management software	.pdf			

Source: Research results

Table 4: Information collected in interview with focal company's engineering area.

Information	Company	System	Format	Exchange media	Benefits	Difficulties

3D mathematical models	Customer 1	Customer parametric CAD	Software original	Customer web portal or e-mail	Same focal company system, which eliminates need for data conversion.	Need for data conversion to send them to suppliers, with risk of data loss.
	Customer 2 Customer 3	Customer parametric CAD	STEP or IGES	e-mail	Standardized format, which allows use of data by other SC members.	Need for data conversion, with risk of data loss.
	Supplier 1 Supplier 2 Supplier 3	Focal company parametric CAD				
2D drawing	Customer 1 Customer 2 Customer 3 Supplier 1 Supplier 2 Supplier 3	Parametric CAD	.pdf	e-mail	Universal format, without need for data conversion. Ease of access for all SC members.	Lack of integration with focal company ERP and from suppliers.
Standards and engineering specifications	Customer 1	Text editor	.pdf	Customer web portal		
	Customer 2 Customer 3	Text editor	.pdf	e-mail		
	Supplier 1 Supplier 2 Supplier 3	Not applicable	-	-		

Source: Research results

Table 5: Information collected in interview with focal company's quality area.

Information	Company	System	Format	Exchange media	Benefits	Difficulties
Product and Process Approval Report	Customer 1 Customer 2	To the discretion of the issuer	.pdf	Customer web portal	Universal format, without need for data conversion. Ease of access for all SC members.	Lack of integration with focal company ERP.
	Customer 3	To the discretion of the issuer	.pdf	e-mail		
	Supplier 1	Not applicable	-	-		
	Supplier 2					
	Supplier 3	To the discretion of the issuer	.pdf	e-mail		

Source: Research results

Table 6: Information collected in interviews with focal company's logistics area employees.

Information	Company	System	Format	Exchange media	Benefits	Difficulties
Delivery Schedule	Customer 1	Customer ERP	.xml	Customer web portal	Universal format, without need for data conversion. Ease of access for all SC members.	Lack of integration with focal company ERP.
	Customer 2	Customer ERP	.doc	e-mail		
	Customer 3	Customer ERP	.txt	e-mail		
	Supplier 1	Not applicable	-	-		
	Supplier 2 Supplier 3	Focal company ERP	.pdf	e-mail		
Packing Specifications	Customer 1 Customer 2 Customer 3	At the issuer's discretion	.pdf	e-mail		
	Supplier 1 Supplier 2	Not applicable	-	-		
	Supplier 3	At the issuer's discretion	.pdf	e-mail		
Means of transportation and delivery windows	Customer 1 Customer 2 Customer 3	At the issuer's discretion	.pdf	e-mail		
	Supplier 1	Not applicable	-	-		
	Supplier 2 Supplier 3	At the issuer's discretion	.pdf	e-mail		

Source: Research results

According to focal company's sales manager, exchange of development information among members of design chain is fully satisfactory, since it occurs in a simple, clear, quick and reliable way. This statement helps to support P2, since it affirms

that information systems allow faster information sharing among chain members. The only improvement point, in this view, is the lack of integration among the Enterprise Resource Planning (ERP) systems of those involved, which generates the need for manual insertion of the orders' information into each system, with risks of typing errors. However, these risks are low, and there is no history of occurrences that have impaired progress of any development. Even with risks being considered low by interviewee, this comment leads to conclusion that information systems themselves cannot provide a high level of integration among SC members, making data exchange easier and more accurate. If there is a chance for errors in exchanged information, this may lead to less accurate data and necessity for complex data exchange processes.

All interviewees considered exchange of engineering data, notably 3D CAD models, as the most important and critical activity of development process, concerning information systems, since these mathematical models are basis for production tools elaboration projects. Focal company senior designer stated that "it is rather common the need to convert 3D models, because hardly all members of design chain have same CAD system. There have been cases of 3D model integrity loss after conversion, especially when using IGES system, which greatly hindered development. For example, in air tube development of some products, surfaces simply disappeared after data conversion and CAM system, used in tooling manufacturing, interpreted that failure as a hole in mold and machined that hole. We did not lose mold, but it was necessary to rework it, which delayed development, increased costs, and decreased tooling durability".

According to focal company quality manager, information exchange regarding quality is intense throughout development, and includes critical analysis and deployment of customer engineering specifications into both focal company's and its suppliers' process specifications and control plans. This culminates in final product and manufacturing process approval. In the words of quality analyst, who is responsible for reports approval, preparation of these reports is "extremely labor-intensive and requires duplicate work, since documentation must necessarily be produced in focal company ERP system, because it will be used during serial production. And it will later be inserted into client systems and will be available on the web, which is different for each customer and is not integrated into internal system. In cases of more complex products, approval documentation involves preparation and verification of hundreds of report pages, what can lead to errors and delays. It is clearly a waste of time and resources." Again, this point of view opposes easier and more accurate data exchange mentioned in P1.

The focal company's logistics supervisor said during the interview: "involvement of our logistics area in developments is generally small, as new products almost always fit pre-existing structures and systems, both internally and externally. For example, transport routes between customers, focal company and suppliers are already established, packages are standardized and logistic protocols and information exchange systems, such as EDI, are the same as other products. Thus, work of logistics for development has been summarized to elaboration of products packaging plans, and data insertion of new product in ERP".

4.3 Data Discussion

The research found a well-structured NPD in focal company, with NPD aligned with sector requirements, especially in involving diverse SC members in product project. The ESI has been applied increasingly in automotive sector, resulting in significant company gains, although there are still no comprehensive and clearly defined criteria and policies to determine each SC member's stage and involvement degree in NPD. This is evidenced by the fact that both focal company and its partners use ESI to a greater or lesser degree.

According to interviewed professionals, major obstacle to making full use of ESI is cultural, since, at first glance, customer–supplier interaction seems to delay and hamper the process. However, experience shows that benefits outweigh any objections. During development process, both information systems usage and data exchange is intense between involved companies, especially concerning engineering data, which demonstrates that information systems help NPD process in Brazilian automotive industry, despite its structural, technological and regulatory problems.

Table 7 examines situation and impact of information exchange in focal company, comparing expected situation according to literature review and real situation found in case

study. Table 7 also shows information exchange impact of NPD results regarding analysis categories defined in this study: product quality, development time and product cost.

Table 7: Situation and impact of information exchange in the focal company's NPD

Area	Information	Expected situation (Literature review)	Situation found	Impact on NPD		
				Quality	Time	Cost
Commercial	Supply contracts or purchase order Confidentiality agreement Development schedule	Full integration of information systems along supply chain, especially mathematical models of products and use of CAD, CAE and CAM technologies.	Moderate exchange of electronic data. Lack of integration regarding ERP systems.	Medium	Medium	Medium
Engineering	3D mathematical models 2D drawing Standards and engineering specifications		Intense exchange of electronic data, mainly CAD, CAE and CAM, but with partial integration due to use of different systems by supply chain members.	High	High	High
Quality	Product and process approval reports		Moderate exchange of electronic data. Lack of integration regarding ERP systems.	Medium	Medium	Medium
Logistics	Delivery schedule Packing specifications Means of transportation and delivery windows		Moderate exchange of electronic data. Lack of integration regarding ERP systems.	Medium	Medium	Medium

Source: Research results

In "Situation found" column in Table 7, the term "intense" means that information exchange among supply chain members occurs throughout project development. The term "Moderate" applies to information exchange that occurs at specific stages of development. The term "Low," which did not appear in the interviews, would mean that information exchange would occur episodically during development. These terms were defined in consensus with interviewees. The NPD impact classification in Table 7 was also defined in consensus with the interviewees: "High" impact means that information has a direct influence on the product, tooling or manufacturing process design, where a failure might indicate the need to revise project bases and, possibly, need to restart entire product validation procedures. "Medium" impact means that information might generate changes that require, for example, minor changes in product design or adaptations in tooling or manufacturing process. "Low" impact means that information would affect only documentation.

It was consensus among interviewees that ERP systems have greatest impact on NPD information systems; CAD systems, which from a supply chain context are key NPD success factors, had a particularly strong impact. ERP systems integrate and organize information within each organization and generate important information for NPD that is transmitted to suppliers. However, interviews still found low integration between customers' ERP systems and other SC members' ERPs. This finding refutes P1, since it mentions that information systems provide a high level of integration among SC members, making data exchange easier and more accurate and leading to development time and costs reductions and improving product quality throughout the NPD process.

CAD system use was identified as a key factor in not only speeding up and adding reliability to SCs information flow but also in promoting deep and innovative changes in products development, generating significant gains in quality, time and development costs, which leads to increased sector competitiveness. Thus, regarding categories of analysis in this research, it should be noted that quality gains and product costs are mainly related, in interviewees opinion, to product geometry changes requested by focal company.

These changes are based on finite element simulations (CAE) and tooling projects experience by focal company and its suppliers. These changes reduce rejection rates and improve product manufacturability and productivity. Development time reduction is due both to reduced need for each chain member to redesign product and tooling in their own CAD system and to reduced number of product changes and processes arising from focal company's and its suppliers' early involvement.

Furthermore, development time is reduced

due higher likelihood of change identifications in process' initial stages, which reduces both project's rework and product validation test repetition, which are, in general, time consuming and costly. Therefore, P2 can be confirmed, because case shows that information systems such as CAD and CAE help companies' NPD, especially concerning ESI practice, and impact positively in development time reduction, costs reduction and product quality improvement, because they allow faster information sharing among chain members.

5 Conclusion

NPD in automotive industry is a complex process and involves interaction and coordination of a large number of companies in SC at several levels of its structure. Due to its potential benefits, ESI has been globally applied in this industry, including in Brazil. However, in order to be implemented properly, ESI requires a continuous information flow supported by robust information systems that can ensure to chain members data availability and reliability as well as information and knowledge confidentiality.

Considering this requirement, it is important to verify if, in an automotive industry context with structural, technological and regulatory problems such as Brazil's, information systems also help NPD process achieve development time reduction, costs reduction and product quality improvement. In the same context, it was interesting to identify whether this help occurs due to information systems providing a high integration level among SC members, making data exchange easier and more accurate, or only because information systems connect companies, resulting in faster information sharing among chain members.

To support this study, two propositions were created from literature review: (**P1**) information systems provide a high integration level among SC members, making data exchange easier and more accurate and resulting in development time reduction, costs reduction and product quality improvement in NPD process; (**P2**) information systems can help companies' NPD, especially concerning ESI practice, impacting positively in development time reduction, costs reduction and product quality improvement, because they allow faster information sharing among chain members.

Findings indicate that NPD process in Brazilian automotive industry is in a well-developed stage, covering relations with suppliers at all SC levels, including large, medium and small companies. APQP methodology, used as a standard in this segment, is in accordance with SCM procedures and especially with ESI, since both procedures' goals are the same and both advocate participation of various SC members throughout product development process. ESI use has been growing over time and across different levels of SCs, but there are still no policies or clearly defined criteria for establishing supplier involvement degree in NPD process.

The study showed that information systems are widely used for data exchange during NPD process, although systems integration level among SC members is still low; this is evident in the ERP and CAD systems of the evaluated chains, in which data exchange requires use of intermediate formats that, in addition to obstructing process, still raise risk of data exchange loss or quality deterioration.

Based on research findings about NPD in Brazilian automotive industry, **P1** was refused, specifically regarding high level of integration among SC members that information systems can provide, which makes data exchange easier and more accurate. Since companies use different systems, obstacles arise from distinct system structures such as application languages and databases management systems not being compatible with each other; this generates further manual activities that render data exchange more complex and less accurate.

However, CAD and ERP system use is fundamental for supply chain members' integration since, as well as providing development time savings and reliability, they represent an innovative and new paradigm in project development. In the case of CAD systems, quality gains and lower product costs arise mainly from product changes suggested by focal company in a streamlined system that reduces rejection rates and increases product manufacturability. Likewise, these systems shorten development time due to quick data exchange between chain members, which reduces rework and results in a smaller number of later changes in product projects.

These research findings demonstrate that **P2** can be confirmed. Information systems such as CAD and ERP have a positive impact on product quality improvement, development time reduction and cost gains, which can contribute to increase

sector competitiveness, especially because these systems allow faster information sharing among chain members.

6 Implications and Further Research

Considering this research objective, is possible to assume that even in a country that has structural, technological and regulatory problems in its automotive industry, information systems help NPD process to achieve development time reduction, cost reduction and product quality improvement. These benefits arise because information systems allow faster information sharing among chain members and not because information systems provide a high level of integration among SC members, making data exchange easier and more accurate. This means that, even with low integration and less accurate and more complex data exchange processes, development time reduction, costs reduction and product quality improvement can be reached through information systems use in NPD. Regarding theory generalization, if this conclusion is valid in a context with structural, technological and regulatory problems, it can be also valid in better contexts.

Further investigations in other companies and chains would be necessary to verify if these findings could be generalizable empirically rather than only in theory but, especially given the dynamics of studied sector and different interactions observed in the research, it is believed that this paper can contribute to discussions about the importance of using information systems in automotive chain product development, especially in a context with several barriers to be overcome..

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The Academic Master's Program in Management: is it relevant to professional practice?

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ABSTRACT

This is an analysis of the relevance of an academic Master's Program in Management to professional practice from the viewpoint of graduates and professors. The study was guided by three perspectives: "academic", "social" and "institutional". It is a descriptive study, focusing on the case of an academic program offered by a Brazilian private university. In the academic dimension, the analysis revealed its emphasis on traditional teaching methods in relation to professional and vocational aspects. A weak social identity and the inexistence of exchanges of experiences, and no perception of a common technical language were highlighted in the social dimension. The prestige of the university, rather than the program, was the main factor that influenced institutional attractiveness, albeit with no benefits in terms of employability. The conclusions show a need to reevaluate the current content and teaching methods to integrate the degree better into management and professional practice to bridge these gaps. This article contributes to the field by identifying critical points of the degree program that require a better alignment of capability, knowledge and resources with the expectations and demands of the productive sector and society. Studies in this field in Brazil are scarce and there is little empirical evidence of the influence of management education on professional activities and organizational management.

PALAVRAS-CHAVE

Mestrado acadêmico,
Administração,
Dimensões acadêmica,
Social e institucional,
Prática profissional.

RESUMO

Neste trabalho é analisada a relevância de um curso de mestrado acadêmico em administração para a prática profissional, na perspectiva dos seus egressos e professores. O estudo fundamentou em três dimensões: acadêmica, social e institucional. Trata-se de um trabalho descritivo com foco em estudo de caso de um curso de mestrado acadêmico ofertado por uma universidade privada brasileira. Na dimensão acadêmica, a análise revelou a existência de uma ênfase em métodos tradicionais de ensino no que se refere aos aspectos de formação profissional e vocacional. Observou-se, na dimensão social, uma fraca identidade e a inexistência de trocas de experiências sendo despercebida a disseminação de uma linguagem técnica comum. Mais do que o prestigio do curso foi o prestigio da universidade que foi considerado um fator influente na atração à instituição, embora sem produzir impacto na empregabilidade. As conclusões indicam a necessidade de uma reavaliação do atual conteúdo e metodologias de ensino, como forma de melhor integrar o conteúdo do mestrado com a administração e prática profissional, preenchendo um hiato existente. Este trabalho contribui para o campo de conhecimento ao identificar pontos críticos do curso o qual requer um melhor alinhamento da capacidade, conhecimento e recursos existentes com as expectativas e demandas do setor produtivo e sociedade. Estudos neste campo no Brasil são escassos, havendo poucas evidencias empíricas da influência da educação em administração nas atividades profissionais e na administração organizacional.

1 Introduction

Higher education makes an important contribution to the formation and development of the intellectual capacity of individuals seeking to improve society. Universities are social institutions that play a fundamental role in preparing qualified professionals for the productive sector, the production of basic and applied knowledge for scientific and technological development and setting people on the path to citizenship.
Universities have traditionally played two essential setting people on the path to citizenship.

Universities have traditionally played two essential roles. The first is to prepare professionals in a wide range of fields of knowledge. The second is the critical function of thinking about society and proposing solutions to its problems and helping to transform it.

Traditional studies in the field of higher education have pointed out that the academic sector is the core area where education takes place. This is the locus where the functions of teaching, research and services, essential to the fulfilment of the institutional mission, are carried out (Peterson *et al*., 1997; Birnbaum, 1989; Gumport 2007 and Bastedo 2012). Universities are identified as social entities in which professors, students and managers interact and build a community where teaching, learning and advancement of knowledge occur (Peterson et al., 1997; Gumport, 2000; Bastedo, 2012, Caplan, 2018). As institutions, universities are the main providers of relevant educational services to society, meeting the expectations of their stakeholders. From this perspective, their institutional effectiveness depends on the quality and relevance of their educational services being perceived as relevant, prestigious and legitimate in the eyes of society (Meyer and Rowan, 1978; Scott, 1995, Meyer and Murphy, 2003; Caplan, 2018).

Furthermore, various levels of learning have been constituted at universities, from undergraduate programs to stricto sensu or graduate programs. In Brazil, the performance of this kind of program is supervised by the Ministry of Education, and evaluated at the graduate level by a specific agency, the Coordination for the Improvement of Higher Education Personnel (CAPES). Its task is to supervise and promote the development of graduate programs, assess the quality and importance of their achievements, and organize a ranking of this type of program in the country.

The growth and quality of the graduate system in Brazil have raised awareness among those involved, focusing on stricto sensu programs as an instrument for the economic, scientific and technological development of the country. Guided by this principle, Academic Master's Degree programs in management, which first appeared in 1967, have grown in number and importance, strengthening their formal role in qualifying professionals for the market and developing research studies in this field.

Over the last twenty years, we have seen in Brazil a rapid expansion and growth in the number of graduate programs in management, both stricto sensu (Master's Degrees and Doctorates) and MBAs, plus other lato sensu or certificate programs, whose purpose is essentially to provide managers with professional training. This industry of management has been analyzed in the United States and United Kingdom, and Business Schools have been the focus of reflective and critical studies (Pfeffer and Fong, 2002; Grey, 2004; Mintzberg, 2004; Bennis and O'Toole, 2005; Jarzabkowski *et al*., 2013).

In the last decade, we have witnessed a growing debate on management education and its effective contribution to professional practice in the field, with its advocates and critics taking a stance on the value and relevance of these Master's Degree programs. In Brazil, however, studies on this topic remain scarce, with little empirical evidence on the real benefits of training professional managers (Paixão and Souza, 2018), particularly in Academic Master's Programs at both public and private institutions.

In this article, we set out to examine the importance and contribution of a Brazilian Master's Degree Program in management to professional practice from the perspective of its graduates, and the reaction of faculty members regarding about these students' perspectives. In this study, we gathered evidence to examine the actual role of a well ranked academic Master's Degree program and contribute to the debate on management education.

2 Management programs and their critics

Management plays a very important role, making a decisive contribution to the workings of organizations and society in economic, social, technical, political and ethical terms. It is impossible to imagine society functioning without efficient, ethical, effective, reliable and, consequently, well managed organizations achieving their goals. Thus, management education is of great importance to society.

Since the nineteen nineties, Brazil has seen a growth in the number of management programs, especially Master's Degrees. This expansion is in keeping with the economic development of the country and has followed a trend already seen in the United States and United Kingdom, where business schools have been operational for over a century. Regarding the growing number of graduate programs in Brazil, we may highlight the creation of professional Master's Degree programs in management over the last twenty years. Simultaneously, there has been a growth in the number of post-graduate programs known as MBAs for marketing purposes.

In the Brazilian context, these MBA programs are known for their short-term, narrow scope, practical orientation toward professional management education and as certificate providers. These programs have been consolidated as highly successful products for their institutions, as short-term graduate programs capable of boosting careers and providing alternatives for training in leadership (Wood Jr. and Cruz, 2014).

In the debate over the relevance of management education, critics have concentrated on aspects such as teaching, curriculum, skills and individual and professional benefits in the work market, focusing on traditional programs in business administration (MBAs) worldwide. Two opposing stances have been taken in this debate. The first emphasizes the importance of these courses, highlighting their contribution not only to preparing more competent and, therefore, better managers, but also to improving administrative practices and managerial skills to handle problems that arise in business (Elmuti, 2004; Davila, 2012; Jarzabkowski *et al*., 2013).

The second stance expresses a different point of view, questioning the teaching of management by highlighting a gap between the techniques and tools taught in MBA programs and the reality of the business world, the market and professional practices, thus challenging the current management education model. One of the most severe criticisms is that management is an essentially practical activity that cannot be taught in a classroom (Pfeffer and Fong, 2002; Grey, 2004; Mintzberg, 2004; Bennis and O'Toole, 2005; Ghoshal, 2005; Podolny, 2009).

Critics who hold this point of view claim that management is not a science, let alone a profession. It is a mixture of art, experience and technique (Mintzberg, 2004). Without experience, there is no art and no application of techniques. This criticism ranges from the selection of students to the teaching and pedagogical approach used in MBA programs, which have proved to be deficient with regard to the main goal of this kind of program: to prepare managers to work in the management of organizations (Grey, 2004).

