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## PRESENTATION

The II South Florida Congress of Development was an event created with the aim of disseminating knowledge, good works and innovations in relation to the theme "Development". It had 27 entries, being submissions of articles.

Promoted by South Florida Publishing, it took place online, with real-time streaming, chat interactions, and recorded form, on April 27 and 28, 2022.

Within the axes of the Congress, 27 scientific articles were previously read, analyzed and approved by the Scientific Committee, for later publication in the form of Anais with CrossRef / DOI registration. From these 27 articles, the three best articles were selected and certified with the South Florida Publishing Award.

The event, in addition to providing the authors with the experience of presenting their scientific articles, had two external speakers: Prof. José Luiz Esteves, PhD., who gave the lecture entitled "Reimagining strategic management and businesses in a post pandemic complexity Era: The ESG approach for innovating towards sustainable organizations", and Prof. Rodolpho Zannin Feijó, MSc., who presented the lecture "Innovation and Sustainable Development: The Case of Curitiba".

The thematic axes worked in this second event were: Public and Business Administration; Accounting Sciences; Tourism; Architecture, Urbanism and Design; Communication and Information; Law; Economy; Urban and Regional Planning; Demography; Social work; Arts and music; Literature, education and teaching; Engineering and mathematics; Environment and sustainability; History and geography; Sociology and philosophy; Politics and international relations; Anthropology, archeology, religion and theology; Biotechnology; Physics and chemistry; Computing and information technology; Other development approaches.

The event was aimed at students, teachers, researchers, the academic community, entrepreneurs, education professionals, involved with issues related to the theme of the event.

Happy reading everyone!

Yours sincerely,



Prof. Edilson Antonio Catapan  
Editor-in-Chief  
South Florida Publishing

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## **Demystifying relational conflicts and organizational behaviors through communicational bridging for culture fostering**

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### **ABSTRACT**

Man is a social being by nature. The need to relate is one of their basic desires for natural survival. This exchange of experience encourages the improvement of values, principles, and the consolidation of personal beliefs. Personal behavioral labeling that is invariably transported to the professional universe. It is not possible to dissociate them, such is the reciprocal influence. The detail lies in personal impressions in a professional context. Questions such as which principles and values to follow, how to stay true to what you believe in, how to disagree without losing respect for others are part of the routine of companies made up of people. These same people, the true gems of any organization, are responsible for the success or otherwise of the enterprise. They are the ones that provide the ruler for decision-making, for measuring behaviors, for setting goals and also for determining the corporate cultural standard. In this sense, the present work has given due importance to human capital by addressing the issue of interrelational conflictology with the organizational behavioral reflection and the bridge of communication within these same conflicts for the establishment of culture.

**Keywords:** conflict, behavior, communication, culture.

### **1 INTRODUCTION**

It is common to hear narratives that where there are people gathered there, at some point divergence will be installed. These are different perceptions coming to the surface through the governing principles of a life story and behavior reinforcing beliefs. An empiricism that is not without its reason for truth. And the big question gravitates around which alternatives to adopt to avoid or face the inevitable conflict.

The vicious cycle of conflict, fed back by people with unsatisfied personal and/or professional needs, reverberates, in a systemic way, in various sectors of life, for example: in the way of communicating, whether verbal or not; in the behavioral pattern; in the attitudes and decisions taken. In an institutional context, the repercussion is more dense, given the direct influence on the very culture of the organization.

In this sense, this paper intends to encourage reflection on how human capital, of precious essence to any organization, can contribute to the success or failure of the same



from the convergence or divergence with its cartel of personal principles. It is to understand the inseparable and existing link between people, personal and professional behavior, and the company's cultural labeling.

Thus, the theoretical foundation is protected by technical apparatus developed by researchers in their relevant scientific productions and authority on the subject. An investigation, conceptualized as quality and exploratory, by materializing in a true invitation to reflect on the theme (Marconi and Lakatos, 2007; Alyrio, 2009).

The methodological structure embraces two topics. The first one weaves, considerations about the valuation of human capital with the issue of interrelational conflictology with reflection on organizational behavior. The second brings the bridge of communication in relational conflicts for the establishment of a new culture.

## **2 DEVELOPMENT**

### **2.1 INTERRELATIONAL CONFLICT AND THE REFLECTION ON ORGANIZATIONAL BEHAVIOR**

One of the most classic perceptions in the business world is that for change to occur, several elements must be brought together: an idea, a pinch of daring, and a sufficient amount of effort, dedication, and renunciation. At first glance, one has the impression that one is reading a cake recipe, whose ingredients are proportionally dosed in order to achieve an exceptional result.

The sensation then is that one is facing a first layer of superficial elements. A discourse that is easy to reproduce to the point of becoming a motivational mantra for professionals in search of entrepreneurship. Expectations created at high levels as if reality would follow the same emotional timeline and would be restricted only to this, which, in practice, is much more challenging.

The exit from the enchanted world of illusion to reality occurs when a simple idea begins to have the robustness of an instrument with a dual purpose: the satisfaction of the needs of a social stratum and the consequent possibility of profitability. This is when one leaves personal amateurism and plunges into the construction of the corporate and legal typology of the future organization.

Descending to a deeper level, one realizes that the legal identity through its effective registration in the competent body, by itself, does not represent the ideal fostered to succeed in the purposes established above. Something is needed to leverage it and make

it concrete. And at this moment the most valuable resource comes in, the precious stones of any organization, the human capital.

Beyer & Vivar y Soler (2019) understand that the human jewel, in an organizational context, would not be just an instrument in the productive process as a mere supporting actor. It would be the protagonist for labor success by managerial strategies capable of potentiating its capacities and abilities in favor of individual and organizational purposes in a clear collaborative spirit.

Carvalho and Sousa (1999), in the same sense, affirm that it is precisely the human factor that is responsible for the success of any business and its differential competition.

The argument brought forward is that the products and services reflect the experiences obtained in attempts to get things right and the openness conferred by managers for technical contributions and suggestions for improvement from each employee.

Thus, for Edvinsson and Malone (1998), there would be an intangibility in the human component in the institutional gear that would place it in a level beyond the physical walls of corporate property. The value and subjective load is such that it embraces not only creativity in products and innovation in the managerial approach, but also the philosophical, structural, and behavioral bases of the companies.

A human subjectivism, relevant to the present day, given the timely thesis established by Beyer & Vivar y Soler (2009, p. 49) that "the subject needs to realize how his way of life is part of an intrinsic value. This value has maximum influence on the behavioral patterns of any company eager to stand out in the market.

People then are responsible for driving the emotion of ideas into profitable activity. They are able to label the necessary value to delimit the identity and competitive differential in the face of a very demanding market. They understand the organizational reason for being, verify its compatibility with their principles and, in a perfect symbiosis, marry their personal purposes with the professional ones.

The role of the subject is now a different one for organizations. In the contemporary world, he is not a cog in the wheel of production systems, but someone who carries an intrinsic value in which his knowledge through skills and competencies are assets for organizations, which, in return, seek to offer a management for the subject's life. This is a two-way relationship between subject and organization. (Beyer & Vivar y Soler, 2019, p.46)

And once again, in a theoretical and romanticized vision, he believes that everything would work out without any margin for error. The key element of success had already been identified, namely people. It turns out that these same people can be the cause of several relational conflicts, which can weaken the thought behavioral and organizational structure. And the interesting thing is that the human resource is also the very solution to eventual disagreements.

People can increase or decrease the strengths and weaknesses of an organization depending on how they are treated, and can be a source of success or a source of problems, so that the objectives of people management are achieved and necessary that they are treated as basic elements for organizational effectiveness. (Nascimento et al, 2011, p. 4)

When one starts from the assumption that the organizational backbone rests on its members and that each human being carries within himself his universality, it is almost a natural consequence the existence of disagreements. These disagreements are caused by the human need to build and maintain relational bonds, reinforcing the idea of the social man.

Man is a social and gregarious being. It is inconceivable, save in exceptional situations, that he can live in isolation. Among the most profound human needs is that of social coexistence, of establishing relations with other men, with the most diverse purposes and the most varied degrees of intensity. (Gonçalves, 2004, p.1)

The variables of beliefs, way of seeing the world, philosophical conceptions, observed principles, respect or violation of laws, in short, everything that directly or indirectly manages to form their personality must be considered. Potentializing elements, or not, of eventual resistance in a harmonious coexistence, capable of generating conflicts capable of generating conflicts, taken as inevitable (Teixeira, 2020).<sup>5</sup> Gaudencio (2008, p. 19) teaches that "conflict is part of life. And it is a dream, just a dream, to think about being happy when conflicts end. Everyone has this dream. But conflicts never end. They are part of the essence of the human being. According to Bonfim and Menezes (2008, p. 21), conflict is "a mechanism that allows the evolution of the human species, to recognize weaknesses and improve them.

Teixeira (2020, p.76-77) adds that "when faced with a conflictive situation, interpersonal in nature, the individual, aware that he or she will spend time and, in turn, will suffer emotional wear, postpones as much as possible the moment to deal with such an issue.

The idea, therefore, is not to postpone or avoid conflicts, but to know how to live with them by drawing lessons from the prolonged effects. It is even, according to Teixeira (2020, p. 77) "to see the opportunity conferred by the conflict to mature, to have an experience that will lead you to a journey of self-knowledge of your limits, your weaknesses, your defects and your qualities.

The context, therefore, is one of organizational chaos: instaurated conflict, weakened relationships, and an environment marked by changes in volume and emotional density. Such attitudes reflect in the behavioral style of the organization. The speeches made corroborate it while they are omitted in the construction of alternatives for the improvement of the environment.

The issue of interpersonal relationships, and their inherent emotional dimension, is crucial to the associated life, for it is these interactive processes that form the set of systems that organize it. The conditions under which these relationships occur define the way in which human beings, beings of relationships, and human beings with nature live together. They make the difference between suffering and well-being and define how social life is built in its daily life. Deteriorations in interpersonal relationships result in deterioration of social relations, inter- and intra-organizational relationships (Leitão et al, 2006, p. 884)

In these terms, there is no way to dissociate the organizational behavioral reflexes resulting from healthy or harmful relationships developed in the work environment. It ranges from satisfaction and sense of alignment of purposes to emotional imbalances, drop in productivity, frequent absences, staff turnover, and mass layoffs (Leitão et al, 2006).

## 2.2 BRIDGING COMMUNICATION WITHIN RELATIONAL CONFLICTS FOR A CULTURE

The big issue is not the diversity that exists in the human structure of any organization. Plurality is inevitable. The crucial point is how to minimize any clashes without breaking the trust in interpersonal relationships and without weakening the institution as a whole, by putting in check its principles and governing values and, thus, misaligning the expected behaviors.

Communication then enters the scene and its classic initial questions: how to develop it, how to maintain it, how to rescue it in worn-out cycles, how to go from monosyllables of dissatisfaction to the exposure of feelings with objective requests

without losing humanity. In other words: would there be a possibility of dialogue reconstruction in an environment where chaos reigns?

Communication represents the link between the sending and receiving parties, while it is the channel transmitting the message in order to exchange ideas, information and life experiences. It facilitates the adjustment of the real interests of those involved, rescues the interpersonal relationship, and promotes social interaction (Teixeira, 2020, p. 82).

In an organizational context, communication can be more delicate. There is the variable of hierarchy and its systemic reflection in the sustaining guidelines of the institution.

after all, behaviors are delimited by practiced actions, whether positive or negative. And ultimately, these behaviors, once solidified, become the culture advocated by the organization.

Thus, there is no way to dissociate the cause and effect relationship between communication, behavior, and culture. There is a cycle of mutual interference between them in a perfect symbiosis, where these three elements, in human contexts, can mean the advance or retreat of any organization.

Communication, as the first element, is not restricted only to what is verbalized. There are words that are not said, but that become evident in the attitudes that are externalized in rigid and formal environments or in informal and more inflexible situations. And it is precisely this difficulty in externalizing the discontent that maculates any possibility of building a constructive bridge of understanding.

Body language and tone of voice make an immense difference in the impact and meaning of what we say. It is not what we say, but how we say it that makes the difference. The words are the content of the message; the posture, gestures, expression, and tone of voice are the context in which the message is embedded. Together, they form the meaning of the communication. (Alecim, 2008, p. 38-39)

Communication, in fact, is also a commitment to the process, while, according to Teixeira (2020, p. 83-84) "listening to each other, respecting each other, expressing what is felt, asking questions in order to clarify the controversial points, are essential steps for the proper emptying of emotion, and thus seek to understand the problem objectively.

The deficiency in the communication process reverberates in the second element, the behavior. This behavior, not infrequently, is materialized by identification crises when it is not clear which set of values to follow: the personal or the institutional. To follow

what one believes and, perhaps, face some relational conflict or simply agree with the guidelines of corporate value to maintain a pseudo peace.

According to Appel & Pucci (2007), there is a congruent line between behavior and attitudes derived from personal beliefs and expectations. There is an internal motivation arising from temporal acquired experiences that are incapable of being camouflaged in the exercise of any role within a professional context.

The behavioral reflection at work comes from the attitudes and choices made in the individual and social sphere. Appel & Pucci (2007) conclude that the interference of the personal environment in the professional is visible, and this reality is something to be considered by all organizations even for the measurement of value responses in productivity and efficiency.

To reinforce all the above, Appel & Pucci (2007, p.3) summarize that "the relations that man maintains with the social, especially with work, can be perceived or interpreted as a source of pleasure or suffering, self-realization, challenges, survival, salary, security, power, status.

In this two-way street between subject and organization, many institutions have offered management systems that involve the development of better working conditions, which include the promotion of stimulating environments, of increased motivation, satisfaction, health and even well-being. In return, they seek performance, productivity and the application of the subjects' skills.(Beyer & Vivar y Soler, 2019, p.50)

The third element, culture, is seen as the reflection of the consolidation of the look at who brings value results to the company, metrified through performance at both the personal and organizational level.

Personal as well as organizational level. Nascimento et al (2014, p. 2) states "organizational culture, as far as it is concerned, is extremely important for determining the practices adopted by the company, also influencing the performance and satisfaction of employees."

In general, it is possible to notice a close relationship between work relations and satisfaction, and the organization is the stage for the interaction of these concepts. In this context, it is evident the importance of the role of managers before situations of dissatisfaction in the workplace, acting as mediators of power and conflict relations, as well as catalysts of satisfactory organizational climate for both parties, company and employees. (Cazella, 2016, p. 80)

A satisfaction not only restricted to salary rewards, but also to the stimuli regarding the challenges proposed and the collaborative perspective of the human body.

A vision that brings two possible sides. Under the positive prism, a fluid line of communication and, under the negative prism, the feeling of lack of belonging, organizational exclusion, reduced productivity, and stress itself (Cazella et al, 2016)

In this sense, companies should take a closer look at their internal customers, in addition to the current trend of investing in the quality of service delivery to external customers, because the satisfaction of the internal customer: and consequently their greater commitment and better performance: is what will promote the success of the organization through the good quality of services provided. (Nascimento et al, 2014, p. 5)

Synthesizes culture, Nascimento et al (2014, p. 4), as being "governing the behaviors of employees of the same organization and imposes models of conduct and customs that will differentiate it from other business organizations. It is, therefore, the ruler used in decision-making processes of relevance to the organization, culture arising from expressions of human behavior and consolidated as organizational practices.

### **3 CONCLUDING REMARKS**

The metric of success or not of any company is its human structure. It is people who drive any idea to the point of turning it into a profitable business opportunity, so looking at them with due respect and importance is fundamental. They are also responsible for setting the tone of the organization in terms of behavior and establishing the cultural standard.

It is worth mentioning the challenges faced when facing relational conflicts: they are personal and/or professional expectations that are often not met; they are values that clash with the organizational guidelines and the eternal dilemma of whom to follow; it is the destroyed communication bridge and the effort to rebuild it in a more harmonious way and without causing horizontal or vertical breaks in the hierarchical chain.

It is to finally achieve that in the apparent problem there is also the solution, existing in the incredible capacity of the human being to rebuild itself from the moment it is given its due value. People are the builders of opportunities, behavior, communication, and culture.

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## **Evaluation of the correlations of the consumption of antidepressant drugs Selective Serotonin Reuptake Inhibitors (SSRIs) and Tricyclic Antidepressants (TADs) consumed in 2020 and other variables of interest in the Pandemic period**

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### **ABSTRACT**

Introduction: Depression is a mental disorder that can affect people of different ages and of varying complexities. The prescription of SSRIs and ADTs are indications to reduce, control or cease the symptoms of depression. Objective: To evaluate the correlation of the consumption of antidepressant drugs Selective Serotonin Reuptake Inhibitors (SSRIs) and Tricyclic Antidepressants (TADs), consumed in 2020 and other variables of interest in the pandemic period. Materials and Methods: Medication consumption data were collected on the National Controlled Products Management System (SNGPC) platform. We analyzed Sperman's correlation of total consumption of antidepressants in 2020 with

the following variables: Human Development Index - 2010; Estimated demographic density (hab/km<sup>2</sup>) - 2020; Monthly household income per capita - 2020; Estimated population of people (2020). Correlations of the rates of total antidepressant drug consumption divided by population were also calculated with the same variables previously to draw out the influence of population size. Results: The results of the correlations of antidepressant consumption are: 0.55, 0.59, 0.64, 0.86 and p-values= 0.003; 0.001; <0.001; <0.001, respectively. In the correlations with the same variables previously, divided by the population, the results were 0.70, 0.55, 0.81, 0.45 and p-values= <0.01; 0.003; <0.001; 0.019, respectively. Final considerations: The values show that the correlations are positive and significant, being higher for the population, as expected, since it is expected that consumption is proportional to population size. Therefore, when divided by the population, the highest correlation between consumption of antidepressant medications and these variables is with per capita monthly household income (0.81 p-value < 0.001), i.e., the higher the per capita income, the higher the consumption of antidepressant medications.

**Keywords:** covid19, corona virus, depression, drugs, pandemic.

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## **Preliminary survey of Bromeliads sold in Macapá supermarkets: economic potential**

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### **ABSTRACT**

Brazil has the greatest richness of bromeliads, with about 3,650 species in the tropical and subtropical region of America and can be found throughout Brazil. In recent decades, due to their beautiful shapes and colors, low maintenance demand, and easy adaptability to small gardens, bromeliads have been used as ornamental plants. The present study carried out a survey of species of bromeliads marketed in three networks of supermarkets, in the Municipality of Macapá, analyzing its potential for regional economic development. The genera of bromelias marketed were *Aechmea*, *Alcantarea*, *Cryptanthus*, *Guzmania*, *Neoregelia*, *Tillandsia* and *Vriesea*. They were found 21 types of bromeliads sold in three web supermarkets chains in the city of Macapá, distributed in seven genera.

**Keywords:** bromeliaceae, flower market, ornamental plants.

### **1 INTRODUCTION**

The trade of flowers and ornamental plants in general in Brazil has been growing on average 8% per year, this growth is strongly stimulated by 28 wholesale distributors, and for more than 18 thousand points of direct sales to the consumer as floriculture, garden centers, supermarkets among others that together are responsible for the trade of 96.5% of Brazilian production (Junqueira & Peetz, 2014, Muraro et al., 2016). The tropical flowers have presented high growth rates, strongly driven by the exotic coloration and foliage, as is the case of the bromeliads, reaching the eighth position in the volume of recipes and sales among the ornamental species (Negrelle 2009, Negrelle et al., 2012, Anacleto et al., 2015).

Brazil has the greatest richness of bromeliads, with about 3,650 species of the family Bromeliaceae Juss., native to the tropical and subtropical region of the Americas, and can be found throughout the Brazilian territory, the Atlantic Forest and Cerrado, which predominate the greatest diversity of species (Flora do Brasil, 2020) According to Rocha (2002) the Brazilian varieties of bromeliads are highly appreciated worldwide for the diversity of colors, shapes, designs of the plant itself and, above all, for their inflorescences that arouse great commercial interest, a factor that contributed to its commercialization, besides its beauty, do not require much care and have great resistance. The most cultivated genera of bromeliads are *Aechmea* Ruiz & Gov., *Neoregelia* L.B.Sm. and *Vriesea* Lindl., and the most commercialized are *Neoregelia* and *Vriesea* (Junqueira & Peetz, 2017).

The consumption of bromeliads in Brazil began in the 1970s, when *Aechmea fasciata* (Lindley) Baker, a plant native to Rio de Janeiro, aroused great demand from consumers of ornamental plants. The insufficiency of this species caused, demand from other species of ornamental plants, of less commercial expression (Paula & Silva, 2004). Since then, due to its high availability and easy accessibility in the natural environment, few investments have been made to establish bromeliads cultivation systems to meet the growing demand of these in the ornamental plant market.

Thus, the marketing chains of most bromeliads species have been heavily dependent on extractivism (Flora do Brasil, 2020). This predatory process, which generally does not respect natural dynamics of regeneration and sustainability, has intensified, including the loss of biological diversity of both bromeliads and other species that coexist with them, threatening some species with extinction (Pereira, Cuquel & Panobianco, 2010). The implementation of agroforestry systems for the cultivation of native species of commercial interest, therefore, can be a coherent alternative to meet the demand and decrease the extractive pressure on natural populations, as pointed out by Martin (1995) and Sugandhi and Sugandhi (1995).