To Mintzberg (2004), MBAs essentially concentrate on teaching analytical skills, with dysfunctional consequences for practical management. According to Bennis and O'Toole (2005), Master's Degrees in management do not impart useful skills; nor do they create leaders or inculcate ethical behavior – elements considered essential when preparing a professional for the market and competent and successful professional practice.

Therefore, criticism is focused on the program's academic structure and, particularly, its curriculum. The true cause of the crisis in education at business schools, according to Podolny (2009), is that the curriculum is almost entirely focused on the rigors of scientific research, in detriment of teaching relevant concepts, techniques and tools for professional life.

As MBA programs focus excessively on "scientific" research, administrators tend to hire professors who are researchers, with limited professional experience in management. The result is theoretical classes that are far from actual managerial practice and students who are not prepared to address concrete complex issues that are often immeasurable. In other words, they are not prepared for the practical requirements of management in the reality of organizations (Bennis and O'Toole, 2005). In this respect, management involves theories and approaches that are not morally neutral. According to Ghoshal (2005),

many of these are destroying good managerial practice instead of aiding it.

Thus, traditional MBAs, with their curricula, textbooks, articles, disciplines and case methods, provide a type of teaching under which students cease to develop relevant practical knowledge and skills, creating a false impression of what management really means. The result is a professional qualification that, when put into practice, ends up undermining organizations and society. Using the classroom to help develop people who already work in management is an excellent idea, but attempting to make managers out of people who have never managed anything is nothing but an illusion (Mintzberg, 2004; Gosling and Mintzberg, 2006).

Bennis and O'Toole (2005) stress that although part of the research produced is of high quality, little of it is based on the reality of management in a business environment. The scientific model adopted by business schools, particularly in MBA programs, is based on a false premise that management is an academic subject like chemistry or geology, rather than a profession, such as medicine or law. Business schools and MBA programs have lost their way, and to find their way back, they need to act like traditional schools that prepare professionals for the real world.

Like other professional fields, graduation in management requires contributions from a number of academic subjects. In management, this contribution comes from the fields such as mathematics, economics, philosophy, anthropology and sociology. It is essential to distinguish between academic subjects and the profession. No curricular reform will be successful until the scientific and rational model is exchanged for a more adequate model built on the requirements of professional practice (Mintzberg 2004; Gosling and Mintzberg, 2006; Grey, 2009).

The socialization that results from MBA programs is another relevant factor when analyzing these programs (Datar *et al*., 2010). Management education plays a social role in providing an environment for learning and interaction between students and professors. In this process, students bring their individual experience of life, the world, organizations and society into the classroom.

Interaction between students and professors, in and out of the classroom, whether formal or informal, influences their cognition, behavior, values and sensemaking with regard to practice in organizational management. Informal networks are created by individuals with diverse goals concerning studies, the relevance of teaching and learning, the sharing of knowledge and the work market. Leavitt (1991) highlights that socialization in MBAs means sharing ways of thinking, value systems, interpersonal relationships and citizenship. Datar *et al.* (2010) are critical of these programs, stressing the excessive dissemination of a trade school mentality by business schools and the need to set limits on managerial models and markets.

To Grey (2009), MBA programs inculcate a clear symbolic indicator that favors certain types of knowledge and behavior lacking necessary concrete knowledge and skills, not only for professional practice but also for life in society. For this reason, professional and personal intellectual training for students deserves special attention in courses that focus on management education.

In practice, what we see is an environment where a socialization process is at work, with individuals acquiring only a more functional and less critical view of what occurs in the world of business management (Grey, 2009). One point that deserves to be highlighted is the language that is disseminated in MBA programs, represented by models, technical approaches and the use of metaphors. This leads to discourse and rhetoric that are characteristic of MBAs and are widely disseminated among their graduates, creating and shaping their own reality.

Collins (1979) and Berg (2003) draw attention to a discrepancy between the behavior of the market and its requirements in terms of formal education. This discrepancy is characteristic of a credentialist society, where a certain kind of formal education is required for a job, but this education is not actually put to use at work. This is the case of professional activities in the public sector, teaching at higher learning institutions and consultancy work. Educational credentials are more important in terms of employability than actual professional skills.

Looking at the Brazilian context of management schools, Wood, Jr., and Cruz (2014) note that the reconstruction of a new culture would

depend on certifying organizations being capable of assimilating ideas, generating articles and incorporating criteria that influence the behavior of business schools. It is our understanding that this would also depend on the position and policies of regulating agencies, such as the CAPES, and the innovative and creative capacity of professors who, individually and with some restrictions, would alter the content and methods used in their disciplines and programs.

More recently, the debate on the importance of education in management has required an in-depth and systematic analysis focusing on the relevance of studies in management being put into practice. Professional education, especially at the Master's Degree level, in management has proved to be a significant career investment, with high direct and indirect costs for users. More recently, in Brazil, this debate has become increasingly important, and it is imperative that new studies examining the relevance of Academic Master's Degrees in management, and particularly their training for professional practice, be conducted to further this debate.

3 Method

We adopted a multimethod research characterized as case study design based on questionnaires, interviews and participant observation (Eisenhardt, 1989; Stake, 1994; Creswell, 2017). The intention was to analyze the relevance of an academic Master's Program in Management to professional practice from the viewpoint of graduates and professors at a prestigious private Brazilian university.

We collected data from three main sources: questionnaires, interviews and non-participant observation (Jaccoud and Mayer, 2008) to avoid possible bias resulting from a single data source. Both researchers acted as participant observers during the research period, interacting with other professors and students and participating actively in changes promoted in the Master's Program.

In the analysis, the issues were clustered into three dimensions: academic, social and institutional. These dimensions were defined as the main general areas that best represent the overall academic context of colleges and universities, aligned with the core of the academic programs that are the focus of the study: academic program, students and faculty, and institutional perspectives.

Initially an online questionnaire applied electronically to former students was used. The purpose of the questionnaire was to identify the extent to which the Master's Program contributed to a graduate's professional practice. The perception of the former students was measured on an attitudinal Likert scale.

The population was composed of 86 former students who graduated between 2007 and 2010. Of this group, 74 former students effectively participated in the study, resulting in a highly representative and valid sample. The gap is attributed to invalid, incomplete or non-responses.

Initially, an online questionnaire applied electronically to former students was used. The purpose of the questionnaire was to identify the extent to which the Academic Master's Program in question actually contributed to the graduates' professional practice. The population was made up of 86 former students who graduated between 2007 and 2010. Of this group, 74 former students effectively participated in the study, resulting in a highly representative and valid sample.

In the second stage, the reaction of seven professors to the perception of the students was obtained through in-depth interviews (Stake, 1994), resulting in a distinct perception that enriched the quality of the data and strengthened the analysis and results. The interviewees were asked to indicate to what degree they agreed or disagreed with the statements in the research instrument. The sampling criterion that we adopted for the interviews and the questionnaires was intentional, focusing on former students and professors of the same Master's Program. The data collection instruments were tested and validated with similar individuals from another Master's Program that did not participate in the study. The interviews and field diary were transcribed for analysis.

The perception of the former students was measured on an attitudinal Likert scale. The interviewees were asked to indicate to what degree they agreed or disagreed with the essence of the structured statements based on issues derived from the three dimensions: academic (Peterson *et al.*, 1997; Gumport, 2000, 2007 and Bastedo, 2012), social (Meyer and Murphy, 2003; Datar *et al.*,

2010).), and institutional (Meyer and Rowan, 1978, 2006; Scott, 1995).

To prepare the instrument and data analysis, the elements presented in the Table 1, below, were considered and clustered into the aforementioned three dimensions.

Table 1. Research dimensions

Research Dimensions		
ACADEMIC	SOCIAL	INSTITUTIONAL
Most important aspects in academic qualification of graduates in the Master's Degree Program for professional practice.	Factors that influenced the socialization resulting from the academic experience of the Master's Degree program in management.	Elements that highlight the importance of the program and institution to professional practice.
Elements of Analysis		
Manager's qualification; Professor's qualification Researcher's qualification	Social networks (formal and informal); Interaction with environment; Language; Integration.	Image; Prestige; Legitimacy.

Source: Research data.

The primary data were examined in the Narrative Analysis (Tsoukas and Hatch, 2001) focusing on the meaning as the analysis technique. The questionnaire data were analyzed using descriptive statistics, with the support of Microsoft Excel. The triangulation of data sources was sought in different types of strategies of gathering and analyzing the data.

4 Analysis

The challenge in this study was to analyze the data obtained from the graduates' perception of teaching in management, considering a complex and dynamic reality represented by management education, which is heavily influenced by economic, social, political and psychological factors, particularly regarding the program and professional market. Special attention was paid to the interface program and professional market, establishing under which conditions the three dimensions in question overlap with the diverse elements that exist in this context.

The professional profile of the graduates ind icated their main occupations after completing the Master's Degree program. The dat a revealed that only 43% work in management as their main activity, and 20% claimed that management was a secondary activity. We also found that 68% of the respondents work in teaching, either as their main activity (27%) or as a secondary activity (41%). We attribute the high number of graduates working in teaching to the fact that it provides them with a supplementary source of income.

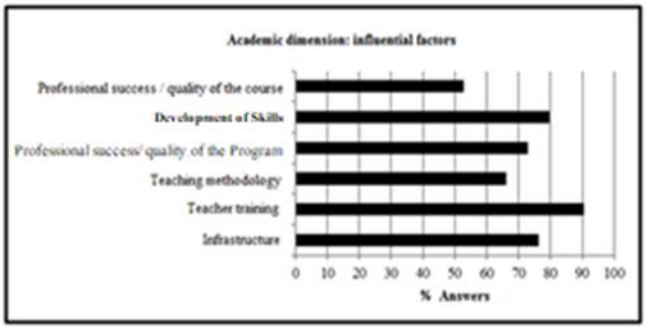
In addition, the profile of the students pointed out that around 40% of the respondents work in consultancy as a main or secondary professional activity. Like teaching, consultancy serves to supplement their income. Finally, it is important to emphasize the number of graduates not working in management (around 30%). Possible reasons for this are the economic situation of the country, the dynamic of the work market and transitions, and a gap between students' skills and knowledge vis-a-vis market demands and expectations.

In the last decade management education has been the target of criticism that has generated tensions in business sc hools, and particularly Academic Master's programs in Management. To respond to new demands, changes are required, focusing on the curriculum s tructure, teaching methods, social integration and better alignment with the labor market and the community's expectations. By examining the reality of a particular Academic Master's program, from academic, social and institutional perspectives (lens), critical points arise that will challenge those in charge of the management education program that is the focus of this study.

4.1 Academic dimension

Regarding the academic dimension, our study examined elements such as program structure, curriculum, training, qualification and prestige of professors, teaching and teaching method, preparation for research and the adaptation of professional training to the reality of the market in terms of developing the required skills and capabilities.

Figure 1. Academic dimension: influential factors



Source: Research data.

We found that approximately 75% of the sample consider the program structure satisfactory in terms of physical space, study environment, laboratories and software. However, these respondents believe that the library does not yet meet the standard of quality required for a Master's program, although the students have used the CAPES Journals Portal – an electronic database of national and international journals in diverse fields of knowledge and study.

Over 90% of the respondents felt that the professors are adequately qualified to conduct classroom activities. The prestige of the teaching staff was a key factor in their choice of coursework. An interesting point is that the teaching method was highlighted as positive, but in the respondents' view the teaching did not spur them to expand their knowledge, which resulted in a feeling of frustration (Figure 2). This was the first inconsistency found in the responses. Although the two concepts had features that distinguished them, the teaching method and the teaching itself were closely related.

The respondents believed that the program developed skills that meet the requirements of the job market (72%). However, it was interesting that a significant part (30%) of the sample is not working in management, as mentioned above, and that the teaching was highly theoretical.

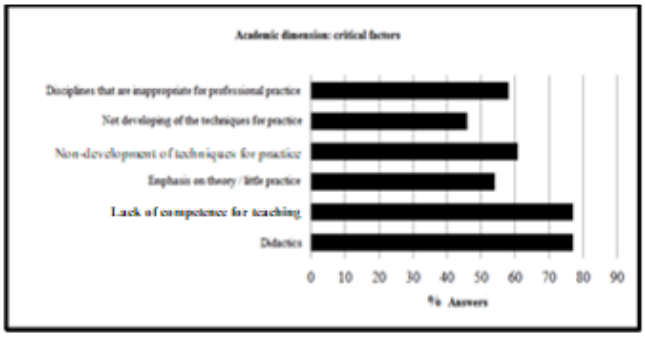
Training for research was considered a strong point of the program by the vast majority of the respondents (80%). The importance of this feature may be due to the requirement to present a dissertation as the main requisite for and obstacle to gaining the Master's Degree. Without research and a defense of its results, the Master´s Program cannot be concluded.

Another point regarding preparation for research that we must stress is that it should not always be viewed as positive. On the contrary, curricula emphasizing abstract scientific models over evaluation based on practical skills have been heavily criticized by authors such as Pfeffer and Fong (2002), Elmuti (2004), Bennis and O'Toole (2005) and Podolny (2009).

Around half of the respondents (52%) credit their professional success to the quality of the training in the Master's program. However, once again, we should highlight the considerable number of respondents that are not working in the field of management.

Some limitations and criticisms of the program were identified, as shown in Figure 2.

Figure 2. Academic dimension: critical factors



Source: Research data.

The most frequently voiced criticisms that deserve to be highlighted focused on the program curriculum. Although an impressive number of respondents believed that the program helped to develop useful skills for the work market, paradoxically, almost 60% concluded that the disciplines were not aligned with professional practice.

The program was considered essentially theoretical, with little practical content, by 55% of the respondents, and as not

developing adequate mastery of the techniques required for professional practice (45%). Consequently, it did not provide the students with the managerial skills they desired. This finding corroborates the criticisms made by Pfeffer and Fong (2002), Mintzberg (2004), Bennis and O'Toole (2005), Ghoshal (2005) and Grey (2004; 2009). To these authors, an executive cannot be taught how to act in the work market in formal education, and will only learn by gaining experience.

In our opinion, it is a cause for concern that 40% of the respondents concluded that the program did not help to define their field in the market. Despite highlighting that the program was predominantly theoretical in nature, 77% of the respondents felt that critical spirit, based on theories, was not strongly developed.

This criticism deserves attention because the teaching of management needs to go beyond the simple prescription of models, approaches and tools, also focusing on the limits of these approaches, theories and the ideology on which they are built, which appears not to have been the case in this study. The time has come to rebalance the curriculum away from excessive theory and place more emphasis on managerial skills and social aspects of the profession that are now demanded by the labor market and society.

Again, the graduates echo the criticisms of researchers, who warned of the negative influence of theories on business management taught in schools. The exaggerated emphasis on rationalism and utilitarianism, and the neglect of political, social, ethical and psychological aspects in organizational practice, are among the strong arguments used in the debate (Parker, 2002; Pfeffer & Fong, 2002; Ghoshal, 2005; Bennis and O'Toole, 2005; Grey, 2004; 2009).

One of the aims of the Master's program in management, like all other academic Master's and Doctorate programs accredited by the Ministry of Education - CAPES, is to train professors, which is the reason why the graduates were asked about the development of skills required for teaching.

What we found is that over 60% of the respondents concluded that they were not prepared for teaching. We recall that even the teaching by the program's professors was a source of frustration for 76% of the respondents. This negative evaluation is especially worrying when we see that the vast majority of graduates (68%) list teaching as their primary or secondary professional activity, even though they do not feel that they were adequately prepared for it.

The professors that were interviewed reacted to the criticisms of the students. Regarding teacher training, the vast majority of the interviewees recognized that this is one of the goals of the Master's program. However, in the Master's program, they did not identify proposals that were intended to train teachers.

In this respect, one of the professors stated: "*we did not train the professor, but we offered experiences that seek to provide a view of what constitutes a class" (*Interviewee 3). To this interviewee, these experiences are offered at the seminars, an opportunity in which students are obliged to prepare themes with which they are not yet familiar and present them in the classroom.

Concerning the criticisms regarding excessive emphasis on theory and lack of professional practice, the professors provided a number of justifications for the proposals of the program. To Interviewee 1 "*the Master's Program was projected to comply with the CAPES assessment system"*, which until the early 2000s favored the academic bias of this kind of program. Although the CAPES is now encouraging professional Master's programs that focus more on the market, Master's programs in Management continue to be judged by the production of scientific articles.

As one professor argued, the institution should separate the Master's and Doctoral programs more clearly, and highlighted that researchers should be trained through the doctorate program (Interviewee 1). This opinion was shared by Interviewee 4, who understood that there is a certain amount of confusion, not only at the institution but in Brazil in general, regarding the difference between a Master's Degree and Doctorate. "*Earning a Master's Degree means greater focus on the development of knowledge, of knowing rather than doing." (Interviewee 2)*

However, Interviewee 3 recalled that the proposal of the program was idealized for the Master's Degree. It was intended to initiate students into scientific research and prepare them

for academia. The professor remembered that Academic Master's programs differ from MBAs and Brazilian specializations. The Master's Program provides a critical viewpoint to students who are already in the market, helping to improve their activities. Although students are not specifically prepared for professional practice, this practice improves as a consequence of the themes that are discussed in the classroom. (Interviewee 3).

The proposal of the Academic Master's program was defined by Interviewees 5 and 7 with the argument that executives have a short-term view. They almost always seek immediate results, and therefore, they need skills that allow them to survive the everyday life of the company. Researchers, however, are trained to find long-term solutions to organizational management challenges.

Another professor also highlighted that the Program should offer new forms of thinking and acting and that students should be trained for functions that do not yet exist in the market. The forms of management that we know are constantly changing and the skills required today will be of little use in the near future (Interviewee 7).

Professors and students agree that the teacher training is not adapted to the reality of the market. This is a cause for concern because the vast majority of students on the Master's program work in teaching as their second principal professional activity.

There is clearly a weak distinction between Academic Master's and Doctoral programs in the statements of the professors. This stems from the origin of graduate programs in Brazil, when the system was fundamentally centered on Master's programs with academic characteristics. In these new times, a more proactive attitude is being demanded of graduate programs in management in Brazil.

The emphasis on essentially theoretical content pointed out by the students was defended by most of the professors, who argued that academic training promotes the critical thinking required for a long-term view, and that this was not perceived by the students. This contrasts with the constant changes in the job market regarding managerial skills and capabilities in organizations.

4.2 Social dimension

In the social dimension, we looked at issues such as the formation of social networks, interaction with the environment and the development of the language used in the practice of management as possible facilitating factors for entry and growth in the professional market. The research was based on the premise that the program environment enabled the formation of social networks and that these had somehow aided inclusion in the job market. The respondents found it difficult to decide on their positions in this respect, as 36% marked the *uncertain* option, while 44% disagreed with the statement and only 20% agreed with it (Figure 3).

On the other hand, most of the sample (62%) indicated that the individualistic behavior of the students hindered socialization in the group, which may be a factor that impedes the formation of informal social networks, and even the integration of the group. This has implications for professional practice, as teams or work groups are constantly organized and reorganized according to the needs and dynamic of the organization.

Regarding another aspect of the social dimension, only 42% of the respondents agreed that the jargon used in the work market was disseminated during the program. This response is surprising, as it appears impossible that a Master's program in management, as in any other professional field, would not adopt the technical language used in books and articles on the diverse range of aspects of management in organizations, as the language is of great importance to the market in which the professionals operate (Grey, 2004; 2009). We believe that the statement on language was not sufficiently understood by the graduates.

Most of the professors that were interviewed agreed that the Master's program does not favor the formation of networks. However, they pointed out a diversity of factors to account for this. According to Interviewee 1, this occurs due to the students' profile. Students do what they can to avoid being physically present, as they work and have numerous other commitments.

However, according to Interviewees 3 and 4, one of the shortcomings of the program is that it does not offer opportunities for socialization. In their opinion, the program should encourage students to socialize. They noted that when

networks exist, they are formed spontaneously and informally.

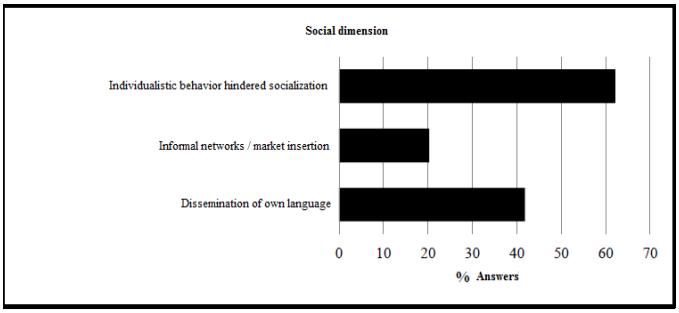
> "I think we have really got this wrong… we do very little… after students get their credits… it becomes an individual work with the supervisor… we don't have mechanisms that encourage socializing… we should rethink this" (Interviewee 3)

As for the development of adequate technical language in the training process, it was highlighted that professors have their own jargon related to their professional areas and their themes of research and use this vocabulary intensely in the classroom. This enables students to acquire a language that is adequate for the business environment through assimilation (Interviewee 7).

It is interesting that the students were not aware of the fact that the disciplines of the Master's program disseminated approaches, symbols and the languages that integrate the jargon of management.

As a result, the socialization of the Master's students was considered weak by both graduates and professors. This deficiency resulted from a restricted flow of information that is important in terms of the job market, salaries and employability.