The increasing increase in the commercial production of bromeliads brings advantages both to the producer, who has an increase in income, as well as to the environment, reducing the predatory extractivism of some species that are in extinction (Anacleto & Bornancin, 2018). This initiative is very little explored in the Brazilian Amazon, which presents one of the greatest diversity of plant species. The state of Amapá, in which most of its plant cover is intact, and among this biodiversity, thousands of plant

species can be studied to compose part of this new economic activity, which would help in regional economic development (Cantuaria et al., 2022). The present study carried out a survey of species of bromeliads sold in supermarkets, analyzing their potential for regional economic development.

## 2 MATERIALS AND METHODS

Data from the survey were carried out through visits to the three largest supermarket networks in the Municipality of Macapá. The bromeliads were related to verification of the price practiced on the market. The information was presented in the following categorization: genus, lifeform, marketing value, and bromeliads pictures.

## 3 RESULTS AND DISCUSSION

Found 21 species/hybrids of bromeliads marketed in the supermarkets of the city of Macapá, Amapá, Brazil North, distributed in seven genera, listed in (Table 1).

Table 1 - Bromeliads sold in supermarkets in Macapá, Amapá.

	<b>Genera</b>	<b>Habit</b>	<b>Average price (R\$)</b>
<b>A-K</b>	<i>Neoregelia</i> L.B.Sm.	Epiphyte	R\$:68,01
<b>L-O</b>	<i>Guzmania</i> Ruiz & Pav.	Epiphyte	R\$:61,20
<b>P</b>	<i>Vriesea</i> Lindl.	Epiphyte	R\$:70,00
<b>Q-R</b>	<i>Alcantarea</i> (É.Morren ex Mez) Harms	Epiphyte	R\$:124,99
<b>S</b>	<i>Aechmea</i> Ruiz & Pav.	Epiphyte	R\$:65,00
<b>T</b>	<i>Cryptanthus</i> Otto & A.Dietr.	Epiphyte	R\$:15,94
<b>U</b>	<i>Tillandsia</i> L.	Epiphyte	R\$:50,00

Sources: Authors.

Cantuária et al. (2022) carried out a survey of flowers and ornamental plants in Macapá, State of Amapá, extreme north of Brazil, and in this work was found only the sale of representatives of the genera *Neoregelia* and *Guzmania*, it is observed that in relation to other groups of plants of the Family Araceae Juss. and Orchidaceae Juss., the Bromeliaceae are still with a market to develop. And compared to the other groups it still needs more species available for marketing.

Another criterion to be discussed is the low diversity of species to be made available, and it is important to mention that for a plant to be made available for sale on a large scale, as, in supermarkets, a number of requirements need to be met as stabilized production in commercial plant nurseries, which requires the mastery of in vitro propagation techniques to prevent species being removed from nature; matrices collected

responsibly and taking into account ethical and legal aspects; market acceptability, which is often defined by large producer centers (Holambra/São Paulo); and finally, the biology of the plant to which includes cultural treatments for maintaining the plant in a controlled environment. And that in order for bromeliads to be sold, it needs to go through all these things and still need to have market demand.

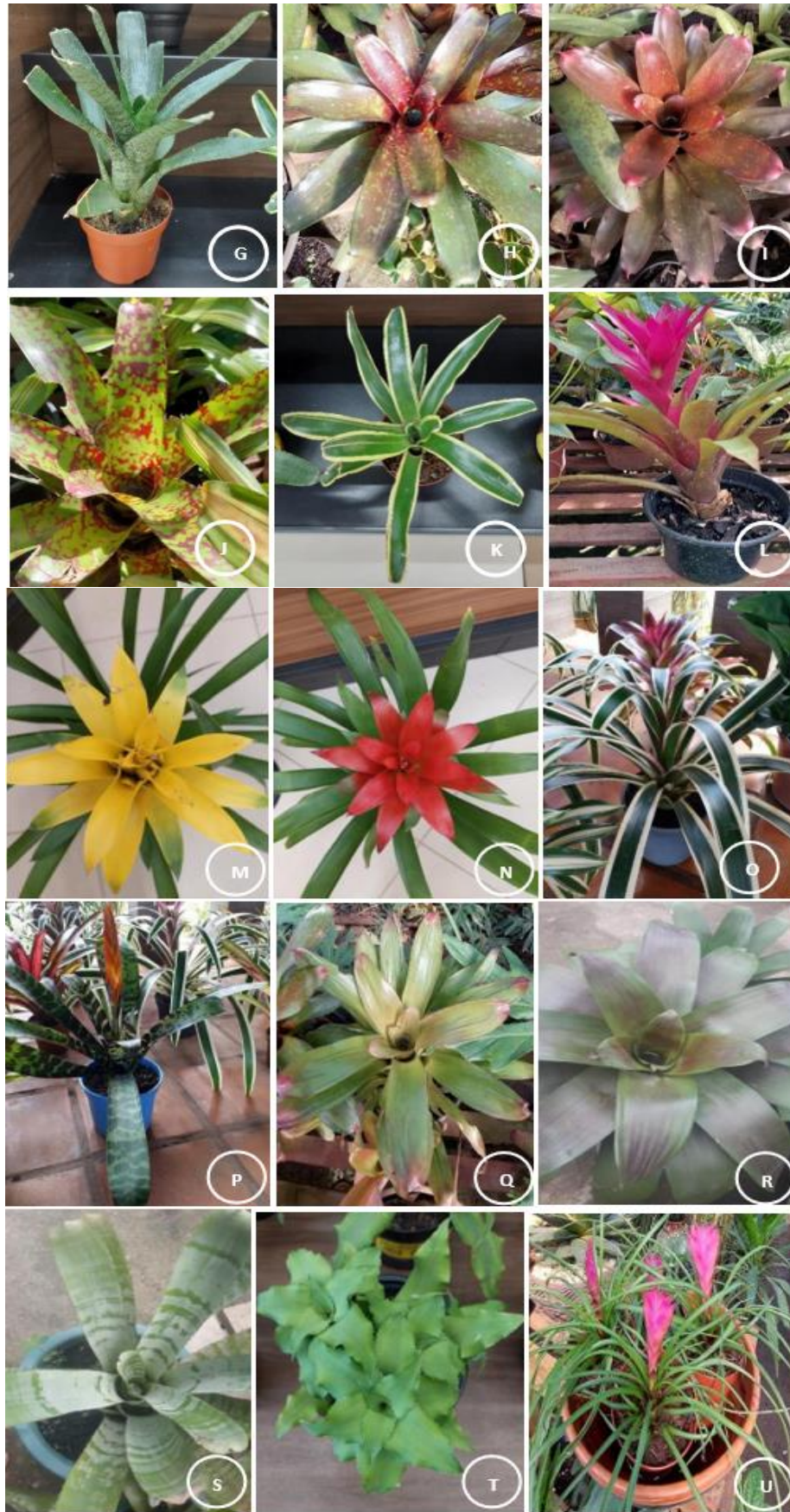
Many aspects still need analysis to better understand the dynamics of the market for flowers and ornamental plants in Macapá, since the State of Amapá is an island, isolated from the other states of Brazil, being accessed only by river and air and this in a way makes the products arrive at much higher prices than practiced in other Brazilian states.

Perhaps the promotion of production in Amapá and strategies for consolidating the market of flowers and ornamental plants involving bromeliads, is one of the strategies that need to be developed in order for the market to contribute to regional development in Amapá

Although there are some residual allowance strategies for biodiversity products in Amapá, never none species native to the region have been able to be included in the local or regional market to be sold. What comes to be a counter census in relation to the rational and commercial use of native species with ornamental potential. Below are presented the individuals found for marketing (Figure 1).

Figure 1 – A. *Neoregelia*; B. *Neoregelia*; C. *Neoregelia*; D. *Neoregelia*; E. *Neoregelia variegata*; F. *Neoregelia*; G. *Neoregelia*; H. *Neoregelia*; I. *Neoregelia*; J. *Neoregelia*; K. *Neoregelia*; L. *Guzmania*; M. *Guzmania* N. *Guzmania*; O. *Guzmania*; P. *Vriesea*; Q. *Alcantarea*; R. *Alcantarea*; S. *Aechmea*; T. *Cryptanthus*; U. *Tillandsia*.







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## **Trajectory and memories of political leader Alcides Prado Nogueira in the municipality of Lafaiete Coutinho/Bahia/Brazil (1952 – 2002)**

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### **ABSTRACT**

This article seeks to understand how Alcides Prado Nogueira exercised political leadership in the city of Lafaiete Coutinho – BA, developing political and social activities. The methodology of Oral History is used here to give the necessary contribution to the writing of the research work, using the narratives of people who have lived with this leadership since the years of the Três Morros district, later the municipality of Lafaiete Coutinho. Authors such as Delgado (2006) report that the best narrators are those who let the words flow in the fabric of a plot that includes memories, records, observations, silences, analyses, emotions, reflections, testimonies. It analyzes the leadership and conduct that Alcides Prado Nogueira had during 50 years of acting in local politics. This is a social, qualitative, empirical research with a narrative approach that highlights the political leadership that Alcides Prado Nogueira exercised in Lafaiete Coutinho.

**Keywords:** leadership, county, local politics, lafaiete coutinho.

## **1 INTRODUÇÃO**

Alcides Prado Nogueira (1914 - 2015), native of the municipality of Vitória da Conquista - Bahia, son of Antonio Pitanga Nogueira and Octaviana Victória do Prado Nogueira, lived 101 years, exercised political leadership since the 1950s, still in the district of Três Morros, municipality of Maracás-Bahia, later municipality of Lafaiete Coutinho.

He began acting in local politics in 1952, when he was appointed to work as a Civil Registry Clerk for Natural Persons with notorious functions in Três Morros, a notary that was jurisdicted by the District of Maracás, later in the late 1960s as part of the District of Itiruçu. In this perspective, the question arises: how did Alcides Prado Nogueira, even though he was not a son of the land and not having economic power, exercise political leadership in Lafaiete Coutinho, overcoming the local hegemonic groups?

He acted as an official of the registry office meeting the demand of the population, giving the contribution to the people, above all, those of low socio-economic profile who could not pay the costs of the fees cartorários, besides actively participating in the social life, religious and cultural district. In 1953 he was one of the founders of the Associação Cultural Esportiva Piraquara - ACEP, then presided over the institution, social club that received the tresmorrense society and later lafaietense at the parties that were held.

He presided over the celebrations of the patron saint San Roque, at which time the festival was held in September. Under his presidency he made the change from the celebration and novena to the month of origin of the Catholic saint that came to be held in the month of August, having its culmination on the 16th, with the realization of the procession through the streets of the district. He actively participated in sports life by giving the support to the football teams that played the games on Sundays and also in trips to other cities in the region. He organized, coordinated and promoted trials for the realization of gangs that performed at the June festivities every year in June.

In 1954 participated in the municipal election supporting Eurides Barbosa da Silva for the position of councilor, representative of Três Morros in the Municipality of Maracás, obtaining a good vote. In 1958 he participated actively in the municipal election supporting Rosalvo Conceição who became elected councilman with a good vote granted by his fellow citizens, having three Morros got two representatives in the municipal parliament. Alcides Prado Nogueira had a free transit throughout the territory of Três Morros,

made many friendships with the people of the community and began to exercise his leadership since his arrival in the district in 1952.

In 1962 he was one of the leaders of the struggle for the emancipation of the territory of Três Morros, along with Governor Juraci Montenegro Magalhães and the deputies Manadro Menahim and Luis Carlos Braga, raising the category of municipality receiving the denomination "Lafaiete Coutinho" dismembered from the territory of Maracás. From that period on, her name was consolidated as one of the most important political leaders of the newly emancipated municipality of Bahia.

## **2 THEORETICAL AND METHODOLOGICAL PERSPECTIVE**

To reconstruct the story of political leader Alcides Prado Nogueira in Lafaiete Coutinho requires the search for input of Oral History narrated by people, politicians, ex. politicians, former residents of the then district of Três Morros, later the municipality of Lafaiete Coutinho. Studies by Alberti (1990) show that "oral history allows not only to understand how the past is conceived by the memories, but mainly how these memories were constituted".

Thompson (1992) emphasizes that "oral history, on the contrary, makes possible a much more impartial judgment: witnesses can now also be summoned from among the lower classes, the underprivileged and the defeated". Simple people from the community of Lafaiete Coutinho who knew and lived with Alcides prado Nogueira. For Alberti (2004, p. 21) the oral history represents a totalizing option against the fragmentation of written documents and because it is centered on the individual, which works, in our culture, as a total compensation for segmentation and levelling in all domains.

Portelli (1997, p. 16) emphasizes that oral history seeks to use the testimony of people who have witnessed or experienced events to reconstitute memories and life stories of people, groups and institutions, and is therefore testimonial is an emerging genre that seeks to listen to people. Delgado (2006, p. 10) reports that oral history, narratives, times, identities, consist of theoretical reflections on accounts, temporalities and constitutive dynamics of identities. It comprises different analyses and inter-relational dynamics between memory between narrated memory, time lived and time remembered by narrators. In this sense, we resort to collective memory that according to Halbwachs (1990) "advances in the past to a certain limit, more or less distant, according to this or that group, beyond this limit it no longer reaches events and people in a direct apprehension". For

Delgado (2006), "memory, both in its individual and collective version, has multiple potentialities, which correspond to the heterogeneity of human experiences". The author also mentions that the act of remembering is almost always individual and memory, as a basis of identities, refers to collective behaviors and mentalities, in that the individual remembering is related to the social and historical insertion of each individual.

Le Goff (2003, p. 469) reports that collective memory is one of the great questions of developed societies and developing societies, of the ruling classes and of the dominated classes, all fighting for power or for life and for survival. Halbwachs (1990, p. 86) points out that all collective memory is supported by a group limited in space and time. The totality of past events cannot be concentrated in a single frame, except on the condition that it is disconnected from the memory of the groups that they kept the memory.

The testimonies of individual memories are also used to supplement what is already known about the life story of Alcides Prado Nogueira. The oral history has given the input providing information through the subjects who narrate the life stories to reconstitute memories, in the specific case of Lafaiete Coutinho, the memories of this leadership with its political trajectory of 50 years of operation in the municipality.

Le Goff (2003) emphasizes that "memory is an essential element of what is usually called identity, individual or collective, whose search is one of the fundamental activities of individuals and societies today". The author also mentions that memory is a glorious and admirable gift of nature, through which we recall past things, embrace present things and contemplate future things, thanks to their similarity with the past.

In this bias, the oral sources are sought as input to make the research with grants interviews with people from the community, especially the elderly, old residents who witnessed the life trajectory of this man in the community of Lafaiete Coutinho. For Halbwachs (2006, p. 29) the individual memories are formed from the relationship with the other: we use testimonies to reinforce or weaken and also to complete what we know of an event about which we already have some information.

Delgado (2006, p. 38) points out that memory is the basis of identity construction and solicitor of individual and collective consciousness. It is a constitutive element of self-recognition as a person and/or member of a public community, such as a nation, or private, such as a family. In the specific case of Lafaiete Coutinho Alcides Prado Nogueira was an active member and participant, exercising his leadership in local politics and giving support to people in the social area of the community.

Nora (1993, p. 09) reports that memory is a phenomenon always current, a link lived in the eternal present; history, a representation of the past. Because it is affective and magical, memory does not settle for details that comfort it: it feeds on vague, telescopic, global or floating, particular or symbolic memories, sensitive to all transfers, scenes, censures, or projections.

Pollak (1992) points out that "the constitution of memory is important because it is linked to the construction of identity. Memory resists alterity and change and is essential in the perception of self and others. To Delgado (2006, p. 51) the memory, while constituting itself as a formative source for History, also constitutes itself as a foundation of identities, through a dynamic process, dialectical and potentially renewable, which contains in its core the marks of the past and the questions and needs of the present time.

In this vein, Alcides Prado Nogueira built his identity as a public man, a political leader who worked in Lafaiete Coutinho for 50 years, with a sense of belonging to the community and its people. Balibar (1996) emphasizes that "the notion of identity becomes more concrete when analyzed from the perspective of belonging, since the representation of 'the we' intersects with the 'I' of the subject to enter into communication with the other.

Hall (2002) points out that "identity becomes a mobile celebration: continuously formed and transformed in relation to the ways in which we are represented or interpellated in the cultural systems that surround us". For Castells (1999) "identities refer to cultural attributes, symbologies, experiences, habits, beliefs, values. It refers to a cast of variables that are permanently under construction".

The trajectory and legacy left by Alcides Prado Nogueira are in the memory of many people from the Lafaiete Coutinho community, but with time they can be erased and forgotten. Ortiz (2006) emphasizes that "national memory and Brazilian identity are symbolic constructions that dissolve heterogeneity of popular cultures in homogenization and ideological narrative.

Besides listening to the people who lived with Alcides Prado Nogueira and who tell and retell stories they have witnessed and even stories heard by parents and grandparents, the stories are also in the memories of older people, former residents, ex-politicians, politicians, and these were obtained through written records by the speech of community collaborators.

Finally, the reconstitution of Alcides Prado Nogueira's memories becomes relevant, because he is a public man who contributed to the history and development of both the Três Morros district and the municipality of Lafaiete Coutinho.

### **3 THE TRAJECTORY AND POLITICAL STRUGGLES OF ALCIDES PRADO NOGUEIRA IN TRÊS MORROS AND LAFAIETE COUTINHO**

Alcides Prado Nogueira's political trajectory and struggles began in 1952, the period in which he started working as a notary public. From his arrival in the then district of Três Morros he began to exercise leadership, he had a free transit among the families and the whole community, both in the district headquarters and in the rural area. In 1954 his leadership in Três Morros called the attention of the hegemonic groups of the municipality of Maracás, which felt threatened in losing their political authorities and in an antidemocratic act requested by Mendes Brasil, a local politician, he asked for his exoneration from the position of Officer of the Civil Register of Natural Persons.

After being exonerated from the position for a period, Alcides Prado Nogueira had the opportunity to return to work as an officer of the registry office, this time through a public contest that at the time consisted of a written test and a typing test, which had a greater weight in the evaluation. She competed for the position with Laura Almeida Ferreira, who was approved in a fraudulent way, with the consent of the hegemonic groups of Maracás.

The result of the contest was questioned, found that the competitor candidate to the post had no skills with typing and after judicial evaluation the contest was annulled. Alcides Prado Nogueira again occupied the title of the registry office, this time as an approved candidate in the contest, with act published in the Official Gazette of the State of Bahia, endorsed by the then governor of Bahia, Antonio Balbino on May 3, 1956.

In 1958 he participated actively in the municipal elections, along with the election also for the posts of state governor, senator of the Republic, state and federal deputies. Contributes in a crucial way to the election of Juraci Montenegro Magalhães to the post of governor, obtaining in Três Morros and also in Maracás an expressive vote, being returned to office, this time for a four-year term, awarded by the suffrage of Bahian citizens.

Three Morros was 90 km away from Maracás, and did not have good access with the offer of vicinal roads, which made good administration by the local mayor difficult. Carvalho (2019, p. 19) points out that the territorial domain of the municipality of



Maracás was quite extensive, covering an area of great territorial dimension, totally hindering the administrative process, leaving the districts in total abandonment. According to Carvalho, the great distance between Maracás and Três Morros and the difficulties of access due to the lack of good roads created obstacles for the realization of a good administration by the local government.

In 1961, discussions began to make possible the political and administrative emancipation of Três Morros, which lacked public policies to improve its infrastructure and the lives of people in the community. Alcides Prado Nogueira articulated himself as local leadership seeking network support at the state level to consolidate the emancipation process.

The other political leaders and influential people of the community met to seek support to achieve the emancipation of Três Morros. Carvalho (2019, p. 19) emphasizes that besides the councilors who represented the district, they also highlighted in this walk: Ariston Pereira, Assemiro Marques de Andrade, Waldemir Temístocles (Didi), Pedro Rodrigues Alves, José de Souza Bastos, Orlando Ferreira Gonçalves, Teobaldo Fernando da Silva, Alfrío José de Oliveira and Alcides Prado Nogueira, who was one of the candidates on the majority plate.

In 1962, the year that the municipal elections were contested, along with the other positions at the state level, the process of emancipation of Três Morros gained strength already in January. According to Carvalho (2019, p. 19) the creation of the municipality of Lafaiete Coutinho took place on February 20, 1962, based on the Law of Creation of Municipalities 1619/62, promulgated in the Official Gazette of Bahia, in the government of Mr. Juraci Magalhães. Received the denomination of Lafaiete Coutinho in honor of the doctor, ex. Professor of the Federal University of Bahia - UFBA, former state deputy and former. Secretary of Public Security of the State of Bahia, Dr. Lafaiete Coutinho.