Figure 3. Social dimension



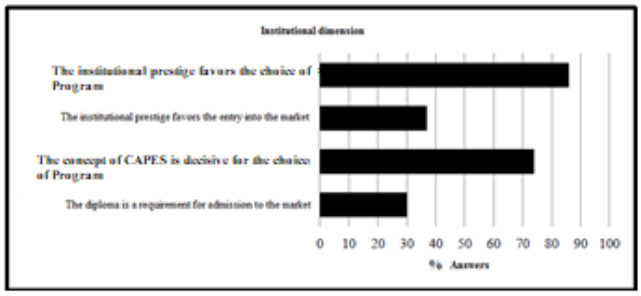
Source: Research data.

4.3 Institutional dimension

In the institutional dimension, our study looked at issues such as the importance of the concept of the Master's program in the eyes of the CAPES, the prestige of the institution and the requirement of the diploma to enter the work market.

On the subject of the diploma being required by employers, only 30% of the respondents agreed that the diploma, as a credential, was needed to enter the work market. The same number of respondents, in answer to a previous question, had already said that the fact that the market did not show a preference for graduates made it harder for them to find work. These conclusions contradict the literature, especially what Collins (1979) and Berg (2003) call the *credentialist society*, meaning a society that demands diplomas for professional practice. According to the graduates who participated in the study, the business world does not value educational credentials in the case of the professional management market.

Figure 4. Institutional dimension



Source: Research data.

However, when asked about teaching, the situation was different. Management schools, due to legal requirements, need to hire professors with at least a Master's Degree, preferably a Doctorate. Thus, as a positive evaluation in the ranking of the Ministry of Education-CAPES is required for programs to be accredited and, consequently, for diplomas to be validated. The graduates took this into account when choosing the program (74%) and the institution where they would enroll for their Master's Degree (86%). It is also important to mention that the institution in question is a private university that charges fees for its tuition and services, whereas in public universities similar programs are tuition free.

The prestige of the institution, on the other hand, proved not to be influential. According to the respondents, this factor was not decisive when it came to entering the work market, emphasizing the notion that the business world in Brazil is not credentialist in nature.

When discussing the institutional dimension, most of the professors highlighted the strength of the university's brand. However, some agreed that the institution should exploit the strength of its brand better, including through partnerships with the business sector. These partnerships would be

yet another factor to attract new students (Interviewees 1, 2 and 4).

Some professors also highlighted the flexibility of the Master's program as an element for attracting students, especially those already in the work market who cannot dedicate themselves full time to academic activities (Interviewees 2 and 3). The fact that the institution is private and charges tuition was also highlighted by the professors. The financial issue restricts the attraction of the program

Regarding the CAPES evaluation, some professors seemed to agree that the concept of the program is not the decisive element, neither for students that choose the program, nor for the market that selects graduates (Interviewees 1 and 4).

> "Having a concept of 3, 4, 5, 6 or 7 at the CAPES doesn't make any difference … because employers don't know the difference between concept 3 and 7, but they know the difference between our institution and other private institutions in the region" (Interviewee 1)

On the other hand, with their opinions differing from those of the graduates, the professors argued that a diploma from a prestigious institution could be decisive when it comes to entering the market. The importance of the institutional brand was highlighted by students and professors. To the former, the institutional brand was attractive, but not decisive when entering the job market. To the professors, the institution should exploit the brand name more with regard to the market, particularly the business sector. A possible effect of partnerships with the business community would be the placement of more graduates in the world of work.

5 Discussion

Measuring the performance of academic Master's programs in management in Brazil using criteria other than those set by the CAPES has been necessary for a long time. We believe that the study of academic, social and institutional dimensions makes a contribution by examining critical aspects of this type of education in the field of management. This is of great importance, first because it involves elements not included in the formal evaluation and, second, because of the discourse that this form of education is transformative and is of great benefit to professional practice, especially in terms of careers and salaries.

In academia, we saw that the Master's program is strategically oriented to meet the requirements of the CAPES rather than the expectations or demands of the production sector or its users. This leads to isomorphism of goals, structuration behavior and standards of quality, resulting in graduates with very similar professional profiles. Furthermore, the work market for management does not favor credentials such as a Master's Degree.

The main consequences of this are a widening gap between essentially academic training, the requirement of the work market and the employability of graduates from this type of program. On the other hand, the diploma is more important in the higher education market, where certificates are required and where the differential for the graduate is the prestige of the certification institution.

Three major problems in management education pose a challenge to business schools, and Master's programs in particular. The first is the difficulty involved in teaching managerial practices in the classroom (Mintzberg, 2004; Grey, 2009). The second is the discrepancy between the curriculum taught and the skills required in the work market (Pfeffer and Fong, 2002; Bennis and O'Toole, 2005). The third is the gap between dissertations and theses, and the reality of the market (Ghoshal, 2005; Antonacopoulou, 2010). The focus of the vast majority of studies is on academic and research interests, particularly in the tutors' fields of study. This is an unsuitable practice for professional qualification programs, as is the case of Master's programs in management (Bennis and O'Toole, 2005; Grey, 2004; 2009).

If teaching has an appeal in the market to graduates, as the data indicated in the academic dimension, more attention ought to be paid within the Master's program to courses and seminars on teaching skills, in addition to greater participation of students in the classroom as teaching assistants under the supervision of the faculty.

Education is known to result in individual and social benefits for students (Bowen, 1991; Meyer and Lopes, 2015) and a public good that

provides public benefits (Tierney, 2006). This is true not only in professional education, but in higher education in general, as it aids intellectual, emotional and human development, reinforcing the relevance of the social dimension of this study. A typical professional education process involves knowledge, mastery of language and use of specific rational and utilitarian tools. However, this education comprises a set of subjects of a humanistic, social, political, ethical and psychological nature that complement professional education, providing students with broader horizons richer than anything that occurs in real life organizations and the world outside academia (Parker, 2002; Gosling and Mintzberg, 2006; Grey, 2009; Ordine, 2013).

What is taught, how it is taught and how this knowledge is transferred to professional life constitutes a challenge for Master's programs in management (Pearce, 2007). Likewise, we hope the limits of the theoretical approaches and diverse ideologies in which these theories and techniques are embedded will be exposed, revealing the false neutrality that is often attributed to them (Elmuti, 2004).

In the case in question, the graduates voiced their frustration with the teaching in the classroom, which can be better understood through the methodological model used by the professors. The teaching, a pivotal function in the academic dimension of this study, tends to be overlooked, with priority given to publishing articles in refereed journals, which is highly valued in CAPES evaluations.

As identified in the Master`s program in question, the predominant methodology used in the courses followed a seminar format with strong emphasis on reading and discussing scientific articles and book chapters. Far removed from professional practice, many of the theories presented end up compromising the knowledge gained by the students and destroying good practices in the market, as stressed by Ghoshal (2005) and Pearce (2007).

When it comes to training for research, the graduates were clearly satisfied with the result, corroborating the findings of Bennis and O'Toole (2005) that management schools confer respectability on scientific research and eliminate vocational stigma. The study shows that even the teaching method used in the courses for research was viewed in a positive light. These courses help to shape articles for the finalization of other courses and for publication in periodicals and, most importantly, provide tools for the dissertation required for certification.

Master's programs in management, like other academic programs, are known to follow a culture of maintaining the *status quo*, with little room for initiatives of innovation and change. Internally, we can attribute this resistance to change to the conservative nature of professors, who seek to maintain current conditions. Nowadays, innovation and creativity are critical factors in the current dynamic and competitive world, especially in business. They need to be analyzed in practical terms in programs focusing on organizational experiences. Externally, the evaluation policies of the regulating agency have a strong influence on the programs, focusing more on academic interests than the market.

We observed that socialization throughout the program was not relevant in the eyes of the graduates, with little impact on professional practice. The students did not build a social network to serve as a strategic link among them following graduation. Indeed, the graduates were not even capable of identifying a common language disseminated during the program.

The graduates' perceptions reveal that the program did not develop a social identity in the group. The situation can be justified by the fact that the program in question does not pay special attention to the relationships of students in and out of the classroom, but rather places greater emphasis on training for research.

Socialization among students during the program occurred in isolation, with no greater contribution towards placement in the work market. This is a cause for concern because an exchange of experiences has been identified as the main benefit of interacting with classmates (Wood Jr. and Cruz, 2014). Socialization derives from two essential characteristics of the program: the prior professional and life experience of students and diversity of profiles. It is associated with creating networks, and has a positive impact on changing jobs and advancing careers.

Researchers tend to underestimate the benefits of contacts and social networks related to

employment and the labor market, including their positive or negative effects or even no effect at all (Caplan, 2018). This is particularly true in the case of professional schools like business schools. In fact, students quite often do informally exchange information about job opportunities and salaries in the market. Thus, discussions on social networks in business schools are important to students, particularly when incentives are provided by offering seminars about market conditions, jobs, career, salaries and employment during the Master's program.

Regarding the institutional dimension, the graduates recognized that the program`s reputation based on the CAPES evaluation was taken into consideration. In other words, they chose a program recognized for its quality and offered by an institution that enjoyed a good reputation. Moreover, they also agreed to pay for the services offered by the university, hoping that the diploma would lead to a quick entry into the job market and give them a curricular differential to improve their careers. However, according to the student`s perceptions, these hopes were not fulfilled. These conclusions deserve a more detailed analysis, as we observed that almost two thirds of the respondents were professors in higher education, which they would not be without their Master's Degree diploma.

Despite the fact that this study concentrated in a single case, the similarities between Academic Master's programs in management, their role, structure, functioning and performance evaluation make it possible to extend some of the findings to the context of other Academic Master's programs in the country.

There is no evidence in this study to show that the Academic Master`s program in management actually makes a significant contribution of the graduates' professional practice. However, the results led us to reflect on the importance of the academic, social and institutional dimensions when rethinking and improving an academic program in management, and its relationship with professional practices and the business world is of great importance. Therefore, there is no doubt that a gap remains to be bridged.

All these dimensions, however internal in nature, revealed critical points to be observed: for instance, in the academic dimension, the way the curriculum is structured and how management is taught in the classroom, and the limitations of business programs in preparing graduates for the business world, especially in terms of teaching methods and knowledge and skills required for the labor market. A huge gap prevails, leading to frustration not only for graduates seeking a position in the job market but also for employers whose needs are not met.

Providing incentives for students to socialize is another challenge to Academic Master`s programs. By exposing students outside the classroom to new experiences would make them more familiar with the outside world. This would help to bridge the gap between academic management education and the outside world, where dynamic economic, social, political and technological forces prevail, setting the tone of business.

Thus, efforts in this area would seek to integrate students through initiatives that bring them closer to the outside reality of organizations whether in the private, public or nonprofit sector. Such initiatives would create an interface between the capabilities and knowledge of academia, allowing a closer look at the problems and challenges faced by those in charge of managing organizations in the productive sector.

The institutional role, whether of a university or academic program, is equally relevant, especially in terms of image, prestige, legitimacy and trust within the community. Beyond that, well developed strategies aiming to attract and retain students in times of fierce competition, based on tuition policies and student aid programs, would aid the better selectivity of students as well as the quality of education.

It is also imperative to think about the paths trodden by education management, and to learn to address ambiguities, paradoxes and uncertainties that are very much present and disseminated in organizational life and society at large, posing a challenge to managers.

This ambiguity has to do with the interpretation of reality in different dimensions, both utilitarian and humanist. In the case of management education, we have to consider that the success of students is related to individual, social, economic, technological and political

variables, all of which are closely related. The way we respond to these challenges will lead us to different stances regarding which directions to follow and what decisions to make in order to rethink Academic Master's programs and promote the required changes in our education management training programs.

6 Concluding Remarks

The Academic Master's program in Management seems to be at a crossroads between following obsolete goals and ineffective academic practices. This is far from the reality of the productive sector, meaning that it is time to make changes and redesign teaching, learning and research processes to align the program with the conditions and demands of the job market. Today's structure and functioning reveal imperfections, incompleteness and inadequacies. However, as the number of these programs in management in Brazil is quite large, it is time to rethink the role of these Academic Master`s programs and the conditions in which they operate. In this regard, the perception of the main players, the graduates, can contribute to the improvement of educational practices by reviewing or even substituting them. In addition, the reaction of faculty members makes a contribution by reinforcing that changes are needed. All of them have the potential to enhance the quality, relevance and benefits of academic programs in management for their stakeholders.

Therefore, the result of this study is important for professors, academic managers and students of academic Masters programs in management, where knowledge, skills and values are critical elements for the qualification of students and a factor valued by the productive sector and society. In a changing world, it is time for those individuals and groups with the responsibility of supervising graduate programs in Management to establish policies and guidelines to meet the demands of the market and expectations of society.

The challenges posed by the context require Master's programs in management to review the profile of the students that they wish to attract and train. This means updating the curriculum and teaching of management. It is imperative to align the expectations and needs of individuals, organizations, society and government, reducing tensions over the discrepancy between the skills and capabilities that are in demand and the professionals being placed in the market today. The humanistic side of training cannot be neglected by Master's programs in management.

In addition to the professional and utilitarian goal, it is also important to highlight the social factor, as organizations are essentially human, and management is work that requires the cooperation of people, led by managers. In this task we have, on the one hand, the aspect of productivity and efficiency and, on the other, the humanist content of values and principles, which is equally useful (Ordine,2013) and equally important for the functioning of organizations and life in society. Thus, much of what is considered useless makes an important contribution to the education of managers.

We need multiple knowledge, through numerous theoretical lenses and numerous technologies, to understand better the complexity of organizations and their management. As pointed out by Santos (1988), we are living in a society that appreciates a science that simultaneously produces knowledge and ignorance, making "[...] a scientist a specialist ignoramus and a citizen a general ignoramus" (Santos, 1988, p. 55).

Few Brazilian researchers have conducted studies involving the perception of graduates and faculty, especially with regard to graduate programs. New avenues should be considered for further research. Here are some key questions that we identified that could be used to guide future endeavors by researchers in the field. Seeking answers to these questions should also be a concern for academic managers and people at the CAPES, the agency in charge of establishing the guidelines for Academic Master's programs in Management:

1) Should Academic Master's programs formally continue with their purpose of preparing scientists, professionals and teachers in the field of management while the external environment displays a different reality in terms of demands?
2) Would it be feasible to keep operating a costly and tuition driven Academic Master's program in Management that is far

from the reality of the demands of the productive sector?

3) Do improvements in the academic area like curriculum and teaching methods, and research topics together with institutional efforts allow the Academic Master's program in Management to respond to new demands and get back on the right track?
4) Does it make sense to maintain an Academic Master's programs in Management while a growing number of professional Master's programs have arrived on the market with the purpose of linking theory and the practical aspects of the profession?
5) To what extent are the problems faced by the Academic Master's program in Management due to a lack of leadership, strategic vision and power, reinforcing amateur academic management and highlighting a paradox in a professional program? (Simon, 1967; Keller, 1983; Meyer, 2003)
6) Do Academic (Master's) programs in Management conduct systematic follow-up studies of their graduates? If so, how do these studies provide feedback and improve the functioning academic activities?
7) What has hindered Academic Master's programs in Management and the development of studies focusing on the knowledge, skills and values taught to their students and the demands of the labor market?

We hope that our study will arouse the interest of researchers and encourage them to study the theme, as few studies of this nature have been conducted in Brazil. We also hope that the results of future studies, supported by theories and critiques of business schools, can be used to improve the training of managers, not only by adding value to the professional profile of graduates, but also by improving professional practices, preparing better managers of academic programs, meeting the needs of business, government, non-profits and the community and fulfilling the mission of higher education institutions. All efforts, in different strands, following distinct mechanisms, are needed to understand better and improve the complex nature of educational work in Master's programs in Management and their interface with the environment. This will result in contributions toward building a theory of higher education.

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Entrepreneurial education: entrepreneurial mindset and behavior in undergraduate students and professors

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ABSTRACT

This study had the objective of analyzing the dimensions of the entrepreneurial mindset and the characteristics of the entrepreneurial behavior in undergraduate students and professors of a higher education institution that develops entrepreneurial education activities and projects. Its methodology is a theoretical-empirical research, with a quantitative approach, of the descriptive type. Data collection was performed using McClelland's Entrepreneurial Behavioral Characteristics Questionnaire (MSI, 1990), and Mannerelli's (2014) *Forma Mentis* Questionnaire to analyze the entrepreneurial mindset, and data were analyzed with statistical tests. It can be inferred, from the results of this research, that aspects of the entrepreneurial mindset and behavior can be developed in professors and students from a proposal of entrepreneurial education. The understanding of the entrepreneurial nature and how the entrepreneur thinks and acts can guide the actions to be carried out with the purpose of creating, especially in emerging countries, subjects, organizations and entrepreneurial environments that generate human development, competitiveness and economic growth, and social advancement.

PALAVRAS-CHAVE

Educação empreendedora.
Mentalidade empreendedora.
Comportamento empreendedor.

RESUMO

O presente estudo teve o objetivo de analisar as dimensões da mentalidade empreendedora e as características do comportamento empreendedor de alunos e professores de graduação de uma instituição de ensino superior que desenvolve atividades e projetos de educação empreendedora. Como metodologia, trata-se de pesquisa teórico-empírica, com enfoque quantitativo, do tipo descritivo. A coleta dos dados foi realizada por meio do questionário de características comportamentais empreendedoras de McClelland (MSI, 1990), e do questionário forma mentis para analisar a mentalidade empreendedora, de Mencarelli (2014), e os dados foram analisados a partir de testes estatísticos. Pode-se inferir, a partir dos resultados desta pesquisa, que aspectos da mentalidade e do comportamento empreendedores podem ser desenvolvidos em discentes e docentes a partir de uma proposta de educação empreendedora. A compreensão da natureza empreendedora e de como pensa e age o indivíduo empreendedor pode nortear as ações a serem realizadas com o propósito de criar, sobretudo em países emergentes, sujeitos, organizações e ambientes empreendedores, que gerem desenvolvimento humano, competitividade e crescimento econômico, e avanço social.

1 Introduction

The development and improvement of the entrepreneurial spirit have been placed, not only in Brazil, but also in many emerging countries, as priority in the political, economic and academic agendas, given the proven influence that it has on the social and economic development of a nation (Krüger 2019). The socioeconomic context and problems of today's world require the active participation of entrepreneurs, who manage innovation and boost positive changes in different spheres of society (Minello, Bürger & Krüger, 2017; Duarte, Debona & Perini, 2018). In this sense, entrepreneurial education is seen as one of the most efficient ways of creating and spreading entrepreneurial culture, by improving the education and performance of new entrepreneurs (Schaefer & Minello, 2017a).

Studies on entrepreneurial education have developed significantly in the last decades due to several reasons. Among them, there is the fact that entrepreneurial education contributes to the emergence of new enterprises, to the creation of new jobs, to stimulate the economy and to the development of innovation and competitiveness in organizations in general (Lanero et. al., 2011; Lima et. al., 2015b; Siluk et. al., 2018). These results encourage engagement and innovation in thinking about the entrepreneurial activity and its influence on this evolutionary process, providing new forms of creation and dissemination of knowledge, thus presenting universities as an appropriate environment for the spreading of an entrepreneurial culture.

Tschá and Cruz Neto (2014) point out that universities contribute to the development of the "entrepreneurial culture" through "entrepreneurial education". This encourages both professors and students "to awaken inside themselves the entrepreneurial spirit and to explore their potential space for entrepreneurship, transforming realities through projects that can develop economically and socially a country and a society" (Tschá & Cruz Neto, 2014, p. 66).

Investigating on entrepreneurial education, Filion and Lima (2010) highlighted that the entrepreneur must be prepared for action and that his characteristics and training needs require special features in the education system geared to entrepreneurial action. The authors report that, in general, university education transfers knowledge, especially the "know-how", while entrepreneurial education "should seek to develop the knowledge of being, of knowing how to become and knowing how to take action "(Filion & Lima, 2010, p. 46). The effectiveness of such education is directly related to the appropriate use of new methods of teaching and learning capable of educating students with knowledge and skills necessary for the entrepreneurial action (Silva & Pena, 2017; Araújo & Davel, 2019).

The understanding of the entrepreneurial nature and profile and how the entrepreneur expresses himself may guide actions and projects with the aim of creating environments, institutions and entrepreneurs, starting from a new proposal for entrepreneurial education (Schaefer & Minello, 2016; Amaral, Hernandez & Bastos, 2018). For Dolabela (2008), the "entrepreneurial way of being" is related to worldview, lifestyle, leadership, reaction patterns when facing ambiguities and uncertainties, ability to make changes in yourself and in the context where you live, creation of innovation, ways and means to seek self-fulfillment.

Given these characteristics, the entrepreneur "expresses himself through a particular type of thinking and acting" (Dolabela & Filion, 2013, p. 135): thinking as a way of seeing and understanding the world, and acting as overt behavior, coming from the first aspect. Entrepreneurship then becomes a way of being, knowing and doing, with mindset (way of thinking) and behavior (way of acting) characteristics being developed both in the students and in their professors, as individual entrepreneurs (way of being) (Schaefer, 2018).

In face of this overview and the evolution of studies on entrepreneurial education, and the characteristics of students and professors involved in it, this research aims to analyze the dimensions of the entrepreneurial mindset and behavior of undergraduate students and professors from a private institution of higher education which develops entrepreneurial education activities.