Alcides Prado Nogueira, exercising his leadership, launched himself as a candidate for mayor running against Eurides Barbosa da Silva in the election held on 7 October 1962, and Eurides was elected for a four-year term, with a slight difference of 76 votes, in a very close contest. In the elections held on 15 November 1966, Alcides Prado Nogueira ran for the position of councilman, obtaining a roll-call vote of 250 votes, with a percentage of 22.4 %, and is considered to be the largest vote for the municipal legislature to date, managed to elect four more candidates in its coalition to compose the City Council.

Since the 1966 elections, his leadership has become even more consolidated, always being sought by municipal and state leaders in search of support in other elections. Carvalho (2019, p. 27) reports that in the minutes of the 6th Ordinary Session of the 2nd Legislative Period of the City Council of the municipality of Lafaiete Coutinho, that at the end of the working was presented a proposition of Councilman Alcides Prado Nogueira, Brazilian, married, major, natural of this State of Bahia, municipality of Vitória da Conquista, resident in this city, elected president of this Legislative on April 7, 1967, to direct the destinations of this house in the current year, in full exercise of his office.

According to Carvalho, Alcides Prado Nogueira was elected to chair the City Council, a term he held for a year between 1967 and 1968. He had great legal knowledge and the internal regulations of the legislative house, besides having free transit in the District of Maracás, as well as in that of Itiruçu. In addition to presiding over the city council, he was elected three more times to the municipal legislature, always with expressive votes granted by his fellow citizens. He also presided over the Internal Regulations of the Chamber, the Municipal Constituent (Organic Law), some important commissions of the House of Laws, in addition to having occupied positions of first and second secretary of the municipal legislative director.

He also presided over important parties in the municipality of Lafaiete Coutinho: the National Democratic Union - UDN and the Brazilian Democratic Movement - MDB that opposed the Military Dictatorship (1964 - 1985). In the period of redemocratization of Brazil presided over the Brazilian Democratic Movement Party - PMDB, with an important support to the candidate for governor of Bahia Francisco Waldir Pires in the state elections in 1986, which obtained in the municipality the expressive vote of 65% of the votes, becoming elected governor of the State of Bahia.

Throughout his political career Alcides Prado Nogueira gave the support to enable good administrations in the mandates of mayors who managed the destinations of Lafaiete Coutinho, with emphasis on: Orlando Ferreira Gonçalves, José de Souza Bastos, Juarez Lira, Florisval Andrade Santos, Eurides Barbosa da Silva, Elzo Pereira Pinto and Eugênio José de Azevedo Santos. He chaired the PMDB until 2002, when he passed the command of the party to the former, Councilman Valdir Rodrigues Gonçalves, completing his public life cycle of 50 years acting at 88 years of age.

At the age of 90 he presented Lafaiete Coutinho with a memoir entitled Vila de Três Morros, Example of a Life, reconstituting the entire history of the municipality, since

the time of the creation of the district of Três Morros in 1935, going through the emancipation of the municipality in 1962, completing the historical record until 2004.

#### **4 THE MEMORIES AND NARRATIVES OF POLITICIANS, EX. POLITICIANS AND FORMER RESIDENTS OF LAFAIETE COUTINHO**

The memories in oral accounts of former residents, politicians and ex. politicians from the municipality of Lafaiete Coutinho were instrumental in the study, conducted through interviews that provided the methodological basis for writing the work. Also used were the book of writer Jonas Gomes de Carvalho, official documents (City Hall, City Hall, District Forum), as well as subsidies acquired through written documents and printed images of political parties.

Collaborator 1 (ex. mayor) reports that:

Alcides always had an important role in Três Morros and Lafaiete. He was one of the founders of the municipality in 1962 and always sought to help the mayors who administered the municipality, even being in opposition exercising the council, always voted in projects that benefited the community. He acted as an opponent of my term as mayor, but always with ethics and respect. Because he had knowledge in the courts because he worked at the registry office, he was very organized and had all the documentation of the parties he presided in perfect order. When he had the opportunity to represent Governor Waldir Pires in the 1980s, he helped a lot with the release of important funds that contributed a lot to the organization of the entire city. He had the privilege of being the first writer of the municipality to write a very good memoir that recorded our entire history. He honored and was honored in Lafaiete at the age of 90.

In the narrative of collaborator 1 who held the office of mayor it is clear that Alcides Prado Nogueira had a relevant performance both at the time of the district of Três Morros and in Lafaiete Coutinho, always participating actively in the municipal administration despite not having exercised the position of mayor. It is also noticed that even being in opposition respected the opponents and was respected by all, besides having a great knowledge in the legal area and the gift of writing, thus giving the contribution to reconstitute the memories of the council.

Collaborator 2 emphasizes that:

Alcides was always an important person for Lafaiete in both politics and social life. He participated actively since the time of Três Morros as a man of respect and prestige. He held all the positions in the city, except for the mayor, and it wasn't him who lost, it was the people, who would certainly have been the best mayor in history. It helped the city a lot, more than some mayors who served in office. I remember that he had bought in 1977 a 0 km Brasília and made sure to give everyone a ride, did not charge anything and also had a lot of knowledge

and helped to retire many people here through the rural background. When the first payment came out people asked when they should and he made a point of not charging anything. I remember when he used to give a ride to Jequié at Lafaiete, and also on his way back to Lafaiete, people would ask him when he owed him, he'd say, You don't owe me anything. He heard it from the mouth of the people: then God will repay him. And God was so good to master Alcides that he lived 101 years and died lucid, because he planted and at the end of life reaped good fruits.

In the speech of collaborator 2 it is noticed that Alcides Prado Nogueira went beyond political, an important citizen for Lafaiete Coutinho. He was called the master because he had a great knowledge. According to collaborator 2 he did not occupy the position of chief executive (mayor), but performed many important actions in benefits of the local population, standing out as a public man with services rendered by the community. He was providing assistance to all who were looking for him, managed to process documents to make possible the rural retirement of many elderly of the municipality, without charging any value for the services provided, using his private vehicle that acquired new, 0 km, always giving the contribution to the most needy people of the whole municipality.

Collaborator 3, retired teacher points out that:

Alcides, the master, as he was called by the people of Lafaiete Coutinho, was a very good man, integret, very respected in the town. He was practically a Catholic, was the president of the festivities of the patron saint São Roque, in which year he held the party with much dynamism. He was also the president of the social club. He actively participated in the social and religious life of the town, he also participated in the sporting events, in the soccer games played on Sundays, he participated in the cultural life, he rehearsed the quadrilhas that were performed during the São João festivities, besides being one of the most important politicians in the history of Três Morros and Lafaiete Coutinho. He was one of the founders of the town in 1962, and was not the only mayor, but did not leave anything to be desired. Lafaiete completed in 2022, 60 years of political and administrative emancipation and owes a lot to master Alcides for all the services rendered to the city. When Waldir Pires was governor of Bahia, he was the president of the party here in Lafaiete, the PMDB, and got many things to help the state schools. I remember that since I was very young I used to hear my parents talk about Alcides with great affection. He left his legacy to Lafaiete not only as a notary public, but also as a public man, and today he is in the memory of the people of Lafaiete as one of the great men in the history of the city and as one of the most beloved patriarchs.

It can be seen in the narrative of collaborator 3 that Alcides Prado Nogueira was a very prestigious public man who left his legacy for having rendered many services for the whole community. He exercised his leadership with the then governor Waldir Pires to give the contribution, above all, in the education of the municipality in schools of state jurisdiction. Collaborator 3 emphasizes that he left his legacy to the whole municipality,

acting as a civil servant, in social, sports, cultural and religious activities and, above all, exercising his political leadership always acting in benefit of the community.

Collaborator 4, e.g. Councilman reports that:

Mestre Alcides acted as one of the most important leaders in the entire history of the municipality of Lafaiete, since the previous period when Três Morros was still a district, belonging to Maracás. He was one of the leaders of the political emancipation of the town, along with deputies Menandro Menahim and Luiz Braga, who negotiated with the governor of the time, Juraci Magalhaes. He actively participated in the entire political history of the town, always getting elected as councilman with expressive votes and, until today, is the record holder in votes for the city council. He managed to get himself elected as councilman in his first election with more than 22% of the votes. Today the highest percentage that can be obtained is 7%, and hardly any other candidate will be able to repeat this vote. I had the privilege of being his colleague for one term, and he always gave us advice, calmed the tempers of his colleagues, and was always willing to help us. He was always present, contributing to Lafaiete, helping with projects that benefited the community. He received from the City Council the title of citizen of Lafaiete, at the time a request made by Councilwoman Edna Ribeiro de Mattos. He died at the age of 101, lived very well, and left a very beautiful story to tell. The city council approved a request to honor him with his name in the health center, less than two months after his death, doing justice to his work. He became immortal to the people of Lafaiete after the publication and launching of his book and now also with his name being honored in the health center.

In the narrative of collaborator 4 is evidenced the importance of Alcides Prado Nogueira to Lafaiete Coutinho, exercising his leadership since the period before the emancipation of the municipality. He left his name in the political history of the community, being until today the most voted councilor to occupy a seat in the municipal legislature, with a vote far superior to current standards. He always acted with great dedication, giving the contribution to projects that benefited the community, being sought by colleagues who needed guidance in the legislative process.

Collaborator 4 also shows that Alcides Prado Nogueira received the title of citizen lafaietense, granted unanimously by the municipal legislature. His name became immortal because he was honored with a public patio, the health center that bears his name, located in Avenida Edna Ribeiro de Mattos, in the seat of the municipality, as Official Gazette Legislative Decree 384/2015, Câmara Municipal, 27 October 2015, year IX, nº 332, besides being the pioneer writer to reconstitute the memories of the municipality in 2004.

In the narratives of the collaborators above is evidenced the leadership of Alcides Prado Nogueira between (1952 - 2002) in Três Morros, later in Lafaiete Coutinho, contributing to the political, administrative and social history of the community. Finally, it

must be thought that his career of 50 years of public life, exercising councilor mandates, acting as an official of the registry and actively participating in all social life, sport, cultural and politics of the municipality left its legacy and today is considered as one of the most prestigious politicians and patriarchs in the history of the municipality.

## **5 FINAL CONSIDERATIONS**

This study demonstrates the political leadership exercised by Alcides Prado Nogueira during half a century of his life. In this perspective, the research has social relevance, because it aims to reconstruct the history and memories of this political leader who lived 101 years of life, crossed two centuries, 50 years dedicated to Três Morros and Lafaiete Coutinho.

In this sense, it is emphasized that the preservation of the population's memories is of fundamental importance for their development and maintenance of records of historical achievements, social life and local politics. Alcides Prado Nogueira created subsidies to exercise his leadership for many years in the community, providing support for political and administrative development, as well as providing assistance to people in need. With a gaze fixed on the political and social history of this man it is possible to perceive the creation of his identity as a public man, a politician who worked in the community of Lafaiete Coutinho. It is noticeable the history of this man being interwoven in his daily life, demonstrating strength and resistance of those who do not escape the fight in difficult periods of our history, especially in the period that Brazil was ruled by military presidents (1964 - 1985), when chaired the MDB and later the PMDB in Lafaiete Coutinho, political parties that opposed the military regime.

The work of this man also encourages the libertarian ideal of the work force of public men who follow the paths of politics to subsidize the community in difficult times. We must think that this man adopted Três Morros and later Lafaiete Coutinho as his homeland, providing the support for growth and development, exercising his political leadership for 50 years dedicated to the entire local community.

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## **Artificial neural networks: basic ideas in high school**

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### **ABSTRACT**

In this paper we describe a principle to apply perceptron neural networks in a way accessible to high school students based only on the concepts of function, aristotelian logic and matrices. It is shown an application of the perceptron neural network in analytical problems about a table of the Brazilian Soccer Championship.

**Keywords:** neural networks, artificial intelligence, perceptron function, ia for high school.

### **1 INTRODUCTION**

Artificial intelligence is very present in our daily lives, and it can certainly help us with the creation of customized learning and teaching environments, allowing interactive platforms and intelligent tutors to guide students on their development journey. Thus, the use of artificial intelligence as a tool for the application of learning strategies can play a relevant role in the new education and school in a broader way. In general, these systems are produced by programming and make available content that is previously curated. When interacting with the platform, students have access to this content and may interact on the platform itself.

In this chapter, we want to address another aspect: that of spreading knowledge on elements of artificial intelligence as a strategy of contextualization of mathematics teaching with an interdisciplinary basis.



According to Kovacz (2006) and Silva et al (2010), artificial intelligence (AI) is a somewhat simple and very comprehensive concept. In general we can summarize AI in a very synthetic way as a concept that refers to machines capable of performing tasks in a way that we consider "intelligent". Machine learning (machine learning in free translation) is the application based on the idea of giving data to machines and letting them learn for themselves.

Artificial neural networks are a type of machine learning. The most striking feature of neural networks is their structuring similar to the network of neurons in our brain, according to Kovacz (2006). They are systems composed of several nodes that interconnect in several branches. Neural networks learn by updating and expanding these links and interconnections.

The proposal of this writing is to describe strategies to work concepts treated in high school for deeper understanding of the functioning of artificial neural networks. Initially we deal with basic aspects that characterize the artificial neural networks, which in synthesis have many elements of automation of the multiplication task and, finally, we make a contribution proposing the simulation of an algorithm of an artificial neural network perceptron (simpler model with only one layer), allowing interpretations of the descriptors of artificial neural networks.

## **2 A BIT OF THE HISTORY OF RNAS**

Artificial neural network is a type of algorithmic system that seeks identification through strategies based on the means observed in the biological neural network. Its goal is not to replicate, but to serve as a model for learning and solving complex problems. The biological nervous system can have architectures of the most diverse complexities. However, these complex systems are composed of simple bases given by neural cells or neurons, which perform different functions. Such nerve cells have a cell body with two types of branches, dendrites and axons.

In 1943, neurophysiologist Warren Mcculloch and mathematician Walter Pitts wrote an article on how neurons could function and, for this, they modeled a simple neural network using electrical circuits (SILVA et al., 2010).

According to Oliveira Jr. (1994) Warren Mcculloch and Walter Pitts created a computational model for neural networks based on mathematics and algorithms called threshold logic (Threshold Logic). This model paved the way for neural network research,

divided into two approaches: an approach focused on biological processes in the brain, and another focused on the application of neural networks to artificial intelligence.

As computers became more advanced, in the 1950s, according to (GADELHA, 2001) it was possible to simulate a hypothetical neural network. The first attempt was made by Nathaniel Rochester of IBM's research laboratories, but unfortunately this first attempt failed (SILVA et al., 2010). In 1956, the Dartmouth Summer Research Project on Artificial Intelligence provided a boost to both Artificial Intelligence and Neural Networks. One of the results of this process was to stimulate research in the area of Artificial Intelligence in the neural processing part (OLIVEIRA JR.; 1994). In 1958, the Perceptron Artificial Neural Network was introduced by Frank Rosenblatt, inspired by the works of Walter Pitts and Warren Sturgis Mcculloch. This model is one of the oldest and deals with a single neuron, classifying the result in a linear way. In other words, when a set can be classified from contour determined by linear functions.

According to Kovacz (2006), in 1959 Bernard Widrow and Marcian Hoff from Stanford developed models called "ADALINE" and "MADALINE". The names come from the use of multiple Adaptive Linear elements. ADALINE was developed to recognize binary patterns so that if it was reading broadcast bits from a telephone line, it could predict the next bit. MADALINE was the first neural network applied to a real-world problem, using an adaptive filter that eliminates echoes in telephone lines. Although the system is from the 1960s, as well as air traffic control systems, MADALINE is still in commercial use.

On the other hand, given the complexity of human society, these earlier successes led people to exaggerate the potential of neural networks, particularly in light of the limitation in electronics then available at the time. This excessive exaggeration, which stemmed from the academic and technical world, infected the general literature of the time. Moreover, many writers began to reflect on the effect the "thinking machines" would have on the home. Asimov's series on robots revealed the effects on man's morals and values when machines were able to do all of humanity's work. Other writers have created more sinister computers, such as HAL's 2001 film. All this discussion about the effect of Artificial Intelligence on human life has made some respected voices criticize research on neural networks. The result was a drastic reduction of much of the research funding. This period of atrophy in AI research lasted until 1981.

In 1982, several events sparked renewed interest. John Hopfield of Caltech presented a document to the National Academy of Sciences. Hopfield's approach was not simply to model brains, but to create useful devices. With clarity and mathematical analysis, he showed how these networks could work and what they could do. In this way, investment in AI research was reborn. In 1986, with multi-layered neural networks in the news, the problem was how to extend the Widrow-Hoff rule to multiple layers. Three independent groups of researchers, among them David Rumelhart, a former member of Stanford's psychology department, presented similar ideas that are now called backpropagation networks because they distribute pattern recognition errors throughout the network.

## 2.1 MULTILAYER PERCEPTRON

According to Oliveira Jr. (1994) this type of network was created in order to deal with the problems not linearly separable. Layers of hidden neuron were added to Rosenblatt's model, then forming the Multilayer Perceptron Artificial Neural Network (MLP).

## 2.2 MLP ARTIFICIAL NEURAL NETWORK MODEL

This new topology functions as a feedforward network (progressive network, in the output of one neuron connects with another neuron of the next layer, in the left/right direction), formed by a set of neurons called "nodes" (KOVACZ, 2006; SILVA et al., 2010). The network has an input layer (no computational function), one or more hidden layers, and an output layer. The complexity of the MLP network is due to the amount of hidden layers that exist and the amount of neurons that these layers possess.

Deepening knowledge about artificial neural networks autonomously becomes easy when one already has some specific knowledge about mathematics and programming for machine learning, that is, who knows calculus (derivatives), the basic of linear algebra, statistics and programming. The entire functioning of the neural network is modeled by matrix operations, so that when we use several neurons in parallel we have a neural network. One can think of each neuron as receiving signals from input variables and passing on a weighted and treated version of this signal (OLIVEIRA JR., 1994). These parallel neurons form a hidden layer of the neural network. We can treat the output

of each neuron as a variable of the input of another hidden layer. So we can stack up hidden layers and produce a deep neural network.

To better understand them, let's start from a very simple neural network: a linear regression model, which can be understood as a neural network with a single layer.

Figure 1 - Matrix representing the operation determined by the inputs and the output.

$$Xw = y$$

$$\begin{bmatrix} 1 & x_{11} & \dots & x_{1d} \\ 1 & x_{21} & \dots & x_{2d} \\ \vdots & \vdots & \vdots & \vdots \\ 1 & x_{n1} & \dots & x_{nd} \end{bmatrix} \times \begin{bmatrix} w_0 \\ w_1 \\ \vdots \\ w_d \end{bmatrix} = \begin{bmatrix} y_0 \\ y_1 \\ \vdots \\ y_n \end{bmatrix}$$

Source: of the authors.

In Figure 1, the vector (W0, w1, .... wd) represents the synaptic weights of the neurons of this layer and the vector (y0, Y1, .... yn) is the output or approximation obtained from the initial data.

To add more neurons to this neural network, just expand the parameter matrix. In addition, we will calculate the multiplication of matrices by one more vector, maintaining the consistency of the output. So we have the model of a neural network with more neurons:

Figure 2 - Multilayered Neural Network

$$(XW_1)w = y$$

$$\begin{bmatrix} 1 & x_{11} & \dots & x_{1d} \\ 1 & x_{21} & \dots & x_{2d} \\ \vdots & \vdots & \vdots & \vdots \\ 1 & x_{n1} & \dots & x_{nd} \end{bmatrix} \times \begin{bmatrix} w_{01} & w_{01} & \dots & w_{0m} \\ w_{11} & w_{11} & \dots & w_{1m} \\ \vdots & \vdots & \vdots & \vdots \\ w_{d1} & w_{d1} & \dots & w_{dm} \end{bmatrix} \times \begin{bmatrix} w_{01} \\ w_{11} \\ \vdots \\ w_{d1} \end{bmatrix} = \begin{bmatrix} y_0 \\ y_1 \\ \vdots \\ y_n \end{bmatrix}$$

Source: of the authors.

In Figure 2, the vector (W01, W11, .... wd1) represents the final synaptic weights of the combination of all layers and the matrix W1 = (Wij) represents the intermediate operations of the vector layers (y0, Y1, .... yn) is the output or approximation obtained from the initial data.

It is important to realize that the W matrix is the hidden layer of the neural network and each column of this matrix is a neuron of the hidden layer. We can think of the vector

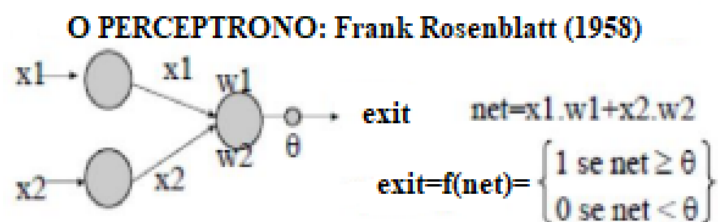
as an output layer with a single neuron, which receives the signal from the previous neurons, weighs them and produces the final output of the network. This neural network is not very interesting from a practical point of view, because it can only represent linear functions.

To deal with nonlinearity, the composition of functions is used, applying a function  $\gamma$  to the above equation. When nonlinearity is considered, Rnas can represent any function, given a sufficient number of neurons. The greater the number of neurons, the greater the capacity of the model. It is also important to note that when we introduce non-linearity in the neural network, the cost function that we will optimize becomes non-convex and extremely complicated to optimize, making the training process considerably more difficult.