2 Theoretical Background

2.1 Entrepreneurial Education

Entrepreneurial education has been an object of investigation of several researchers since it plays a primary role in creating and spreading entrepreneurial culture in today's society (Nabi, et. al. 2018). The entrepreneurial activity is strengthened by it, presenting itself as vital to the economy of a country. Through it, individuals are instructed and prepared with the knowledge and skills needed to perceive obstacles as opportunities, taking advantage of their situation and context to create enterprises and generate, as a consequence, economic and social development (Silva & Pena, 2017; Duarte, Debona & Perini, 2018).

The entrepreneurial education, however, must follow its own methodology and pedagogical approach, differing from those used in traditional education (Schaefer & Minello, 2017a). Dolabela and Filion (2013) advocate a radical change from the traditional teaching methods, which still tend to focus on the transfer of knowledge, passing to student-centered learning, who is able to think and act independently and proactively.

Henrique e Cunha (2008) also consider that entrepreneurial education should not be done as in other subjects, in the traditional way, and should lead students to structure contexts and to understand the various stages of their evolution. The entrepreneurial education should also focus more on the development of knowledge and sense of self and the acquisition of a know-how, far beyond the mere transmission of knowledge. Dolabela and Filion (2013) add that this new proposal of education should stimulate and develop confidence and self-esteem, seeking to immerse the student in a teaching and learning system where there is a coherent and close relationship between himself and his surrounding reality.

Mendes (2011) also argues that entrepreneurship should be treated not as an autonomous subject, as it is seen in most educational institutions, but integrated with other subjects, as there are a number of issues inherent in other research fields that intertwine in its study. The university, therefore, when willing to invest in entrepreneurial education, should do it in an integrated, interdisciplinary, harmonized and cross-curricular way. Guerra and Grazzotin (2010) also emphasize that entrepreneurship should not be discussed only in isolated subjects, and even less within the four walls of the classroom. The authors maintain that entrepreneurial education should be experienced intensely by all those involved in the process, in all directions. The professor should take the subject to the classroom in an integrated manner to other subjects, the institution and the community. "It is up to all professors the responsibility to see that students are encouraged to think and act with an entrepreneurial mindset. The classroom, increasingly, has to be transformed into a knowledge lab. The entrepreneurship issue should be treated in all courses and at all levels" (Guerra & Grazziotin, 2010, p. 83).

In this proposal, the professor acquires new functions, starting to act more as a facilitator and a catalyst of the learning process. The students also take on a new role, as responsible for their own learning and development, motivated by their own desires and wishes that relate to their person and context. Thus, it is developed a dialectical and dialogical relationship between teacher and student during the learning process, whose profiles, thinking and action models influence each other reciprocally (Schaefer & Minello, 2016, 2017a).

This transformation is possible, since this new approach is geared not only to students who intend to open their own businesses as individual entrepreneurs, but to all future professionals from different areas, to perform their activities and professions - individually or within organizations - with entrepreneurial values, attitudes and behavior (Lima et. al., 2015b).

The Brazil GUESSS Study Report shows that is attractive and promising that students strive to expand their vision of career possibilities. Such as being the creator of a business (with profit or social purposes), or being an entrepreneur in an autonomous or liberal profession, or being a intraentrepreneur or corporate entrepreneur, acting as an innovative employee who takes the initiative in a public or private organization. This would help educational institutions to fulfill their role

in a better way and students to be more active drivers of social and economic advancement (Lima et al., 2014b).

To achieve these goals, it is necessary to have new methodologies of teaching and learning that enable "learning by doing", so that the student encounters situations, challenges and difficulties that stimulate to reflect and think differently, seeking alternatives and solutions, and learning from experience. Thus, entrepreneurial education gathers action-oriented proposals for teaching and learning, such as experiential learning, learning by action, contextual learning, problem-centered learning, cooperative learning, among others (Schaefer & Minello, 2016; Silva & Pena, 2017, Araújo & Davel, 2019).

The entrepreneurial training, being fostered and developed in the various dimensions of the university, leads to the concept of "entrepreneurial university". Guaranys (2010) describes that this university proposal has as its scope, in addition to teaching, research and extension, economic development, educating entrepreneurs to boost the social and economic context. The author adds that the entrepreneurial university also encourages its students from several different areas to develop entrepreneurial skills. This entrepreneurial training is coordinated and comprehensive, offered as a second area of skill development, and articulated on different fronts and projects: business incubators, technology parks, intellectual property cores articulated with research groups and laboratories, junior companies, events on entrepreneurship, actions of dissemination of entrepreneurial culture and support to social and economic enterprises in communities, among others. One is able to, therefore, "consider the entrepreneurial university a new type of university, already existing in other countries, but emerging as the most suitable alternative to the training needs of human resources and economic development in Brazil" (Guaranys, 2010, p. 105)

Presented the specificities of entrepreneurial education and training opportunities for the entrepreneur, it is then investigated the way of thinking that leads to action: the entrepreneurial mindset.

2.2 Entrepreneurial Mindset

A promising field of research inside the process of learning that occurs through entrepreneurial education is the entrepreneurial mindset (Schaefer & Minello, 2017b). Filion and Lima (2010) point out that "the development of the field of entrepreneurship should be done not only for the study of entrepreneurial action, but also the entrepreneurial thinking and the links between these two concepts" (Filion & Lima, 2010, p. 32) .

Schaefer and Minello (2017b) reported that the entrepreneurial mindset has aroused the interest of authors from different areas of knowledge (administration, education, psychology, etc.) that started to conduct research with different approaches (cognitive, systemic, constructivist, ontological, humanist, etc.). Filion and Lima (2010) also emphasize that, to a greater understanding of the actions and behavior of the entrepreneur, one of the key aspects that should be better understood refers to the processes that are in the basis of his thinking, the processes from which the entrepreneurial action is primarily conceived and, in the sequence, accomplished.

Human behavior, and therefore the entrepreneurial behavior, is open, demonstrable, plastic and, through experiences and teaching strategies, new processes can be designed, trained and internalized. One way to achieve this result is to work on the representations and the thinking processes behind the entrepreneurial activity (Barini Filho, 2008).

Research on the dimensions of the modes or mental models have brought new understandings on the way that entrepreneurs impact, process and understand the contexts in which they operate, and their relationship to business performance (De Toni et. al., 2014; Dheer & Lenartowicz, 2016; Wood et al., 2017). Studies in this area have identified mental models of entrepreneurs as a way of seeing the world, as the thought or image rooted in the mind that influence their ways of behaving and acting (De Toni et. al., 2014).

Mental models are important drivers of entrepreneurial action and entrepreneurs are directly influenced by their constituted knowledge, rational and emotional skills, view

of the world and of themselves shaped by their trajectory. Mental models evolve, both with life experiences and the maturing of the personality, as with learning processes promoted by education or training (De Toni et. al., 2014). Barini Filho (2008) highlights that entrepreneurs are able to abstract new rules of modeling and acting in an aligned manner with new concepts learned from experiencing a new situation or transmitted knowledge (Barini Filho, 2008).

Filion and Lima (2010) also show that it is necessary to focus the study of the entrepreneur on the act of entrepreneuring, trying to understand the model and the mental attitude that precedes the act. From images and representations of themselves and the world, entrepreneurs impact with opportunities and uncertainties the surrounding environment, project views, fulfill dreams, progressively build and shape their self-concept. The authors complement that a proper understanding of the representations of themselves and the world around them can help entrepreneurs in their way of acting and relating with the surrounding reality.

Investigating the proper mindset for a young entrepreneur to undertake a successful professional path, Mencarelli (2014) defines five dimensions of an entrepreneurial mindset or *forma mentis*: responsibility, autonomy, will, initiative and problem-solving spirit, and the ability to manage functional relationships with others. Table 1 describes each of these dimensions.

Table 1. Dimensions of the entrepreneurial *forma mentis*

Dimensions	**Characteristics of the individual who possesses this dimension**
Responsibility	Asks himself about the root causes of what happens, trying to harvest his potential responsibilities. He is mature, has a sense of responsibility and constructive self-criticism and does not blame external causes for the events surrounding him.
Autonomy	He is able to act freely and independently, using as reference his individual criteria. Acts without being influenced by people or situations, or not having as necessary the support or assistance from others: shows to have autonomy in operation, and this is also linked to self-esteem and maturity.
Will	He is determined, has constancy, commitment towards an individuated goal. Acts in a continuous exercise of his intentionality in order to fulfill his projects.
Initiative and problem-solving spirit	Knows how to be creative in the face of situations, proposing suitable solutions for problems. Places himself in a synthetic and decisive way in front of problems. Does not waste time, is non-dispersive, but result-oriented. He is able to recognize the priorities and to adapt them in a functional response. He sees the problem not as an obstacle, but as an opportunity to stimulate his own intelligence.
Ability to manage functional relationships with others	He is able to manage relationships in a functional way, that is, in advantage and reference to a scope. He is able to resolve a situation without controversy or resort to assistentialism, but creating harmony among the people functional to the scope. He is able to manage the relations in an intelligent and diplomatic way.

Source: Adapted from Mencarelli (2014).

These dimensions of entrepreneurial mindset or *forma mentis* identified and described by Mencarelli (2014) will be used for the analysis of the research data, as it will be detailed in the methodological procedures.

Having described the aspects of the entrepreneurial mindset, we continue to describe how this way of thinking defines the way of acting through the entrepreneurial behavior.

2.3 Entrepreneurial Behavior

Different studies have been conducted in the last decades to describe the entrepreneur under the behavioral perspective, as well as reviews and compilations of the evolution of these studies (Barini Filho, 2008; Coan, 2011; Krüger, 2019). The study of the entrepreneurial activity has attracted the attention of researchers from different fields. Not just administrators or economists, but educators, sociologists, psychologists and researchers in the fields of exact sciences began to investigate the way of thinking and acting of entrepreneurs. This melting pot of theoretical and methodological approaches - each with its paradigms, research methods, analysis patterns, experiences, contents, etc. - could not generate but different views on the concept, enriching the

understanding of this field of study. Dolabella (2008, p. 78) points out that “this new look on the entrepreneurial capacity transported it from its original cradle, the company – without leaving it, - to all human activities”.

Ribas (2011) also emphasizes that the entrepreneurial behavior has to be investigated by researchers from different areas of expertise, who began studying the "accomplishing behavior of the entrepreneur". This behavior is the obverse of conformity with the status quo, of the search for security and stability, of opposition to change, characteristics of most people. "On the contrary, the entrepreneur reflects this concern by creating, by making it happen, by enjoying a condition of being the center and not part, even at the risk of losing everything and become nothing" (Ribas, 2011, p. 37).

The entrepreneurial behavior comprises the features that some individuals exhibit, how they perceive entrepreneurial opportunities, how they think and process, how they adapt, how they are predisposed to action, at last how they act in an entrepreneurial way (Hisrich, Peters & Shepherd, 2014). These features are unfolded in the view of Minello (2014, p. 74), who understands the entrepreneur as "the individual who develops something new, has initiative, ability to organize and reorganize social and economic mechanisms to turn resources and situations to practical advantage, and accepts the risk or failure of his actions" (Minello, 2014, p. 74).

For Dolabela (2008), being an entrepreneur is to not only accumulate knowledge, but to possess and demonstrate attitudes, ways of perceiving the world and yourself, behaviors, it is to turn to activities where there is a risk and the possibility to innovate, to persevere, to live with uncertainty. Tschá and Cruz Neto understand the entrepreneur as a critical agent who recognizes and assumes the power to create and transform, inherent of the human being. Performing these capabilities, he places himself as "a reality changer agent (as a solver of problems that afflict society) through collaborative ventures which he develops" (Tschá & Cruz Neto, 2014, p. 70). This way, the entrepreneur, in order to be considered as such, cannot be dissociated from the entrepreneuring action, strongly driven by the motivation of accomplishment.

In relation to this aspect of entrepreneurial behavior, David McClelland (1972, 1978, 1987) gained prominence with his studies that investigated the motivation for entrepreneurship associated to the need of accomplishment. The author carried out research for nearly five decades and in different countries and cultures, studying the behavioral aspects of entrepreneurs, especially related to the motivation to take their actions. The researcher perceived entrepreneurs as different individuals and began to investigate their main behavioral characteristics, so that it was possible to create programs to stimulate the development of these characteristics (Matias & Martins, 2012).

Lima and Nassif (2017, p. 370) point out that McClelland’s theory figures "as one of the most referred to in the literature on entrepreneurs presenting needs as a motivator factor for the individual. This author developed a model that has been used in the theoretical basis of training for entrepreneurs". Dedicating his life to the study of entrepreneurial behavior, McClelland sought to identify personal characteristics inherent to the successful entrepreneur. His studies contributed to the formatting of the Empretec, a program developed globally by the United Nations (UN) in the 80s and, from his studies, programs have been created to project the development of entrepreneurial behavior in different countries (Krüger, Pinheiro & Minello, 2017).

For McClelland (1972), therefore, the success of individuals, groups or even a nation is in motivation, which may result from three dominant needs: achievement, power and affiliation. McClelland (1972, 1978, 1987) observed that the normal human being has a predominant profile of needs - for achievement, affiliation or power - to a greater or lesser extent influence on his behavior and interaction with the surrounding environment. The researcher also found that people with the greatest need for achievement are more likely to become entrepreneurs and that these skills can be stimulated and developed through specific training programs, obtaining with these individuals the same success obtained by those who developed these characteristics innately. This way, the author advanced in his studies, dedicating himself in the understanding of these

competences, named "characteristics of the entrepreneurial behavior" (Matias & Martins, 2012; Krüger, Pinheiro & Minello, 2017).

These characteristics of the entrepreneurial behavior were later grouped into three broad categories (accomplishment, planning and power) and are described in Table 2.

Table 2. Characteristics of the entrepreneurial behavior

Cat.	Charact.	Behavior
Accomplishment	Search for opportuni-ties and initiative	Does things before asked, or before being forced by circumstances; acts to expand the business into new areas, products or services; takes advantage of unusual opportunities to start a business, to obtain financing, equipment, land, workplace or assistance.
	Taking calculated risks	Evaluates alternatives and calculates risks deliberately; acts to reduce the risks or to control the outcomes; puts himself in situations involving challenges or moderate risks.
	Persistenc e	Acts before a meaningful obstacle; acts repeatedly or changes strategy in order to face a challenge or overcome an obstacle; makes a personal sacrifice or performs an extraordinary effort to complete a task.
	Demand for quality and efficiency	Finds ways to do things better, faster or cheaper; acts in a way to do things that meet or exceed standards of excellence; develops or uses procedures to ensure that work is completed in time, or that the work meets quality standards previously agreed.
	Commitment	Takes personal responsibility for the performance necessary to the achievement of goals and objectives; collaborates with employees or puts himself in their place, if necessary, to finish a job; strives to keep customers happy and puts in first place the good will in the long run, rather than short-term profit.
Planning	Search for infor-mation	Dedicates personally to obtain information from customers, suppliers and competitors; personally investigates how to manufacture a product or provide a service; consults experts for technical or commercial advisory.
	Setting of goals	Establishes goals and objectives that are challenging and that have personal meaning; sets clear and specific long-term goals; establishes measurable and short-term goals.
	Systematic planning and monitorin g	Plans dividing large tasks into sub-tasks with deadlines; constantly reviews plans, taking into account the achieved results and circumstantial changes; keeps financial records and uses them to make decisions.
Power	Persuasion and contact networks	Uses deliberate strategies to influence or persuade others; uses key people as agents to achieve his own goals; acts to develop and maintain business relations.
	Indepen-dence and self-confidence	Searches for autonomy in relation to rules and controls of others; maintains his point of view in the face of opposition or initially disappointing results; expresses confidence in his own ability to complete a difficult task or face a challenge.

Fonte: Adapted from MSI (1990).

These characteristics of the entrepreneurial behavior identified and described by McClelland (Mansfield et al., 1987; MSI, 1990) will be used for the analysis of this research data, as it will be detailed in the sequence.

Having described the entrepreneurial nature and how it manifests itself in the entrepreneur, through his mindset and behavior, we continue to the methodological procedures adopted in this research.

3 Methodological procedures

Based on the objective set for this article, this theoretical and empirical research presents a quantitative approach, of the descriptive type. This type of research aims to obtain information about a particular population objectively, allowing the quantification of data, using statistical data, numbering and evaluating this data (Oliveira, 2002; Roesch, 2005). The use of quantitative methods for analysis of the social reality present in the same study or separated into different studies aims to describe and/or compare characteristics of social groups, contexts, situations or institutions, establishing causal relationships (Ramos, 2013).

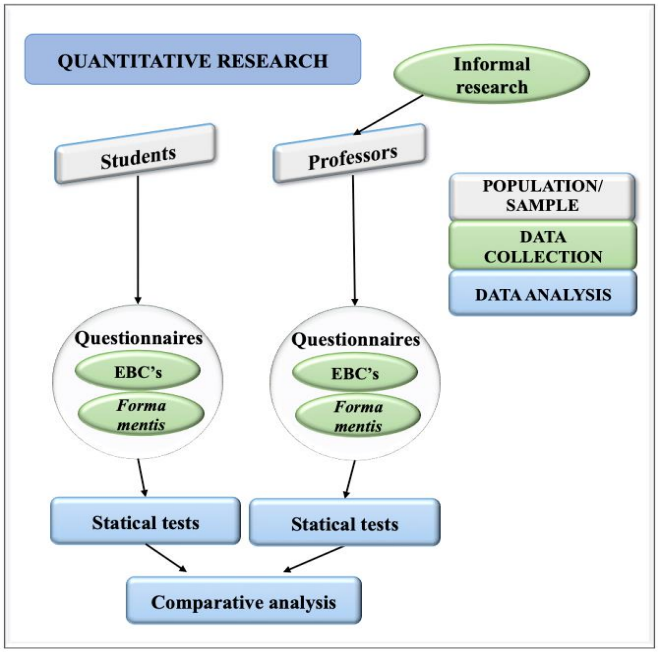
In this study, the data collection was carried out in a private higher education institution in Rio Grande do Sul - Brazil, which has activities and projects that characterize an entrepreneurial university, as described by

Guaranys (2010). Data were collected with professors and students from the three undergraduate courses with more students (Business Administration, Law and Information Systems), all with cross-curricular subjects of entrepreneurial education.

Initially, an informal survey was conducted (Triviños, 2008; Yin, 2016) with students of the educational institution, in order to identify the professors who, in the view of students, perform unique and innovative activities. The informal survey sought to identify who the professors are, what they do, and the achieved results. It was stipulated as a goal to interview 40% of each of the three courses of the institution, as they were found circulating in the institution, either in the breaks between classes, hallways or coffee shop. Out of 427 undergraduate students, 170 attended the informal data gathering. From the analysis of data collected by the informal survey, four professors were identified as most cited in each of the three courses of the analyzed institution of higher education. A total of 12 professors, who participated in the second quantitative moment of the research, described in the next paragraphs, besides a qualitative continuity of the research, with semi-structured interviews and data triangulation on entrepreneurial education (Schaefer, 2018), which is not being focused in this article.

The second moment of the methodological approach used two instruments for data collection. The first refers to McClelland's entrepreneurial behavioral characteristics (EBC's) (Mansfield et al., 1987; MSI, 1990), in order to identify the entrepreneurial behavior of students and professors. The second corresponds to the *Forma mentis* questionnaire (Mencarelli, 2014), which measures 5 dimensions of the entrepreneurial mindset. For the population of 427 students of the institution, the minimum sample was calculated based on Hair et al. (2005), which was considered a non-probabilistic sampling by convenience, taking into account the number of variables of the applied instruments. For the treatment and analysis of collected data, statistical tests were performed. Figure 1 shows schematically the methodological procedures of the study.

Figure 1. Methodological research procedures



Source: prepared by the authors.

McClelland's questionnaire of EBCs (Mansfield et al., 1987; MSI, 1990) consists of 55 statements and was developed from the original research studies of McClelland (McClelland, 1972, 1978, 1987). Respondents can assign a value from one to five, in a Likert scale. The 10 dimensions of the EBCs are evaluated by means of respective questions, as shown in Table 3.

Table 3. Dimensions and questions of the instrument of McClelland's EBCs

Dimensions	Questions				
Search for opportunities and initiative	Q1	Q12	Q23	Q34 *	Q45
Persistence	Q2	Q13	Q24	Q35 *	Q46
Commitment	Q3	Q14	Q25	Q36	Q47 *
Demand for quality and efficiency	Q4	Q15	Q26	Q37	Q48
Taking calculated risks	Q5	Q16	Q27	Q38 *	Q49
Setting goals	Q6	Q17 *	Q28	Q39	Q50
Search for information	Q7	Q18	Q29*	Q40	Q51
Systematic planning and monitoring	Q8	Q19	Q30	Q41 *	Q52
Persuasion and contact networks	Q9	Q20 *	Q31	Q42	Q53

Independence and self-confidence	Q10	Q21 *	Q32	Q43	Q54

* Negative questions.
Source: Created by the authors, based on Mansfield (1987).