### 3 APPLICATION IN HIGH SCHOOL

Artificial neural networks (Rnas) are tools for scientists to work for a better understanding of the mechanisms of the cognitive process. Engineers use this powerful tool as a process to implement electrical circuits, develop parallel and distributed computers, apply pattern identification in safer and more comfortable equipment construction and optimization.

Figure 3 - First Model of Artificial Neural Networks for two Variables























**FUNDAMENTAL EQUATION OF THE PERCEPTRON**

$w1.x1 + w2.x2 = \theta$  ← EQUATION OF A LINE

Source: SILVA et all

The Perceptron model identifies patterns relative to bounded subsets of a plane that can be bounded by a line. At first it seems little, but we will see a practical application. Consider the table of information concerning the final of the championship brazilian 2019.

Table 1 - Brazilian Championship Classification 2019.

		Pt	Jg	V	D	E	G+	G-	S
1	 Flamengo	90	38	28	6	4	86	37	49
2	 Santos	74	38	22	8	8	60	33	27
3	 Palmeiras	74	38	21	11	6	61	32	29
4	 Grêmio	65	38	19	8	11	64	39	25
5	 Athletico-PR	64	38	18	10	10	51	32	19
6	 São Paulo	63	38	17	12	9	39	30	9
7	 Internacional	57	38	16	9	13	44	39	5
8	 Corinthians	56	38	14	14	10	42	34	8
9	 Fortaleza	53	38	15	8	15	50	49	1
10	 Golás	52	38	15	7	16	46	64	-18
11	 Bahia	49	38	12	13	13	44	43	1
12	 Vasco da Gama	49	38	12	13	13	39	45	-6
13	 Atlético-MG	48	38	13	9	16	45	49	-4
14	 Fluminense	46	38	12	10	16	38	46	-8
15	 Botafogo	43	38	13	4	21	31	45	-14
16	 Ceará SC	39	38	10	9	19	36	41	-5
17	 Cruzeiro	36	38	7	15	16	27	46	-19
18	 CSA	32	38	8	8	22	24	58	-34
19	 Chapecoense	32	38	7	11	20	31	52	-21
20	 Avaí	20	38	3	11	24	18	62	-44

Source: by own authorship

Patterns for a variable are easy. For example, point sorting points to a ranking in which the teams with the most points are ahead. But this data brings more information. If we want to identify patterns relating more than one variable, for example points and goal balance, we can have other information, new groups:

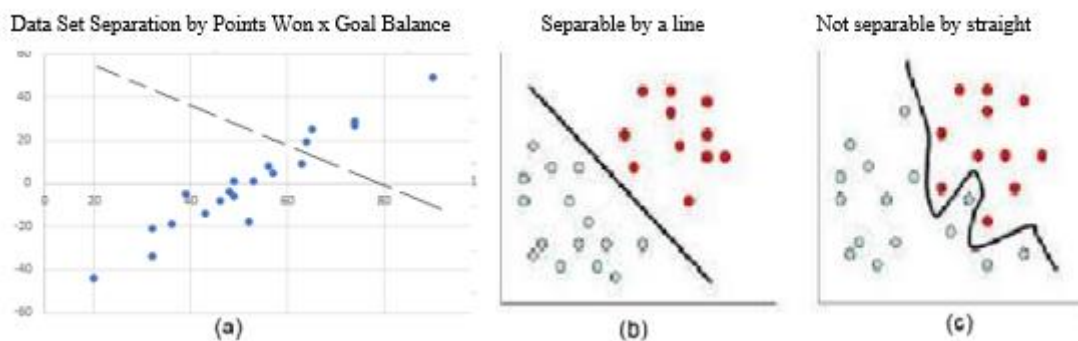
Table 2 - Data on points won, defeats and goals balance.

Teams	Points Earned	Derotas	Goal Balance
E1	90	4	49
E2	74	8	27
E3	74	6	29
E4	65	11	25
E5	64	10	19
E6	63	9	9
E7	57	113	5
E8	56	10	8
E9	53	15	1
E10	52	16	-18
E11	49	13	1
E12	49	13	-6
E13	48	13	-4
E14	46	16	-8
E15	43	16	-14
E16	39	21	-5
E17	36	19	-19
E18	32	16	-34
E19	32	22	-34
E20	32	20	-21
E21	20	24	-44

Source: by own authorship

Let’s represent the graph of how points (x, y) where x indicates points won and y goal balance.

Figure 4 - Representations of the partition in a set of points in two distinct subsets.



Source: the author himself.

In Figure 4 (a) the set of points that represent the teams of the Brazilian championship in which each team is represented by a point (x, y), where x is the amount of points of the team and y the balance of goals, separated by line  $y = 40 - 49x$ , which separates the points in two sets. This means that the perceptron neural network is able to identify the pattern that distinguishes the points above and below the line. The synaptic weights for this identification are the equation coefficients and the Bias ( $W_0$ ) is 40. In Figure 2 (c) one has a hypothetical representation of a set of points that is divided so that

a single line does not separate the set of red and blue points. It's a situation where perceptron-like neural networks aren't able to classify with full accuracy. Figure 2(b) represents a hypothetical situation in which the set of points is partitioned by a line that allows the set of red and blue points to be distinguished. It is worth noting that the separation line is not unique; thus the perceptron network is able to fully classify the red dots of the blues by one of the lines that separates the red dots from the blue dots.

Table 3 - Data on points won, defeats and goals balance.

Teams	Points Earned	Derotas	Goal Balance
E1	90	4	49
E2	74	8	27
E3	74	6	29
E4	65	11	25
E5	64	10	19
E6	63	9	9
E7	57	113	5
E8	56	10	8
E9	53	15	1
E10	52	16	-18
E11	49	13	1
E12	49	13	-6
E13	48	13	-4
E14	46	16	-8
E15	43	16	-14
E16	39	21	-5
E17	36	19	-19
E18	32	16	-34
E19	32	22	-34
E20	32	20	-21
E21	20	24	-44

Let's analyze now Filling the points, with the components x indicating defeats and y indicating goal balance.

Figure 5 - Representation of the teams of the Brazilian championship from pairs in which the components are the number of defeats and the balance of goals.



Source: by own authorship



In Figure 5, the line  $y = 20 - 22x$  separates the points into two sets. This means that the perceptron neural network is able to identify the pattern that distinguishes the points above and below the line. The synaptic weights for this identification are the equation coefficients and the Bias ( $W_0$ ) is 20. Note that the classes highlighted in gray are distinct goods from the previous ones, that is to say that these six elements have the same pattern if the variables to be taken as decisive are defeats and goal balance.

Table 4 - Data on points won, defeats and goals balance.

Teams	Points Earned	Derotas	Goal Balance
E1	90	4	49
E2	74	8	27
E3	74	6	29
E4	65	11	25
E5	64	10	19
E6	63	9	9
E7	57	113	5
E8	56	10	8
E9	53	15	1
E10	52	16	-18
E11	49	13	1
E12	49	13	-6
E13	48	13	-4
E14	46	16	-8
E15	43	16	-14
E16	39	21	-5
E17	36	19	-19
E18	32	16	-34
E19	32	22	-34
E20	32	20	-21
E21	20	24	-44

A little more detail...

Considering the Table - 1 - Classification of the Brazilian Championship, we can observe characteristic patterns of the teams according to the evaluation of their general results of the variables in question. For example, taking into account the variables points earned and goals pros, one can make the following binary analysis of the teams Flamengo, Goiás, Atlético Mineiro and Avaí, for example.

Consider the variables x points and y goals pros

Table 5 - Binary Analysis concerning the performance of four teams from two variables

Team	Linguistic variable analysis x (B and NB)	Linguistic variable analysis y	income
Flamengo	Good	Good	Good/good
Goiás	Good	Not good	Good/Bad
Atlético MG	Not good	Good	Good/Bad
Avaí	Not good	Not good	Poor/bad

The table above represents a bank of the final results obtained by the 4 teams in the Brazilian championship referring to the variables pro points and goals. In the income column can have different values according to the more or less critical analysis.

Note that we can identify the table above with one of the following:

Table 6 - Binary data with representations with zeros and ones associated with a mild evaluation

X1	X2	Y ( result)
1	1	1
1	0	1
0	1	1
0	0	0

Source: by own authorship

Table 7 is obtained from Table 5 with the substitution of the linguistic variables by zero and one, with the last column obtained from the definition of the yields: good, bad, bad and bad, that is, the understanding that only the first team is attributed to good performance and the other teams are attributed to bad returns, referring to the variables of the problem.

To a perceptron, it says:

$$w_i(n + 1) = w_i(n) + \eta(d(n) - y(n)).x_i(n)$$

Where:

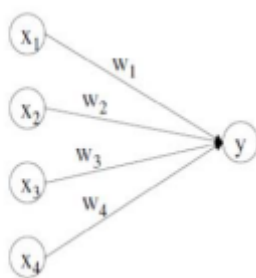
- $\eta$  = learning rate (or coefficient)
- $d(n)$  = desired output
- $y(n)$  = actual output
- $\delta = d(n) - y(n)$  = error
- $x_i$
- $(n)$  = entry  $i$ ,  $1 \leq m$

We will apply the perceptron algorithm to identify the pattern defined in table 1 of the clubs (one of the binary tables above).

Consider now a real (usual) activation function  $f(v) = \begin{cases} 1, & \text{if } v \geq 0 \\ 0, & \text{if } v < 0 \end{cases}$

Let's take learning rate  $H=1$  and file  $\theta = 1$ , and let's simulate network operation.

Figure 6 - Representation of the architecture of a neural network for four input variables.



Source: by own authorship

Still with data from Table 1 - Brazilian Championship Classification 2019, we will take the following variables: X1 - points won, X2 - goals pros, X3 - number of defeats and X4 - goals suffered.

Consider the following binary classification assigned to some teams (by quiz) and the respective tabulation, where 1 indicates positive evaluation of the variable by the fans and -1 a negative evaluation.

Table 8 - Binary description of six teams of the Brazilian championship due to four variables

Team	Points	Goals Pros	Defeats	Goals conceded	Evaluation
Atlético	1	-1	1	1	1
Flamengo	1	1	1	1	1
Grêmio	1	1	-1	1	1
Corinthians	-1	-1	-1	1	-1
Fortaleza	-1	1	-1	1	-1
Goiás	1	-1	1	-1	-1

Source: by own authorship

In Table 8, a binary representation with values 1 and -1 associated with the variables points, pros goals, defeats and suffered goals pointed in columns and evaluation is a critical attribution on the total performance of the teams in the championship.