In this context, (*) corresponds to negative questions, which the score must be subtracted from the final result of the respective characteristic and 6 points should be added at the end of the sum. Questions of numbers 11, 22, 33, 44 and 55 correspond to the "Correction Factor" used to prevent, often unconsciously, the respondent presents an overly favorable self-image. The Correction Factor is used if the score of the sum of these questions is equal or greater than 20 points. If this occurs, all EBCs should be corrected by subtracting the corresponding points as shown in Table 4.

Table 4. Correction factor for the questionnaire of McClelland's EBCs

If the total of points for the Correction Factor is ...	... subtract the number below from the score
24 or 25	7
22 or 23	5
20 or 23	3
19 or less	0

Source: Created by the authors, based on Mansfield (1987).

The final score after applying the Correction Factor identifies the intensity of each of the ten entrepreneurial behavioral characteristics. The maximum score is 25 points for each characteristic.

To analyze the entrepreneurial mindset of professors and students participating in the research, the *Forma mentis* questionnaire, developed by Mencarelli (2014), was applied along with the EBCs questionnaire. The instrument consists of 62 questions with three alternatives each, related to the five dimensions of the entrepreneurial mindset: autonomy, responsibility, will, spirit of initiative and problem solving, and the ability to manage functional relationships with the group. These five dimensions are evaluated through respective questions, which seek to identify the appropriate *forma mentis* for each given situation. The five dimensions are evaluated by means of respective questions, as shown in Table 5.

Table 5. Dimensions and questions of the *Forma mentis* questionnaire

Dimensions	Questions					
Autonomy	Q32	Q34	Q36	Q39	Q41	Q42
	Q49	Q52	Q53	Q56	Q57	
Responsibility	Q9	Q19	Q21	Q22	Q24	Q25
	Q28	Q30	Q33	Q37	Q43	Q44
	Q46	Q47	Q54	Q61		
Will	Q1	Q2	Q3	Q4	Q5	Q8
	Q10	Q12	Q20	Q29	Q50	Q62
Initiative and problem-solving spirit	Q6	Q11	Q14	Q16	Q17	Q18
	Q23	Q26	Q27	Q40	Q51	Q55
	Q60					
Ability to keep functional relationships	Q7	Q13	Q15	Q31	Q35	Q38
	Q45	Q48				

Source: Created by the authors, based on Mencarelli (2014).

The data from both questionnaires were tabulated in an electronic spreadsheet, which enabled the organization and processing of the numerical data, following the guidelines of the authors of each instrument to verify or not the existence of entrepreneurial behavior characteristics in the respondents and evaluate the intensities of the entrepreneurial mindset dimensions.

For the processing and analysis of data, statistical tests were performed using the SPSS software. On this occasion were analyzed quantitatively and exploited the data of the models proposed by McClelland (Mansfield et al., 1987; MSI, 1990) and Mencarelli (2014).

For each instrument it was calculated the means, the intensity and standard deviation of each characteristic, dimension and constructs studied. Then, to estimate reliability, the internal consistency was measured by Cronbach's Alpha Coefficient (Sampieri, Collado & Lucio, 2013).

In order to establish the relationship between the entrepreneurial behavioral characteristics and the dimensions of the entrepreneurial mindset, we used the Pearson Correlation Coefficient, a parametric technique that indicates the measure of the strength of association between two variables (Collis & Hussey, 2005) . To evaluate the correlation between the results of entrepreneurial behavioral characteristics and dimensions of the

entrepreneurial mindset of professors and students, the Mann-Whitney test was performed. This test is used to compare the positions between the two groups, verifying if the two populations have the same distribution, indicating equality in behavior (Lopes, 2016).

The analysis of the results of this research is presented next.

4 Analysis of results

The analysis of the results will be presented in three steps: initially, the results of the instruments applied to professors, then the analysis of the results of the students and, finally, we analyze the relations of the quantitative data of professors and students, crossing entrepreneurial behavioral characteristics and mindset in order to identify possible similarities and discrepancies.

4.1 Analysis of professors

The collection instruments adopted by this research were answered by the 12 professors most referenced by students in the informal survey, whose profile is shown in Table 6.

Table 6. Sample characteristics - professors

Category	Variables	Frequency	
		Absolute	%
Sex	Male	8	66.67
	Female	4	33.33
Marital status	Married (a)	4	33.33
	Single (a)	8	66.67
Had entrepreneurial training at under-graduation level	Yes	10	83.33
	No	2	16.67
Has or had an entrepreneurial activity	Yes	12	100.0
	No	0	0.00
Category	**Parameters**	**Values**	
Age	Min.	30	
	Max.	44	
	Average	35.5	

Source: created by the authors.

The analysis of the results began with the calculation of minimum, maximum, means and standard deviation for each EBC and entrepreneurial mindset dimension of the investigated professors, portrayed in Table 7.

Table 7. Descriptive statistics - professors

	Characteristic/ Dimension	Min	Max	Mean value	SD
EBCs	Search for opportunities and iniciative	18	24	20.500	1.930
	Persistence	15	22	17.916	1.831
	Commitment	19	24	21.083	1.240
	Demand for quality and efficiency	17	22	20.166	1.749
	Taking calculated risks	15	21	17.500	1.623
	Setting of goals	16	24	20.500	2.467
	Search for information	17	25	20.916	2.712
	Systematic planning and monitoring	17	25	19.833	2.552
	Persuasion and networks	13	23	18.083	2.644
	Independence and self-confidence	17	22	19.583	1.729
Mindset	Autonomy	8	13	9.916	1.240
	Responsibility	9	16	13.833	1.946
	Will	7	12	9.666	1.497
	Initiative and problem-solving spirit	7	11	8.666	1.435
	Ability to have functional relationships	3	8	5.750	1.422

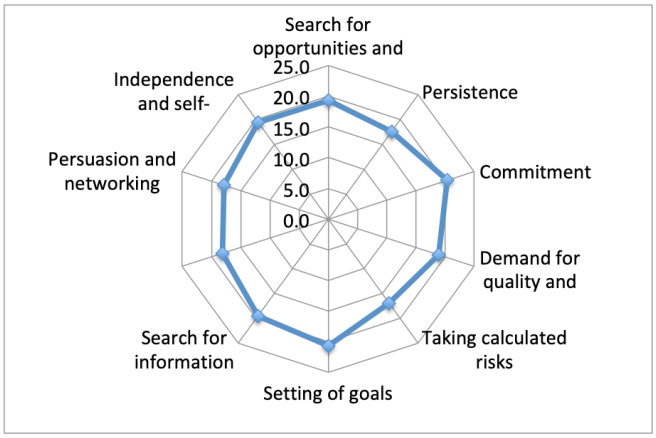
Source: Created by the authors

Regarding the entrepreneurial behavioral characteristics, the maximum limit is 25 points, reached in the characteristics search for information and systematic planning and monitoring, and the minimum limit of 5 points, not verified in any characteristic. A minimum score below 15 points, which for McClelland indicates the absence of the characteristic (Mansfield et al., 1987), was found only in the characteristic persuasion and networks (13 points), indicating that one or more professors do not possess this characteristic. In the case of mindset, each dimension has its own maximum limit, which varies according to the number of questions for each dimension, as described in the methodological procedures. The maximum limit was reached in four dimensions: autonomy (13 points), responsibility (16 points), will (12 points)

and functional relations with the group (8 points). The minimum limit of this instrument is the absence of points, not seen in any of the mindset dimensions. The smallest standard deviation was found in the EBC commitment characteristic and in the mindset autonomy dimension.

Using the minimum score of 15 points, all professors investigated in this study may be considered entrepreneurs according to the questionnaire of entrepreneurial behavioral characteristics (Mansfield et. al., 1987), as shown in Figure 2.

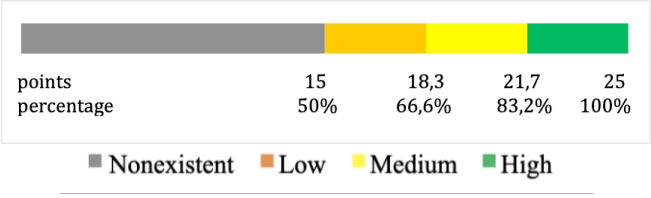
Figure 2. Distribution of means of EBCs - professors



Source: Created by the authors.

However, for this study, it was decided to adopt a stratification to analyze the intensity of EBCs of the participants, with the objective of better understanding their characteristics. Thus, it was adopted a stratification dividing the total score, ranking it in intensity levels: Non-existent, Low, Medium and High. For a better visualization of the data with this stratification, we used a complementary color scale as follows: Non-existent below 15 points (gray), Low from 15 to 18.3 points (orange), Medium from 18.4 to 21.7 points (yellow), and High from 21.7 to 25 points (green) as shown in Figure 3.

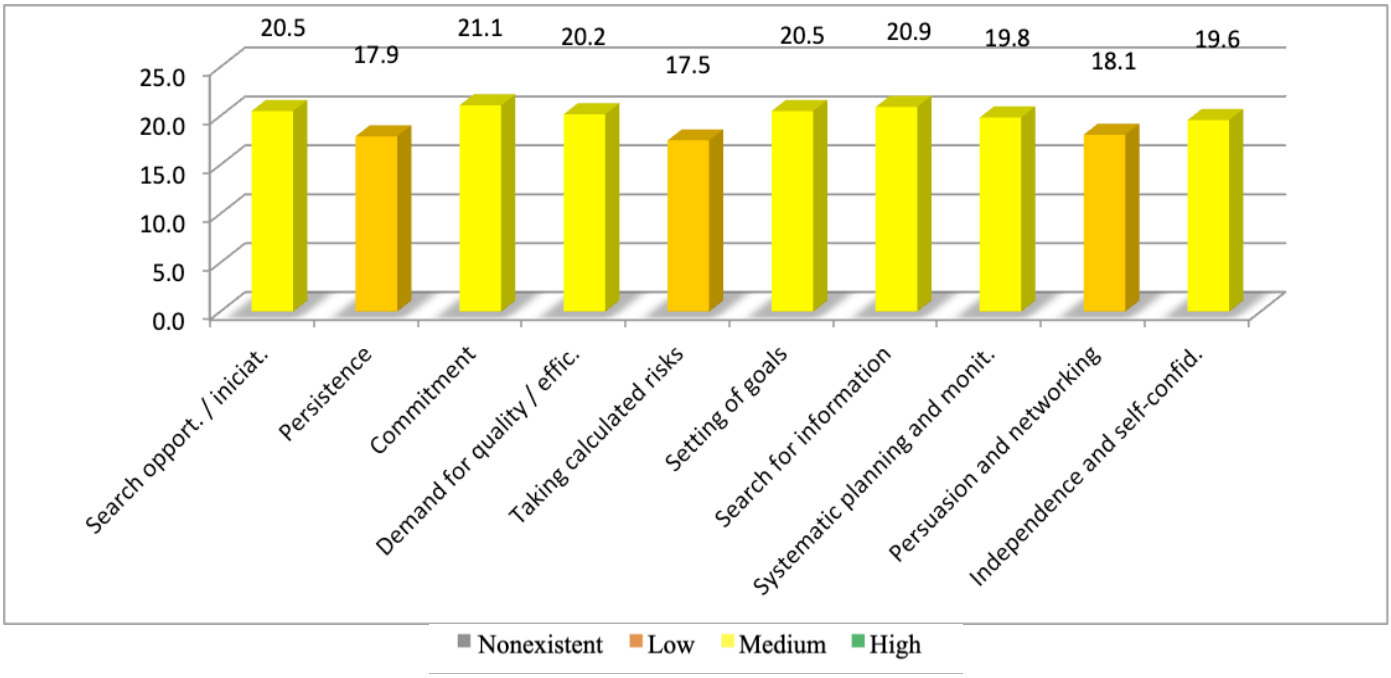
Figure 3. Stratification of the EBCs levels



Source: created by the authors

From this scale, Figure 4 shows the mean value of each dimension of the entrepreneurial behavioral characteristics verified in the professors.

Figure 4. Mean values of entrepreneurial behavioral characteristics – professors



Source: created by the authors.

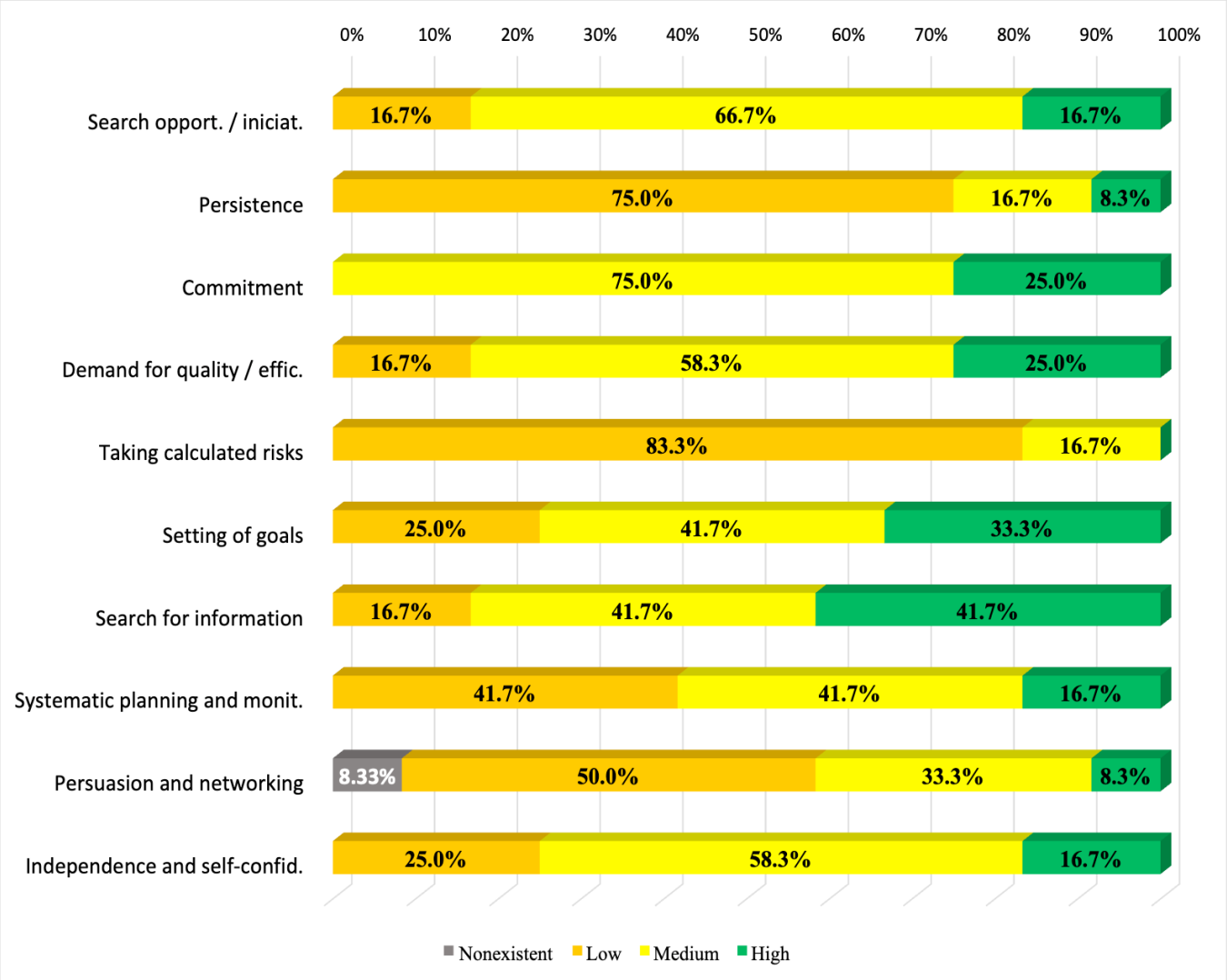
From the mean values, it may be inferred that the surveyed professors have the ten entrepreneurial behavioral characteristics (15 points or more), 7 of them are characterized as of medium intensity: search for opportunities and initiative, commitment, demand for quality and efficiency, setting of goals, search for information, systematic planning and monitoring and independence and self-confidence. The other three characteristics have low intensity: persistence, taking calculated risks, and persuasion and networking. The characteristic with the highest mean value was commitment, with 21.1 points, and the one with the lowest value was taking calculated risks, with 17.5 points.

To better understand this data, it was performed the calculation of the percentages of the intensities of each behavioral characteristic shown in Figure 5.

It is possible to verify the percentage of respondents before each entrepreneurial behavioral characteristic. The characteristic with the highest mean value, commitment (21.1 points), has a better distribution of intensity: 75% of professors have this characteristic with medium intensity and 25% with high intensity. Commitment is related to personal sacrifice and effort above average to perform a job (MSI, 1990). It can be inferred, from these results, that the professors investigated take personal responsibility for the performance necessary for the achievement of goals, collaborating with those involved for the implementation of work, so that the objective is reached.

The behavioral characteristic with the

Figure 5. Intensity of entrepreneurial behavioral characteristics – professors



Source: created by the authors.

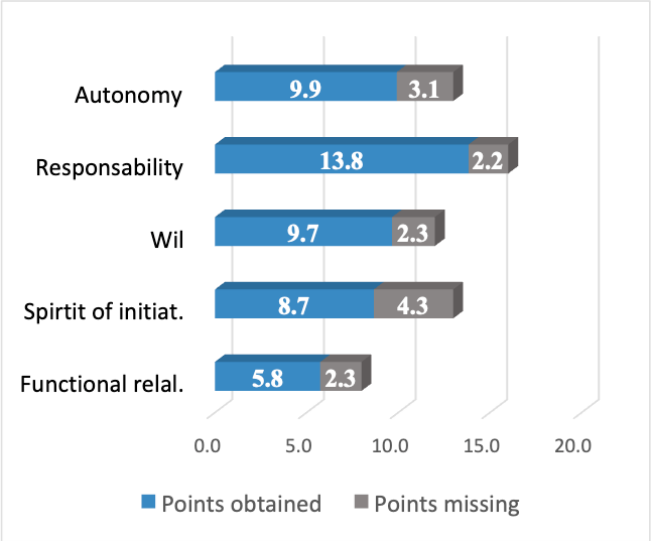
highest percentage of high intensity is the search for information, corresponding to 41.7% of professors. This feature is related to the individual who personally dedicates himself to obtain information from customers, suppliers, competitors and others involved with the activity and project with which he is involved (MSI, 1990). Making use of personal and business contacts to get useful information and resources, professors can increment and intensify their entrepreneurial education projects, strengthening the link between education and the real market world.

The characteristic with the lowest average is taking calculated risks (17.5 points), with the following distribution: 83.3% of professors have low intensity and 16.7% medium intensity. This feature, which should be developed in professors, taking into account of all the results, is related to the individual who evaluates and calculates risks deliberately, takes attitudes to reduce the risks or to control the outcomes (MSI, 1990). Based on this result, professors can be encouraged to put themselves in situations involving challenges or moderate risk, present in every enterprise, so that this characteristic is intensified.

The only characteristic that showed a percentage of professors with nonexistent intensity was persuasion and networking (8.33%). It is inferred from this that this professor does not use deliberate strategies to influence or persuade others. This characteristic may be intensified so that key people can be used as agents to achieve his own objectives (MSI, 1990).

Next, Figure 6 shows the mean values of the dimensions of entrepreneurial mindset for professors, measured by the *Forma mentis* test (Mencarelli, 2014), with the points obtained for each dimension and missing points to the maximum limit, considering that the limit varies for each dimension, as described in the section on methodological procedures. It can be seen in the figure that the highest proportional average among the dimensions of professors' mindset is responsibility (13.8 points obtained out of 16) and the lowest is the spirit of initiative and problem solving (8.7 points obtained out of 13).

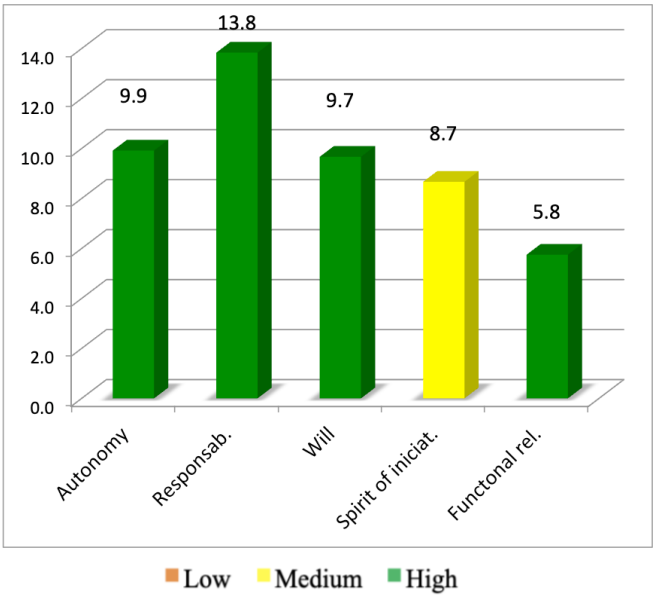
Figure 6. Mean value of dimensions of entrepreneurial mindset – professors



Source: created by the authors.

Figure 7 shows the average of each dimension of the entrepreneurial mindset in the faculty members. In order to facilitate the reading, a color stratification has been established, being orange for low intensity, yellow for medium intensity and green for high intensity.

Figure 7. Intensity of the mean values of the entrepreneurial mindset dimensions – Professors



Source: created by the authors.

According to Figure 7, out of the mean values of the 5 dimensions, 4 of them presented high intensity: autonomy (9.9points out of 13), responsibility (13.8 points out of 16), will (9.7

points out of 12), and ability to manage functional relationships (5.8 points out of 8). One of them, spirit of initiative and problem solving showed medium intensity (8.7 points out of 13). Then, it was calculated the intensities of the dimensions of entrepreneurial mindset in the professors, reported in Figure 8.

It is possible to verify the percentage of respondents on each dimension of entrepreneurial mindset. It is inferred that the 12 investigated professors showed high or medium intensities for mindset dimensions, and none showed any dimension with low intensity. The dimension with the highest percentage of professors with high intensity was responsibility, with 83.3%. This dimension refers to the attitude of asking yourself about the root causes of what happens in order to identify and take responsibility for your potential liabilities. From these results, it can be inferred that the investigated professors have a sense of responsibility and constructive self-criticism, they are mature and do not blame external things for faults or causes of events with which they are involved (Mencarelli, 2014).

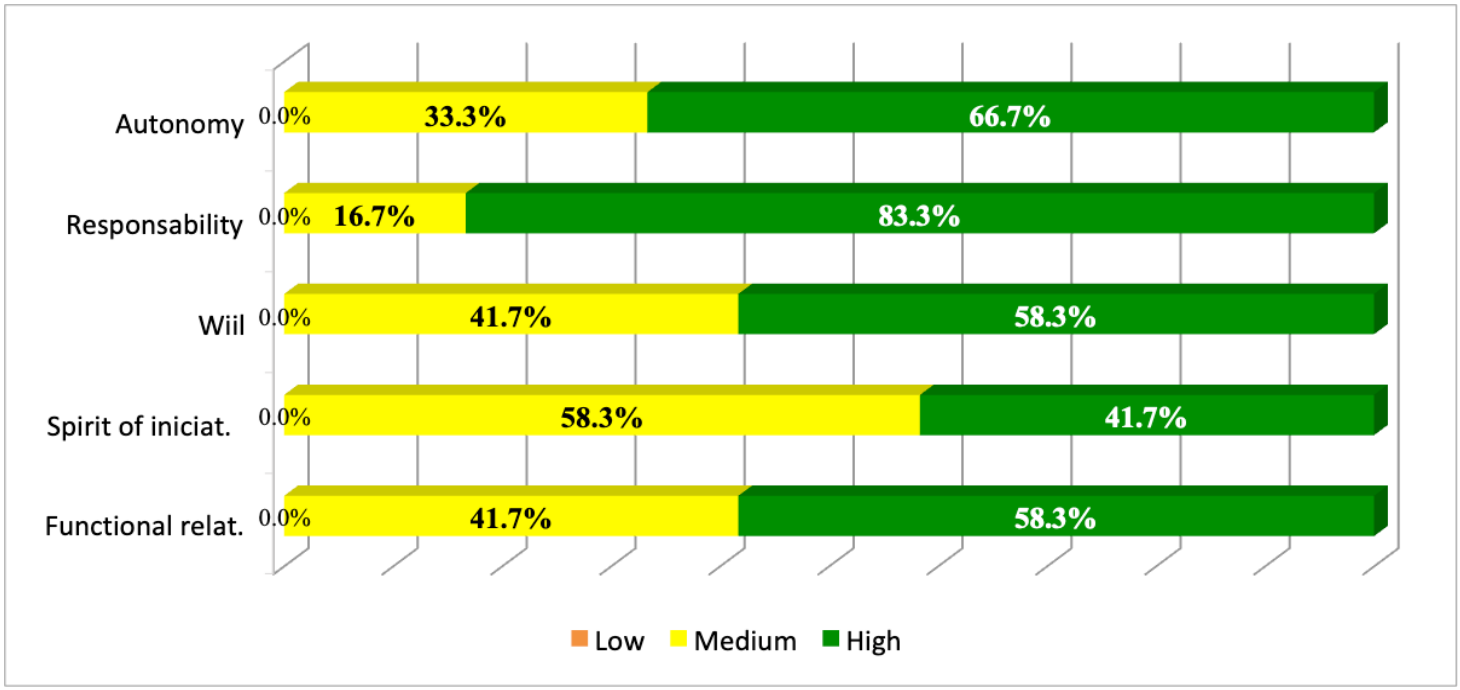
The only dimension in which the percentage of professors with medium intensity (58.3%) exceeded high intensity (41.7%) was spirit of initiative. This dimension characterizes an individual who knows how to be creative facing situations, proposing suitable solutions to problems. An individual with entrepreneurial mindset with this dimension also places himself facing problems in a synthetic and resolving manner, does not waste time nor is dispersive, being oriented towards results (Mencarelli, 2014). The professors investigated in this research can develop more this dimension of mindset in order to strengthen the ability to recognize the priorities and adapt them in a functional response to the context, seeing the problem not as an obstacle, but as an opportunity to stimulate his own intelligence.

To estimate the reliability, the internal consistency was measured by Cronbach's alpha (Sampieri, Collado & Lucio, 2013; Lopes, 2016). Cronbach's alpha is calculated through the following equation:

$$\alpha = \frac{k}{(k-1)}\left[1 - \frac{\sum_{j=1}^{n} S_j^2}{S_T^2}\right]$$

where:
k is the number of items in the instrument;
S2j is the variance of each item;
S2T is the total variance of all items.

Figure 8. Intensity of the dimensions of entrepreneurial mindset– professors



Fonte: elaborado pelos autores.

Cronbach's alpha for the EBCs instrument, which adopts Likert scale, obtained α = 0.828. Thus, the resulting values of the questionnaires with the 12 professors are reliable.

In order to establish the relation between the dimensions of entrepreneurial behavioral characteristics and dimensions of mindset, it was used Pearson's correlation coefficient, a parametric technique that indicates the measure of strength of association between two variables (Collis & Hussey, 2005). For this study, we adopted the Lopes's conversion (2016), specified in Table 8.

Table 8. Interpretation of the values of correlation coefficient ®

r value (+ or -)	Interpretation*
0.00	Null
0.01 a 0.20	Very weak
0.21 a 0.40	Weak
0.41 a 0.60	Moderate
0.61 a 0.80	Strong
0.81 a 0.99	Very strong
1.00	Perfect

* Classification is only valid if the correlation value is significant, p <0.05.
Source: Lopes (2016, p. 158).

According to Hair Jr. et al. (2005), Pearson's correlation coefficient has the objective of measuring the linear association between two metric variables and has a variation of -1.00 to 1.00. "r" value coefficients near +1 indicate little dispersion and a strong positive correlation; when the values are close to "zero" it indicates much dispersion and an absence of relationship; and, finally, when the value of "r" is close to -1 it indicates little dispersion and a strong negative correlation (Lopes, 2016).

The correlation matrix between the means of the entrepreneurial behavioral characteristics and the mindset dimensions of professors are presented in Table 9.

The correlation between the dimensions of entrepreneurial behavioral characteristics and the dimensions of the entrepreneurial mindset were mostly positive associations, very weak intensities (0.01 to 0.20), weak (0.21 to 0.40) and moderate (0.41 to 0.60), indicating a direct relation between them. The strongest positive associations, of moderate intensity, are highlighted in gray in the table, and the strongest correlation was found between the EBC of commitment and the mindset dimension of autonomy (0.60). It was also the EBC commitment that had the highest number of moderate positive associations with the dimensions of mindset: autonomy (0.60), will (0.50), show initiative, spirit of initiative and problem solving (0.58) and functional relationships (0.41). Considering the dimensions of mindset, the one that presented the strongest

Table 9. Correlation of behavioral characteristics and entrepreneurial mindset - professors

		Mindset				
		Auton.	**Respons.**	**Will**	**S. of iniciat.**	**F. relations.**
EBCs	**Search for opport. and initiatives**	0.1374	0.40809	0.02257	0.55426	0.05943
	Persistence	0.36845	0.31544	0.42967	0.39695	0.59606
	Commitment	0.60035	0.24933	0.50111	0.58386	0.41719
	Demand for quality and efficiency	0.20796	0.38431	0.30872	0.52196	0.56393
	Taking calculated risks	-0.05973	-0.28697	0.11445	-0.07086	0.18084
	Setting of goals	-0.03685	0.22531	-0.07867	-0.0717	0.53231
	Search for information	0.1345	0.45529	0.27613	0.22341	0.24725
	Syst. planning and monitoring	-0.34114	-0.41723	-0.27393	-0.23746	-0.0787
	Persuasion and networking	0.25366	0.10008	0.19488	0.37476	0.35748
	Independence and self-confidence	0.35715	0.336	0.50199	0.02119	0.30005

** Correlation is significant at the 0.01 level (bilateral).
Source: created by the authors.

correlations with EBCs was the ability to have functional relationships, with moderate positive associations with persistence (0.59), commitment (0.41), demand for quality (0.56) and setting of goals (0.53).

The analysis of the results of the instruments applied to students will be shown next.

4.2 Analysis of the students

From the population of 427 students, 261 questionnaires were obtained in the three undergraduate courses of the college. 12 instruments were disregarded due to incomplete answers. The percentage of respondents for each course is presented in Table 1.

Table 1. Total respondents - students

Course	Total students	Respondents	%
Business Administration	137	94	68.6
Information Systems	73	45	61.6
Law	217	110	50.7
Totals	**427**	**249**	**58.3**

Source: created by the authors.

The sample was then comprised of 249 undergraduate students, a number greater than the calculated minimum sample, representing 58.3% of the population. The profile of the respondents is presented in Table 10.

Table 10. Characteristics of the sample - students

Category	Variables	Frequency	
		Absolute	%
Sex	Male	131	52.82
	Female	117	47.18
Marital status	Married (a)	17	6.94
	Single (a)	219	89.39
	Separated (a)	9	3.67
College year	1 year	79	31.73
	2nd year	44	17.67
	3rd year	51	20.48
	4th year	60	24.10
	5th year	15	6.02
Works	Yes	212	85.48
	No	36	14.52
Had entrepreneurial training at under graduation	Yes	245	98.39
	No	4	1.61
Has or had entrepreneurial activity in the family	Yes	191	77.96
	No	54	22.04
Category	**Parameters**	**Values**	
Age	Min.	17	
	Max.	68	
	Average	24.4	

Source: created by the authors.

The analysis began with the calculation of minimum, maximum, mean values and standard deviation for each dimension of behavioral characteristics and entrepreneurial mindset. Table 11 shows the descriptive statistics of the instruments used in this study.

Table 11. Descriptive statistics – students

	Dimension/ Characteristic	Min	Max	Mean value	SD
EBCs	Search for opportunities and iniciative	13	25	19.277	1.987
	Persistence	10	23	17.594	2.008
	Commitment	12	25	20.401	2.360
	Demand for quality and efficiency	8	25	19.008	2.918
	Taking calculated risks	9	23	16.927	2.378
	Setting of goals	13	25	20.634	2.441
	Search for information	10	25	19.514	2.732
	Systematic planning and monitoring	10	25	18.060	2.459
	Persuasion and Networking	10	25	17.911	2.467
	Independence and self-confidence	12	25	19.473	2.255
Mindset	Autonomy	2	13	8.815	2.470
	Responsibility	2	16	10.967	2.993
	Will	1	12	8.228	2.467
	Spirit of initiative and problem solving	0	12	7.803	2.344
	Functional Relations	0	8	5.204	1.661

Source: created by the authors

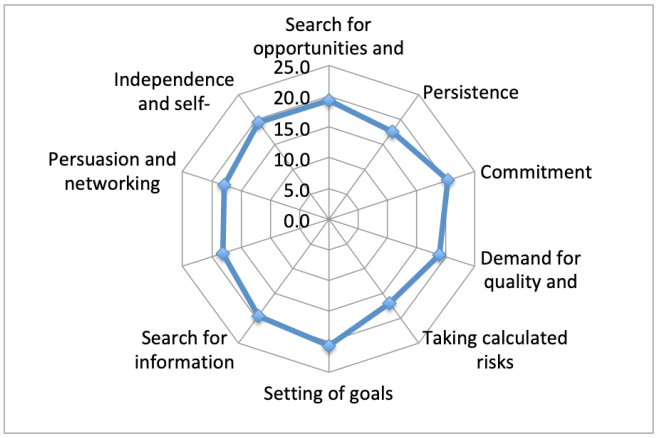
From these data, it is possible to identify the minimum and maximum scores for each dimension of entrepreneurial behavioral characteristics and mindset, as well as the mean

values and standard deviation. Regarding the entrepreneurial behavioral characteristics, the maximum limit is 25 points, reached in 8 out of 10 behavioral characteristics by students, and the minimum limit of 5 points was not verified in any characteristic. A minimum score below 15 points, indicating the lack of the characteristic, was seen in all dimensions, indicating that one or more students do not have that behavioral trait.

In the case of mindset, each dimension has its own maximum limit, which varies according to the number of questions for each dimension. In four dimensions, one or more students reached the maximum limit: autonomy (13 points), responsibility (16 points), will (12 points), and functional relationships with the group (8 points). The minimum limit of this instrument is the absence of punctuation, not seen in two dimensions: spirit of initiative and problem solving, and functional relationships. The smallest standard deviation was found in the dimension demand for quality and efficiency, from the entrepreneurial behavioral characteristics, and the dimension responsibility, from the mindset.

All 10 of the students' EBCs were with mean values above 15 points, indicating the existence of entrepreneurial behavioral characteristics (Mansfield et al., 1987), as shown in Figure 9.

Figure 9. Distribution of means of entrepreneurial behavioral characteristics - students



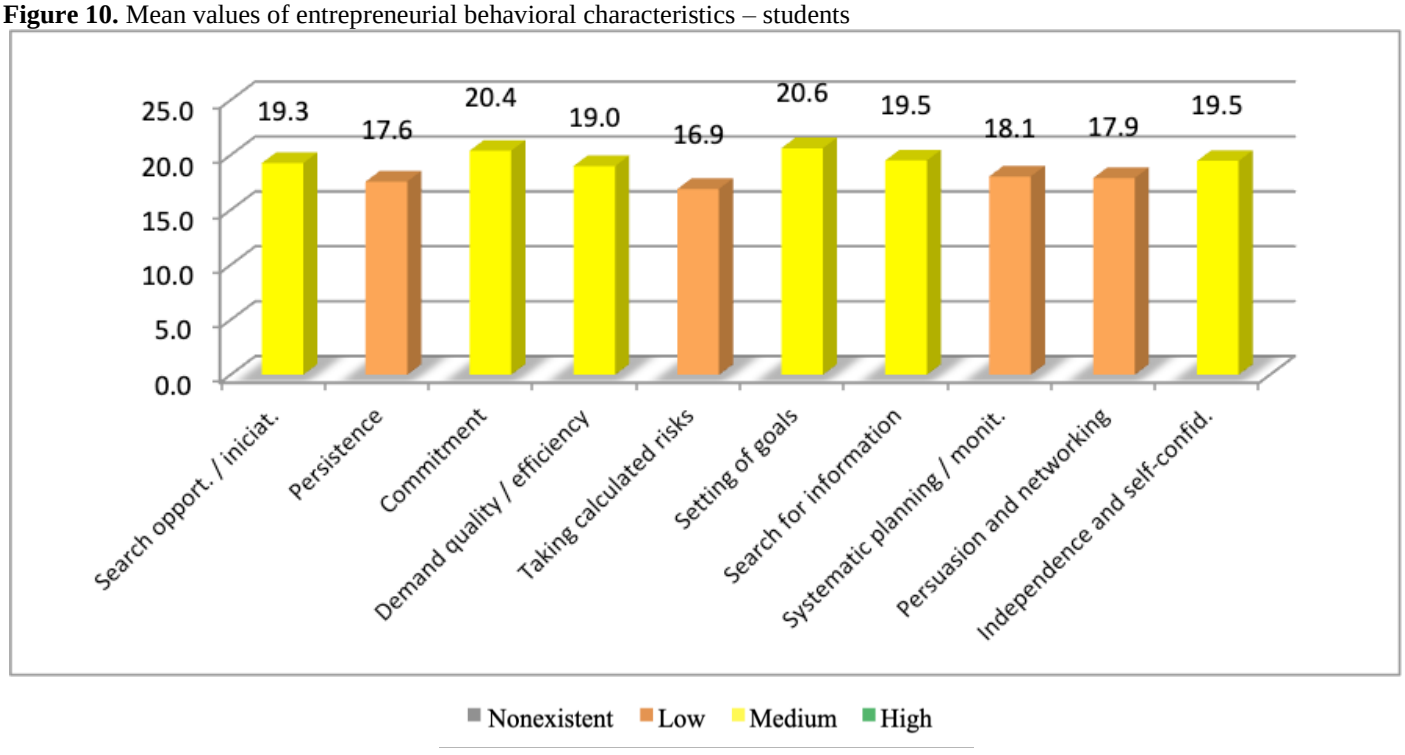
Source: created by the authors.

In relation to the mean values, among the 10 entrepreneurial behavioral characteristics, the setting of goals stands out, presenting the greatest average of 20.6 points. As for the lowest average, it was obtained for the characteristic taking calculated risks, with 16.9 points.

In Figure 10, it is possible to see the mean values of each dimension of the EBCs for students, using the stratification for intensities adopted for this research.

As it may be seen in Figure 10, six behavioral characteristics exhibited means with medium intensity (search for opportunities and

Figure 10. Mean values of entrepreneurial behavioral characteristics – students



Source: created by the authors.

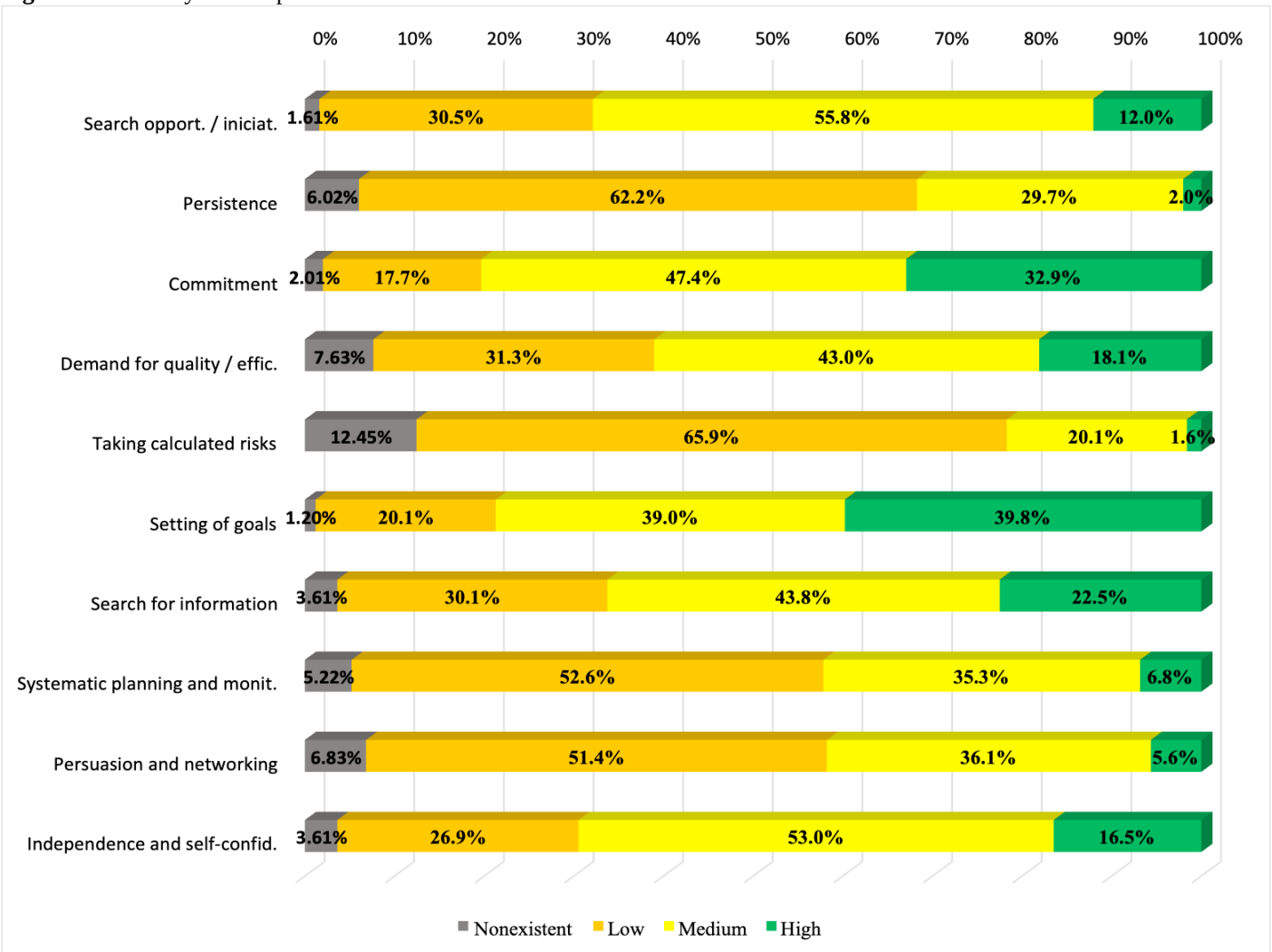
initiative, commitment, setting of goals, demand for quality and efficiency, search for information, and independence and self-confidence) and four characteristics presented averages with low intensity (persistence, taking calculated risks, systematic planning and monitoring and persuasion and networking).

To better understand these data, it was calculated the percentages of the intensities of each characteristic (Figure 11). To do this it is used the color stratification adopted with the professors: gray corresponds to absent characteristic (up to a maximum of 15 points), orange represents that the characteristic is low (15.0 to 18.3), yellow considered medium (18.3 to 21.7) and in green the characteristic is considered high (18.3 to 25).

The characteristic with the highest mean value, setting of goals (20.6 points), is also the one that has the best distribution of intensities: the highest percentage of students with high intensity (39.8%) and the lowest percentage with nonexistent characteristic (1.2%). This feature is related to the individual who sets long-term goals, clear and specific, continually defining and reviewing the short-term goals (MSI, 1990). This is an important behavior when undertaking a business or project, and we can infer that this characteristic has higher intensity in the students investigated because of the kind of learning, based on problems and challenges, and because of the projects that they develop along the subjects and entrepreneurial education projects present in the investigated institution of higher education.

As for the behavioral characteristic with the worst distribution of intensities, it is taking calculated risks, with the highest percentage of students with non-existent characteristic (12.45%) and the lowest percentage of students with high intensity (1.6%). As mentioned in the analysis of

Figure 11. Intensity of entrepreneurial behavioral characteristics – students



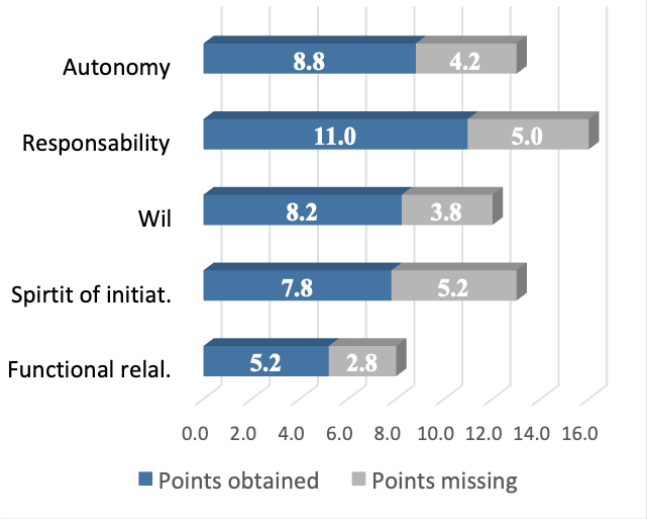
Source: created by the authors.

quantitative data of professors, in which this characteristic also showed a lower intensity, taking calculated risks refers to the attitude of evaluating and calculating the risks deliberately, taking steps to reduce them or control the results (MSI, 1990). This feature can be developed, both in professors and in students, encouraging them to place themselves in situations involving challenges or moderate risks inherent to the entrepreneurial activity.

To estimate the reliability, the internal consistency was measured by Cronbach's alpha (Sampieri, Collado & Lucio, 2013; Lopes, 2016). Cronbach's alpha for the instrument of EBCs, using the Likert scale, obtained $\alpha = 0.831$. This way, the resulting values of the questionnaires with 249 undergraduate students are reliable.

Next, in Figure 12, the mean values of the mindset dimensions of the students are shown, with the points obtained for each dimension and missing points to the total, considering that this varies for each dimension (Mencarelli, 2014).

Figure 12. Mean values for mindset dimensions - students

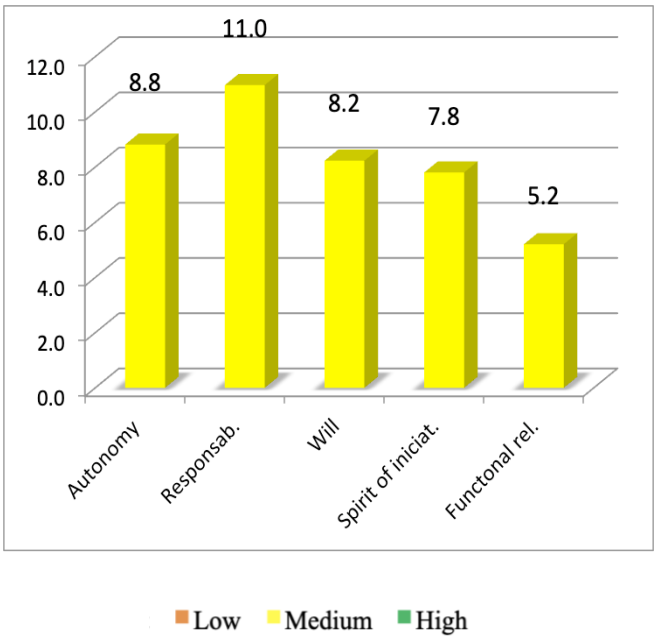


Source: created by the authors.

It may be seen in the figure that the highest proportional averages between the dimensions of mindset of the students are responsibility and will, and the lowest proportional average is the spirit of initiative and problem solving.

Figure 13 shows the mean value of each dimension of the entrepreneurial mindset of students, considering the instrument reading key presented in the methodological procedures and the stratification by color adopted in this research.

Figure 13. Intensity of mean value of the dimensions of entrepreneurial mindset - students



Source: created by the authors.

It can be seen that all five dimensions of mindset presented mean values with medium intensity: autonomy (8.8 points out of 13), responsibility (11 points out of 16), will (8.2 points out of 12), spirit of initiative and problem solving (7.8 points out of 13) and functional relationships (5.2 points out of 8).

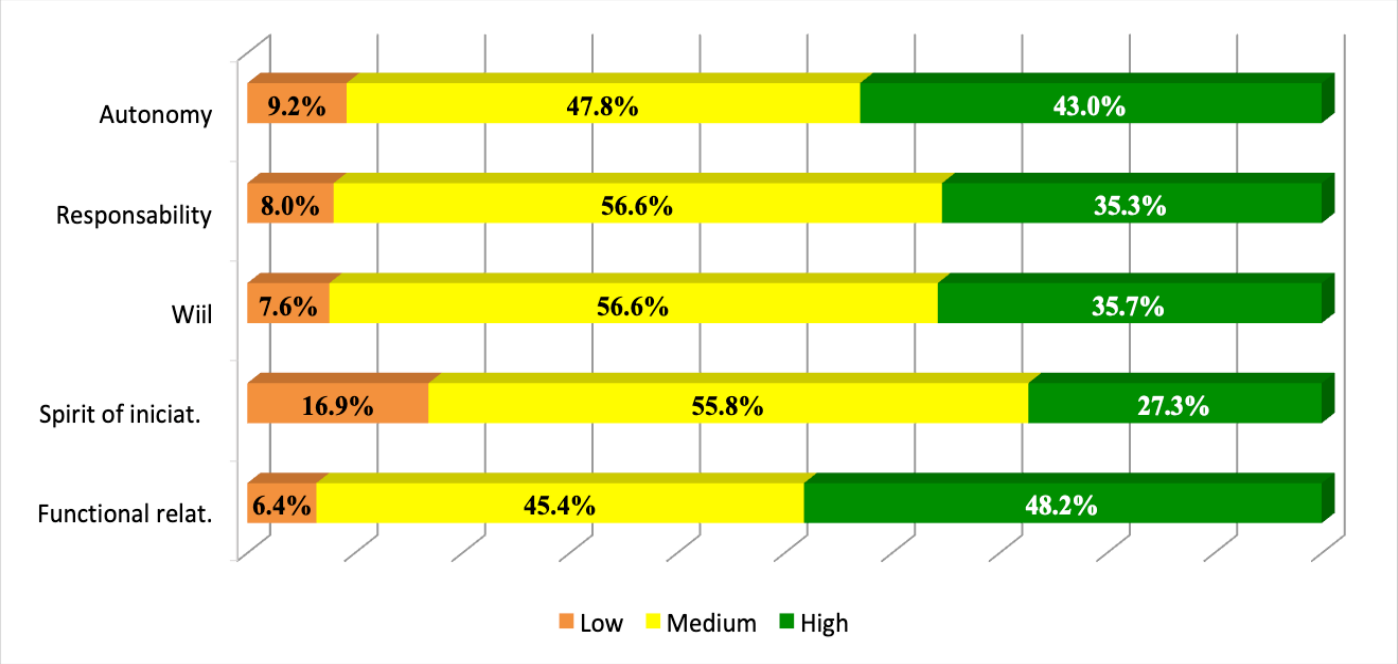
To better understand this data, it was calculated the percentages of the intensities of the entrepreneurial mindset dimensions of students, reported in Figure 14. It is inferred, from the figure, that the 249 students investigated showed predominance of medium intensities for mindset dimensions, followed by high intensities, with the exception of the dimension ability to manage functional relationships, which presented the highest percentage of high intensities (48.2%), with an average in the boundary between medium and high intensity. This dimension refers to the individual with entrepreneurial mindset able to manage relationships in a functional manner, that is, with advantage and reference to his scope. He is able to resolve a situation without controversy or resort to assistentialism, but managing relations intelligently and creating harmony among the people who are functional to that scope (Mencarelli, 2014).

The students also showed a small percentage of low intensities in all dimensions, which was higher in the dimension spirit of initiative and problem solving (16.9%). As described in the analysis of professors, who also had the lowest percentage in this dimension, having spirit of initiative and problem solving is related to the characteristic of being creative in situations, placing yourself before the problem in a purposeful and decisive manner (Mencarelli , 2014). Having knowledge of this lower performance and adopting pedagogical strategies aimed at its development, it can be enhanced in the students this dimension of entrepreneurial mindset related to the orientation to results and solving problems, mainly because one of the particularities of entrepreneurial education is precisely being based on problem solving learning (Lopes, 2010; Mendes, 2011).

In the sequence, the correlation matrix was made among the mean values of entrepreneurial behavioral characteristics and mindset of students, which is presented in Table 12.

It is found that the correlation between entrepreneurial behavioral characteristics and dimensions of entrepreneurial mindset were

Figure 14. Percentages of the intensities of dimensions of entrepreneurial mindset - students



Fonte: elaborado pelos autores

Table 12. Correlation of entrepreneurial behavioral characteristics and mindset - students

		Mindset				
		Auton.	**Auton.**	**Auton.**	**Auton.**	**Auton.**
EBCs	**Search for opportunities and initiative**	0.20508	0.18449	0.21392	0.17873	0.23549
	Persistence	-0.13547	-0.11153	-0.07477	-0.04357	0.07335
	Commitment	0.22921	0.2735	0.36699	0.32689	0.20514
	Demand for quality and efficiency	-0.07306	0.04112	0.04286	0.00389	-0.0702
	Taking calculated risks	-0.05925	0.0042	-0.03427	-0.04667	0.03642
	Setting of goals	-0.00857	0.14464	0.1157	0.01909	0.12989
	Search for information	0.00039	0.07696	0.07217	0.0448	0.15433
	Systematic planning and monitoring	0.05493	0.10434	0.11267	0.11464	0.10157
	Persuasion and networking	-0.06024	-0.02878	0.00135	0.04507	0.13131
	Independence and self-confidence	0.10766	0.07333	0.12241	0.15874	0.15259

** Correlation is significant at the 0.01 level (bilateral).

Source: created by the authors.

mostly positive associations very weak and weak intensity, indicating a direct relation between them. The entrepreneurial behavioral characteristic with the strongest correlations with the mindset dimensions was commitment, which had the highest intensities in the correlation with the dimension will (0.36) and spirit of initiative (0.32).

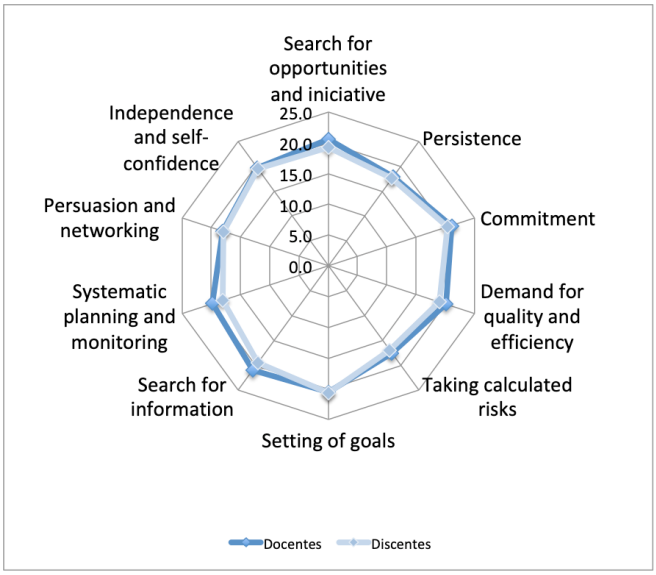
After analyzing the results of the applied instruments separately, it is made an analysis of all data, crossing the entrepreneurial behavioral characteristics and mindset of professors and students in order to identify possible similarities and discrepancies.

4.3 Comparative analysis of professors and students

The relationships of the data collected are analyzed as follows, crossing the mean values and intensities of entrepreneurial behavioral characteristics and mindset of professors with the means and intensities of students.

Initially, it is compared the distribution of the means of entrepreneurial behavioral characteristics between professors and students, as illustrated in Figure 15.

Figure 15. Distribution of means of entrepreneurial behavioral characteristics - professors and students

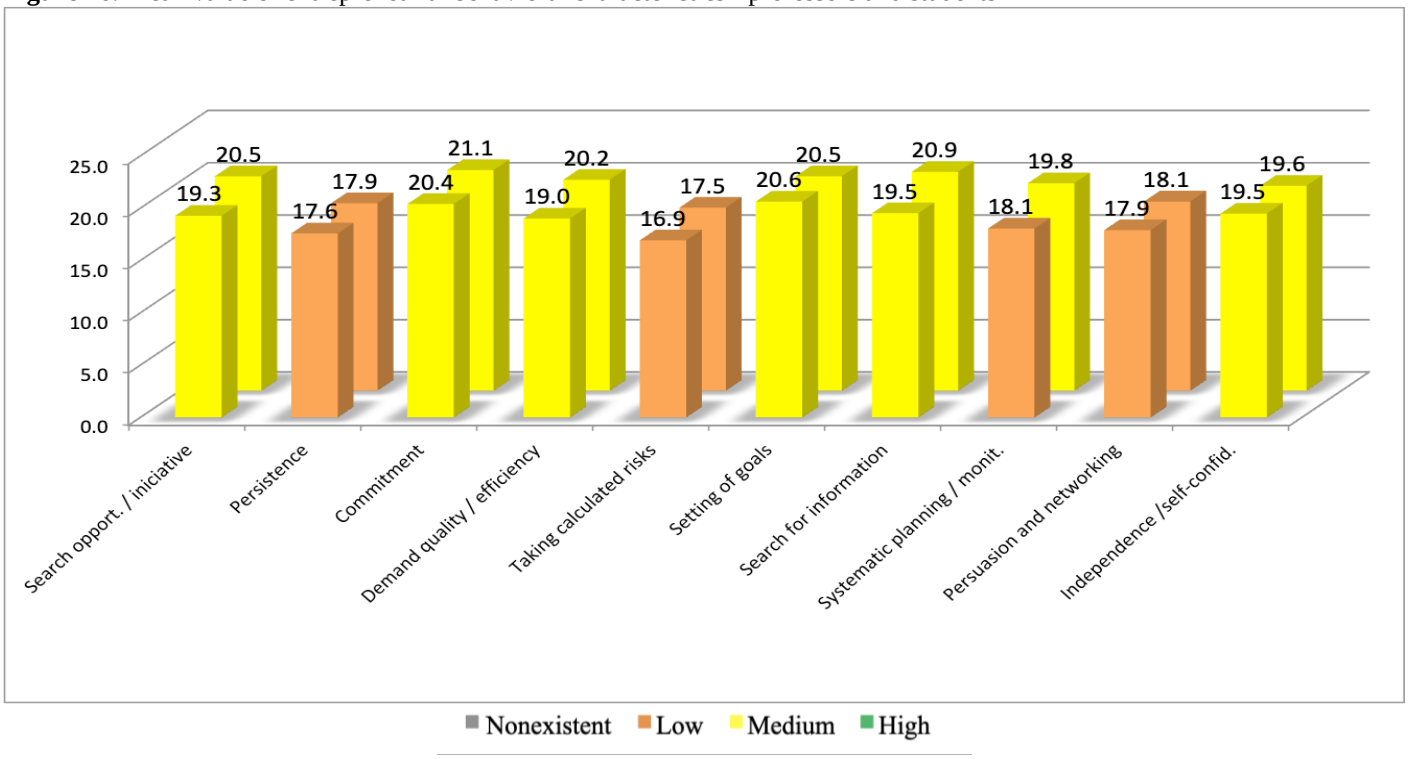


Source: created by the authors.

Considering the minimum score of 15 points, the investigated professors and students in this study may be considered entrepreneurs (Mansfield et al., 1987). What can also be seen in the graph lines is that there is a direct correlation between the averages of the behavioral characteristics of the two groups.

In order to better understand this

Figure 16. Mean value of entrepreneurial behavioral characteristics - professors and students



Source: created by the authors.

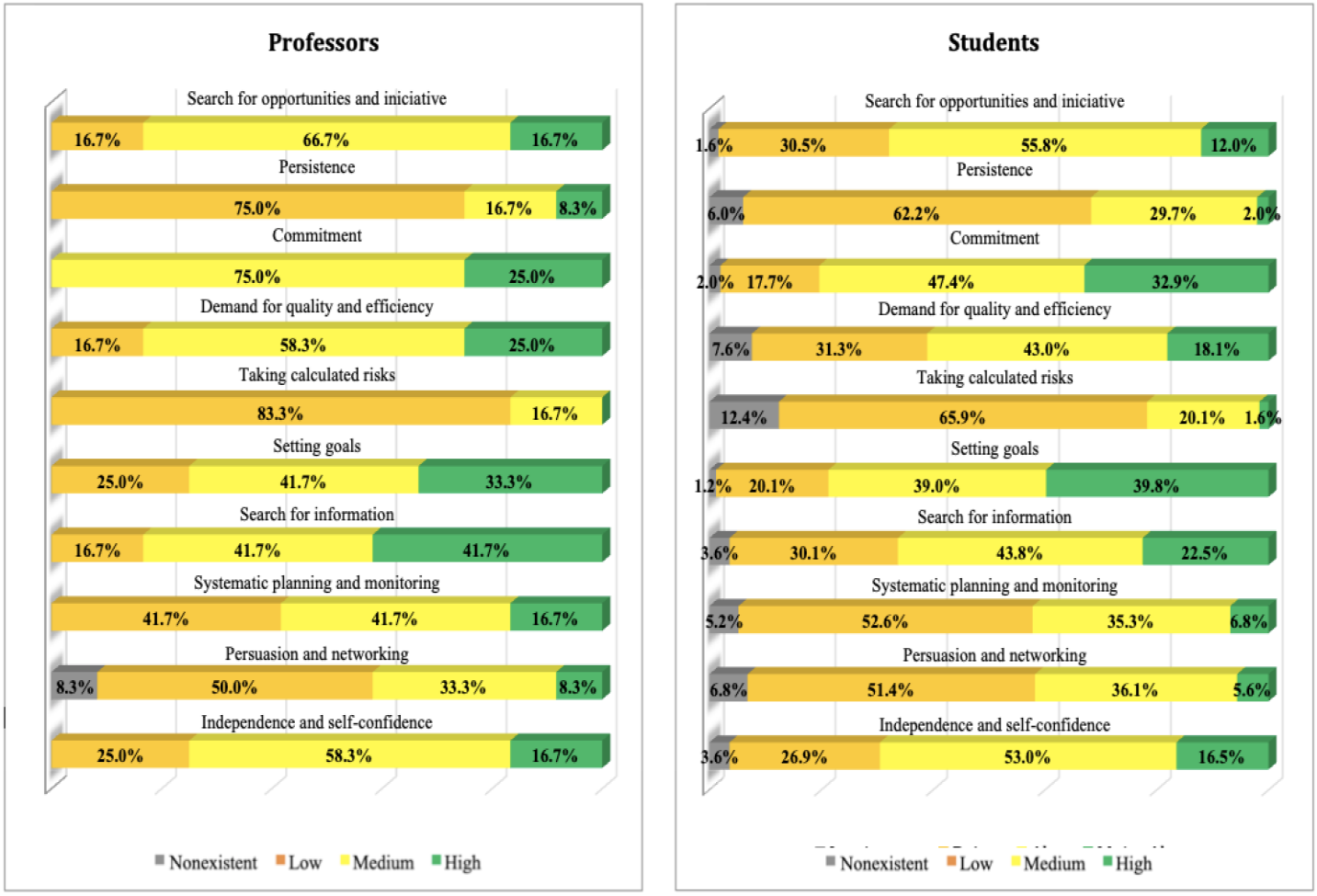
relationship, Figure 16 compares the mean value of the entrepreneurial behavior characteristics of professors and students, from the colors of the stratification scale created for this research.

From the data presented in Figure 16, it is possible to identify a relationship between the mean values and intensities of entrepreneurial behavioral characteristics of analyzed professors and students. Professors have averages a little higher than the students, except for the characteristic setting of goals, with the average of students (20.6 points) being slightly higher than that of professors (20.5 points). In the other characteristics, the mean value of professors is higher, with the greatest difference in the characteristic systematic planning and monitoring (1.7 points). In relation to the intensity of the means, all the characteristics have the same intensity for professors and students, with the exception of the characteristic systematic planning and monitoring, in which the students have low intensity (18.1), and professors show high intensity (19.8), with the largest difference between the groups, as previously explained. This feature refers to the individual who plans, dividing large tasks into sub-tasks with deadlines, and constantly reviews his plans (MSI, 1990). Being aware of the difference in this feature, more developed in the professors than in the students, professors can create teaching strategies in entrepreneurial education projects that they already have in order to intensify this aspect also in their students.

To analyze in a more detailed way the relationship between EBCs, Figure 17 brings the calculation of percentages of the intensities of each behavioral characteristic in both professors and students.

From the percentage of responders for each entrepreneurial behavioral characteristic,

Figure 17. Intensity of entrepreneurial behavioral characteristics - professors and students



Source: created by the authors.

compared among professors and students in Figure 17, it may be seen that professors have percentages of respondents with high intensities slightly greater than the students in most characteristics. Among the students, there is still a small percentage of respondents who show non-existent behavioral characteristics, which appears for professors only in the persuasion and networking characteristic.

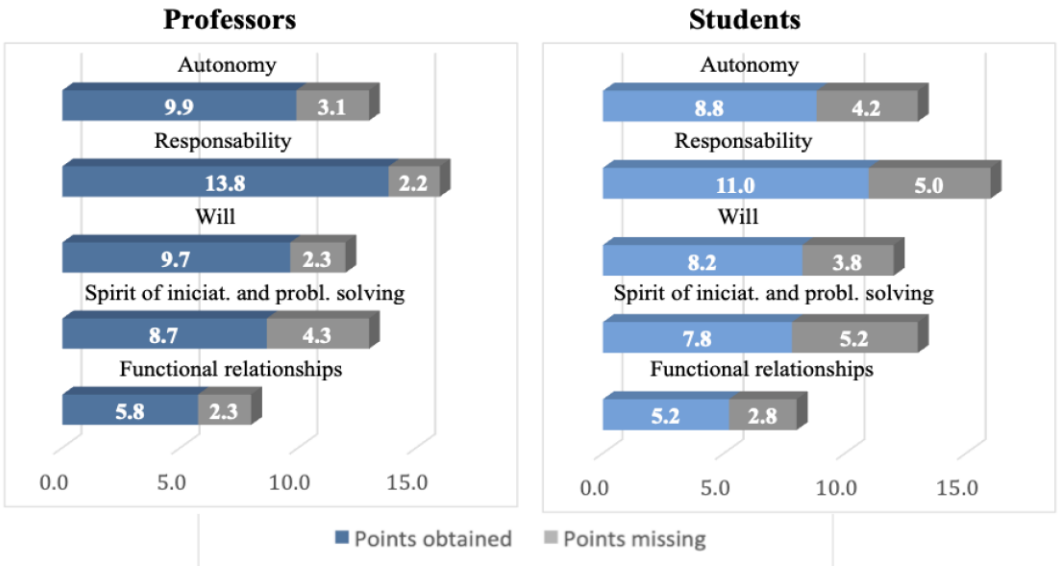
Although there is this difference - expected given that professors have stronger entrepreneurial characteristics than the students, because of the activity they carry out, and also considering their professional experience and greater life experience (Krüger & Minello, 2017) - comparing the intensities between the two graphs can identify a correlation between the two graphs, a correlation between the percentages of EBCs in professors and students in most characteristics.

Turning to the entrepreneurial mindset in both groups, Figure 18 shows the means of the dimensions of professors and students, as measured by the *Forma mentis* test (Mencarelli, 2014), with points obtained for each dimension and missing points to the maximum limit.

It can be observed in Figure 18 that, as in the graphs relating to the entrepreneurial behavioral characteristics, there is also a certain relationship in the results of entrepreneurial mindset in the professors and students investigated in this research.

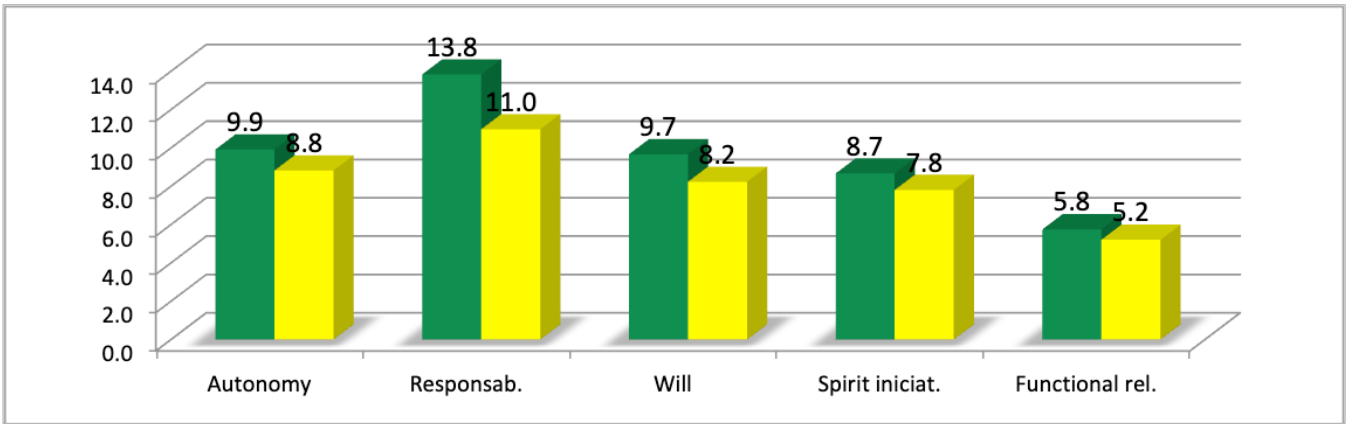
To better understand this relationship, Figure 19 shows the average of each dimension of the entrepreneurial mindset of professors (left

Figure 18. Mean value of the dimensions of entrepreneurial mindset - professors and students



Source: created by the authors.

Figure 19. Intensity of the means of dimensions of entrepreneurial mindset - professors and students



Source: created by the authors.

columns) and students (right columns) with stratification by colors identifying the intensity of each dimension.

As it can be read in Figure 19, the dimension with the greatest difference is responsibility, with high intensity for professors (13.8 points) and medium intensity for students (11.0 points). As for the dimension of entrepreneurial mindset with the closest values is the spirit of initiative and problem solving, with medium intensity both for professors (8.7 points) and students (7.8 points).

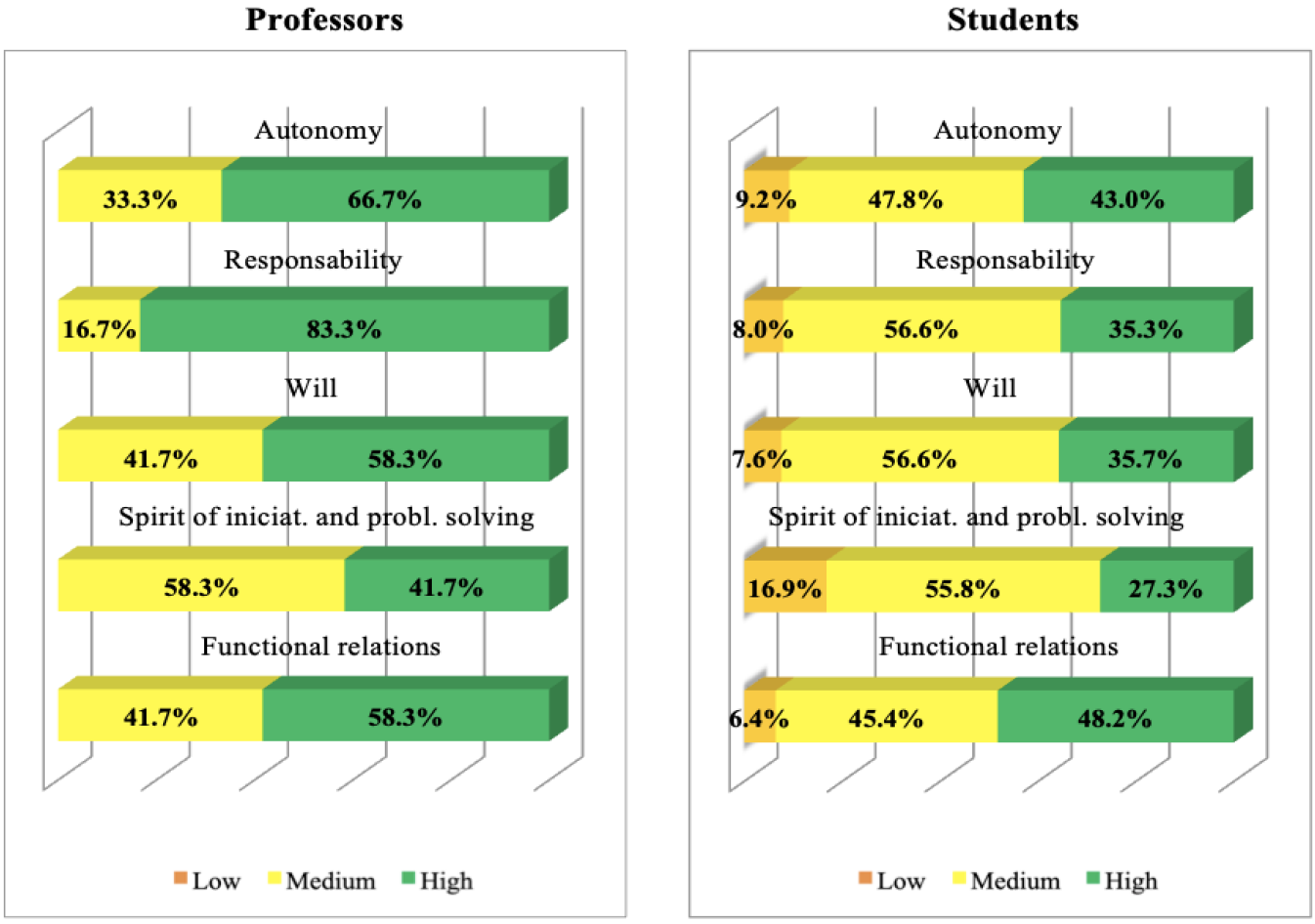
To further understand these relationships, Figure 20 shows the calculation of percentages of intensities in each dimension of entrepreneurial mindset in both groups.

From the figure, it can be confirmed that the greatest difference between the dimensions of entrepreneurial mindset is responsibility, which has a high intensity in 83.3% of the professors and in 35.3% of the students.

To Mencarelli (2014), responsibility concerns the mindset of the individual entrepreneur, asking himself about the first causes of what happens, trying to harvest his potential responsibilities. It features a mature individual with a sense of constructive self-criticism, that does not blame something external for causes or the events surrounding him. Being aware of these results, professors can intensify activities and adopt didactic and pedagogical strategies in order to increase this dimension in their students.

In relation to the other four dimensions, one can notice a more direct relationship between the results. Excluding the dimension of responsibility, it may be graphically noticed a ratio of intensities between professors and students in the other dimensions, with percentages of high intensity slightly higher in professors and presence of some respondents with low intensities among students. As already identified by Krüger and Minello (2017), professors have stronger entrepreneurial

Figure 20. Percentages of the intensities of the dimensions of entrepreneurial mindset - professors and students



Source: created by the authors.

characteristics than the students, due to the course of study already taken, professional activities that they carry out and their greater life experience.

Seeking to advance in the understanding of the correlation between the results of entrepreneurial behavioral characteristics and dimensions of the entrepreneurial mindset of professors and students, we performed the Mann-Whitney test with the collected data. The Mann-Whitney test is used to compare the positions between the two groups, making sure that the two populations have the same distribution, indicating equality in behaviors (Lopes 2016). Table 13 shows the results of the Mann-Whitney test for the collected data. When p>0.05, it can be inferred that the two groups show equality in behavior.

Table 13. Correlation between entrepreneurial behavioral characteristics and dimensions of the entrepreneurial mindset of professors and students

	Dimension/Characteristic	**P**
EBCs	Search for opportunities and initiative	0.0600
	Persistence	0.5852
	Commitment	0.3692
	Demand for quality and efficiency	0.1233
	Taking calculated risks	0.5512
	Setting of goals	0.8839
	Search for information	0.1398
	Systematic planning and monitoring	0.0320
	Persuasion and networking	0.8174
	Independence and self-confidence	0.9590
Mindset	Autonomy	0.1651
	Responsibility	0.0007
	Will	0.0479
	Spirit of initiative and problem solving	0.2218
	Ability to manage func. relationships	0.2917

Source: created by the authors.

From the results of the Mann-Whitney test, it can be inferred that the group of professors and the group of analyzed students show behavior equality in relation to most of the behavioral characteristics and dimensions of entrepreneurial mindset, highlighted in gray in the table. The highest test values for the behavioral characteristics are for independence and self-confidence (0.95), setting of goals (0.88) and persuasion and networking (0.81), and the lowest for systematic planning and monitoring (0.03), the only behavioral characteristic where p <0.05, indicating no equality in behavior between the groups.

Regarding entrepreneurial mindset, the dimension with the greatest correlation is the ability to manage functional relationships (0.29). Will showed the value of p very close to the limit (0.047) and responsibility, as already identified above, was the dimension with the lowest correlation between professors and students (0.0007).

Com base em todos esses resultados que buscaram correlacionar as características comportamentais empreendedoras e a mentalidade empreendedora entre os docentes e discentes, em sua maioria indicando uma correlação entre os dois grupos investigados, pode-se inferir que o processo de aprendizagem na educação empreendedora ocorre de maneira complementar entre os professores e alunos investigados nesta pesquisa.

Leiva, Alegre and Monge (2014) describe three ways in which entrepreneurial learning may be acquired: formal, experimental and indirect. The formal way is through direct consultation with sources of information, instruction and training processes. The experimental way is from experience and how it then turns into knowledge. And the indirect acquisition occurs through observation of the behavior and actions of others, as well as your own results, with the approval or disapproval of the context and the reference group. In the case of under graduation, students learn through observation and interaction with their professors, and through the results they achieve together in this process. The image of the professor as an example of how to see things (mindset) and of action (behavior) has an indirect effect, but decisive, in the development of the entrepreneurial behavioral characteristics and mindset of students.

5 Conclusions

This research aimed to analyze the dimensions of the mindset and entrepreneurial behavioral characteristics of undergraduate students and professors in a higher education institution that develops entrepreneurial activities and education projects.

To be effective, entrepreneurial education

has to be based on an integrated, cross-curricular and interdisciplinary education, seeking to connect teaching, research and extension to the university environment, the ecosystem of the labor market and the local business environment. In addition, entrepreneurship should not be treated as an autonomous subject, as it is the case in a large part of higher education institutions, but integrated and cross-curricular in various subjects and courses, since the contents of other research fields intertwine. This way, we have an effective proposal for the entrepreneurial university.

The higher education institution investigated in this research develops entrepreneurial actions and activity projects in this regard, and the results obtained from its professors and students corroborate this scope. It may be inferred, from the results of this research, that aspects of mindset and behavior of entrepreneurs can be developed with reciprocity in professors and students from a proposal for entrepreneurial education. Entrepreneurs develop a type of mindset and a set of skills and abilities they use to create value for themselves and the society. And this process is always internal and external: Internal towards individual characteristics which determine a way of thinking (mindset), and external as its application in the environment as way of acting (behavior).

It was found in this study that, the analyzed professors, who, in the view of the students, perform unique and innovative activities, possess the 10 entrepreneurial behavioral characteristics. Stratifying them with a scale created for this study, 7 of them are configured with medium intensity (search for opportunities and initiative, commitment, demand for quality and efficiency, setting of goals, search for information, systematic planning and monitoring, and independence and self-confidence) and 3 characteristics showed low intensity (persistence, taking calculated risks, and persuasion and networking). The characteristic with the highest mean value was commitment, and the one with the lowest average was taking calculated risks. Regarding students, 6 behavioral characteristics exhibited mean values with medium intensity (search for opportunities and initiative, commitment, setting of goals, demand for quality and efficiency, search for information, and independence and self-confidence) and 4 characteristics showed low averages (persistence, taking calculated risks, systematic planning and monitoring and persuasion and networking). The characteristic with the highest mean value was setting of goals and the lowest average obtained was taking calculated risks.

Regarding the entrepreneurial mindset of the investigated professors, the highest proportional average between the dimensions of mindset is responsibility, and the smallest one is spirit of initiative and problem solving. From the means of the five dimensions, four of them show high intensity (autonomy, responsibility, will and ability to manage functional relationships) and one of them, spirit of initiative and problem solving, has medium intensity. In relation to students, the highest proportional average among the dimensions of mindset are responsibility and will, and the lowest proportional average is spirit of initiative and problem solving. All five dimensions of the entrepreneurial mindset of students presented mean values with medium intensity.

Comparing the results obtained from the studied professors and students, it is possible to identify a relationship between their mean values and intensities of entrepreneurial behavioral characteristics. Professors show means a little higher than the students, except for the characteristic setting of goals, in which the average of students is slightly higher. In the other characteristics the average of professors is higher, with the greatest difference for the characteristic systematic planning and monitoring. As in the results for the entrepreneurial behavioral characteristics, there is also a certain relationship in the results of the entrepreneurial mindset of the investigated professors and students. The dimension with the greatest difference is responsibility, with high intensity in professors and medium intensity in students, and the dimension with the closest values is spirit of initiative and problem solving, with medium intensity for both groups.

When verifying the relationships between entrepreneurial mindset and behavior in professors and students, it was initially examined the relationship between the entrepreneurial behavioral characteristics and dimensions of the mindset of the two groups separately, using Pearson's correlation coefficient. It was found that, in the professors, the correlations between the dimensions of entrepreneurial behavioral characteristics and dimensions of the

entrepreneurial mindset were, mostly, positive associations, of very weak, weak and moderate intensities, indicating a direct relationship among them. Regarding the students, it was found that the correlations between the entrepreneurial behavioral characteristics and dimensions of entrepreneurial mindset were positive associations of very weak and weak intensities, mostly, what also indicates that there is a direct relationship among them.

Subsequently, it was verified the relationship between the results of entrepreneurial behavioral characteristics and dimensions of the entrepreneurial mindset of professors and students using the Mann-Whitney test. From the results, it may be inferred that the analyzed group of professors and the group of students have equality of behavior in relation to most of the behavioral characteristics and dimensions of the entrepreneurial mindset.

Based on these results, we can infer that the process of learning in entrepreneurial education occurs in a complementary manner among the investigated professors and students. By means of learning by formal, experiential and indirect acquisition, students develop behavioral and mindset characteristics along with their professors. This recognition and mutual alignment is important because it enhances the results of entrepreneurial education, seen that the way of thinking and acting of professors and students converge. The accomplishment of activities and integrated entrepreneurial training projects lead to the development of the mindset and the behavior of entrepreneurs in both students and professors.

6 Implications and future research

Based on the studies that were gathered and compared in this research, it may be stated, by investigating the behavior and mindset of entrepreneurs, that entrepreneurship is an essentially human process. A better understanding of this enterprising nature has been investigated scientifically and the development of the entrepreneurial spirit has been placed as a priority on the political, economic and academic agendas and debates from developing countries, in view of the positive influence that the entrepreneurial activity plays in social and economic development of a nation. In this direction and with this objective, for a greater understanding of the actions and behavior of entrepreneurs, one of the key elements that still needs to be better understood are the processes that are in the basis of their thinking, the processes from which entrepreneurial action is first conceived and then accomplished. This research aimed to join efforts in this direction in order to contribute to a greater understanding of the mindset and behavior of entrepreneurs. The understanding the entrepreneurial nature and how entrepreneurs think and act, from further research to investigate these issues, can guide the actions to be carried out with the purpose of creating, especially in emerging countries, entrepreneurial individuals, organizations and environments, which may create human development, competitiveness and economic growth, and social advancement.

This study was limited to the collection instruments developed by McClelland to evaluate the entrepreneurial behavioral characteristics and by Mencarelli to check the dimensions of entrepreneurial mindset in a cross section. Future studies may include new instruments to measure the way of thinking and acting of enterprising individuals, or even use the same collection instruments adopted in this research, but in a longitudinal study, in order to verify if there are changes and evolution in the development of the entrepreneurial mindset and behavior.

The data of this research were also limited to the Brazilian culture, through the analysis of professors and students of a private institution of higher education. One has to be cautious, therefore, in relation to the generalization of the results. It is suggested to enlarge the scope and allow inspections and confrontations, that the methodological procedures used in this study be replicated in new research in other educational institutions, both public and private. Comparative studies on entrepreneurial education initiatives and development of entrepreneurial mindset and behavior may bring benefits to management, teaching, research and extension of institutions both public and private. Besides that, future studies on the theme approached in this research may be carried out in other countries, in order to contribute to a greater understanding on the specificities of the entrepreneurial education in Brazil, as well as to allow an exchange of understandings and good practices among institutions of different nationalities.

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