Let's simulate the perceptron algorithm on the data and see that the network can recognize this type of pattern.

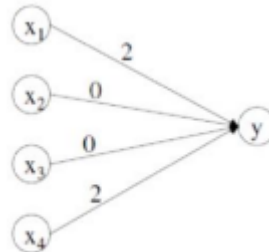
Table 9 - Simulation/Training process by perceptron algorithm in Table 8

X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	Y <sub>in</sub>	Actual Output	Depejada Exit	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>
							0	0	0	0
1	-1	1	1	0	-1	1	1	-1	1	1
1	1	1	1	2	1	1	1	-1	1	1
1	1	-1	1	-1	-1	1	2	0	0	2
-1	-1	-1	1	0	-1	-1	2	0	0	2
-1	1	-1	1	0	-1	-1	2	0	0	2
1	-1	1	-1	0	-1	-1	2	0	0	2
1	-1	1	1	4	1	1	2	0	0	2
1	1	1	1	4	1	1	2	0	0	2
1	1	-1	1	4	1	1	2	0	0	2

Source: by own authorship

Note in Table 9 that the synaptic weights stabilize from the 4th (fourth line) step in (2, 0, 0, 2), and therefore the final result obtained by perceptron algorithm in training from the data in Table 9.

Figure 7 - Representation of the final synaptic weights obtained by the perceptron algorithm



Source: by own authorship

Figure 7 represents the final results from the training of the Percepto Neural Network with four variables applied to the data that make up the analysis of Table 8.

#### 4 FINAL CONSIDERATIONS

Currently the models that have attracted the most attention of the community are the models based on artificial neural networks. This tool has become one of the mainstays of AI as a whole.

In this introduction to neural networks, we are dealing with an extremely simplified model, so that, in a simpler way, we understand the functional basis of neural networks, this powerful structure that allows great flexibility in the architecture of technical models.

Certainly, Rnas are one of the most interesting strategies for developing Machine Learning models. We highlight some properties associated with Rnas:

- a) They are quite simple in handling, once understood the linear models;
- b) Has an interesting mneumonia, IE, the operation is somewhat intuitive, allows us to interpret learning levels of hierarchical abstractions;
- c) they are very flexible, making them ideal for solving the most diverse types of problems;
- d) They produce results in a very dynamic and effective way, in addition to the quality of the results.

On the other hand, there are some disadvantages of artificial neural networks. The most observed disadvantage is that RNA-based models are usually very large, requiring

high computational power. Another disadvantage is the performance of network training, as training an RNA can be extremely difficult. For this reason, it was only in 2008 that the scientific community was able to find methods to train efficiently the most complex models available.

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## **Elaboration of functional bread with adding grape bagass flour**

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### **ABSTRACT**

We sought to develop bread enriched with fibers and antioxidants from grape marc flour from residues from the production of fine wines from the São Francisco Sub-Middle Region. Three bread formulations were prepared: PP - standard (wheat flour), PFUV5% (wheat flour + 5% grape flour), PFUV10% (wheat flour + 10% grape flour). To determine the chemical characteristics, moisture, carbohydrates, proteins, lipids, dietary fiber, ash were evaluated. Sensory analysis was evaluated by the attributes of appearance, color, texture, aroma, flavor, and global acceptance, in addition to purchase intent. In view of the results found, the development of bread enriched with grape residue flour proved to be a viable alternative, through good acceptance, of the sample with the highest concentration of grape residue (10%). It is also well accepted in the analysis of purchase intention, indicating that the developed product has commercial potential, being able to compete in the market with similar products available.

**Keywords:** grape, garbage, functional food, dietary fiber.

## **1 INSTRUCTION**

The constant changes in the population's eating habits are creating trends within the food industry. The use of ingredients obtained from industrial by-products has been increasingly encouraged due to its nutritional potential, economic gain and as a way to avoid the barriers found for the realization of adequate disposal. In addition, there is a growing concern about healthiness and the search for ingredients that promote benefits related to its intake (Abud; Narain, 2009).

On the other hand, solid waste is generated during the production of wine. The seeds, husks, stems (bagasse), besides the filtered material of the liquids are solid residues of the industrialized grape that may present economic interest (Perin, 2011). Bagasse contains compounds that have not been fully extracted during the wine manufacturing process, such as antioxidants, dyes and others that have potentially functional activities (Perin, 2011).

The residues of wine production represent about 30% of the volume of grapes used in the process. It is estimated that the residue produced by wineries in the processing of white wines represents about 31.7 kg of waste per 100 kg of processed grapes, while the red produces a total of 25 kg. Of the 31.7 kg produced by white grapes, 20 kg are of bagasse and red grapes, 25 kg of residue corresponds to 17 kg of bagasse (Lopes, 2013).

One of the alternatives for the recovery and conservation of the waste discarded by the grape products industry is its use as flour. Grape flour can be used in the preparation of biscuits, breads, cereal bars, homemade pasta, vitamins, juices, being very useful for diabetics who cannot consume the fruit in natura by its sugar content. Flour has a high fiber content and high flavonoid concentration, and as well as grape, it has a high antioxidant activity, with application in the fight against free radicals and prevention of neurodegenerative diseases (Araújo, 2010).

In turn, bread is considered a popular food, due to its high availability and to be a food of affordable cost to the population, besides its much appreciated sensory characteristics. According to Resolution DRC No 90 of 18 October 2000, bread is the product obtained by cooking, under technologically appropriate conditions, a fermented or unfermented dough, prepared with wheat flour and other flour containing gluten-forming proteins or added gluten-forming proteins and water, and may contain other ingredients. It is possible to observe a great diversity of breads enriched with dietary fibers from various sources, and thus create more and more innovative formulations providing



food technology, with a view to obtaining differentiated products in the market (Borges et al., 2011).

In this context, due to the high consumption, the nutritional and functional characteristics of the grape and the large wine production present in the São Francisco Valley region, the objective was to produce a bread using flour made from grape residue, as a way of contributing to reducing the environmental impact and making better use of the functional elements present in these meals.

## **2 METHODOLOGY**

The acquisition of the ingredients was carried out in the local market of the city of Petrolina, Pernambuco, Brazil, and the obtaining of the residues for the production of grape marc flour were obtained from the Rio Sol winery, belonging to the Vinibrasil group, located in the rural area of the municipality of Lagoa Grande, Pernambuco, Brazil.

### **2.1 EXPERIMENTAL PLANNING**

For the experimental planning, factorial 2<sup>1</sup> was used, where the independent variable is the concentration of grape residue (%). As dependent variables, acceptance in relation to the products' sensory attributes, phenolic compounds concentration, antioxidant activity and dietary fibers were evaluated in the final product.

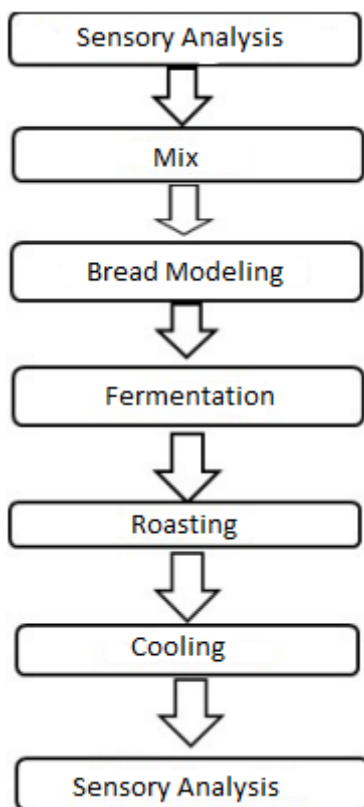
### **2.2 PREPARATION OF GRAPE RESIDUE FLOUR**

The seeds and shells were dried by means of a food dehydrator (Nesco®), processed in a blender of the brand Arno, model LN42 with 550w of power, and in sequence the powder from the grinding was tamizado in muslin sieve.

### **2.3 BREAD PRODUCTION**

The production of the bread was performed according to the flowchart as shown in figure 01, in which the samples were differentiated only in the concentration of grape pomace flour. A control production (0%), without grape marc flour, was prepared. In the other productions were administered for enrichment in fiber and antioxidants at concentrations of 5% and 10%

Figure 1. Descriptive flowchart of the bread production process. Petrolina, PE. 2019.



The following procedures were adopted for the preparation of the bread dough: first the yeast, sugar and salt were mixed, then the liquid ingredients and eggs were added (Table 1). The flours were added gradually until they formed a soft mass and were finally beaten. After the dough was mixed until it did not stick to the hands, it was placed in a container to ferment for 1 hour until it doubled in size. It was beaten again, and then the loaves were modeled and stored at room temperature (30°C) for 1h for the size increase. The kiln temperature was 200°C preheated and the cooking time was approximately 30 minutes.

Table 1. Formulation of bread increased with grape pomace flour. Petrolina, PE. 2019

INGREDIENT
White wheat flour
Grape Residue Flour
Baking powder
Demerara sugar
Salt
Egg
Milk
Oil

## 2.4 SENSORY AND PURCHASE INTENT ASSESSMENT

The evaluation of the sensorial acceptance of the loaves was performed by means of acceptance test by hedonic scale structured with 9 points with notes that varied from very much liked (1) to very much dislike (9). Intent to purchase was assessed through a 3-point scale (1 = would certainly not buy, 2= would probably buy and 3= would certainly buy) and the results were evaluated through the frequencies assigned on the intent scale, using the method described by the Adolfo Lutz Institute - IAL (Brazil, 2005) and Oliveira's adapted questionnaire (2011).

The team of tasters was formed by 50 untrained evaluators, older than 18 years (Brazil, 2005). The samples were coded with three random digits and served in individual cabins where the tasters assigned a note to each analyzed parameter and indicated the preference between samples.

## 2.5 CARACTERIZAÇÃO QUÍMICA

The physical and chemical analysis was performed with the sample that presented the highest sensorial acceptance rate (10%). Total dietary fiber determinations were performed according to AOAC procedure (1997), method number 991.43. The carbohydrate content was estimated by difference, excluding the fibers and iminuindo of 100 the sum of proteins, lipids, ash, moisture and total dietary fiber. Moisture, protein, lipid and ash determinations were performed according to the 1995 AACC procedures, methods numbers 44-15 A, 46-12, 30-20 and 08-12, respectively. The total energy value of the samples was estimated considering the Atwater conversion factors (Guimarães, Silva, 2009). The analyses were performed in triplicate and the results were expressed in percentage. The analyses were performed in the general chemistry laboratory of the Federal University of Vale do São Francisco (UNIVASF) Petrolina campus, and in nutrition laboratories I and II of the UPE Petrolina campus.

## 2.6 STATISTICAL ANALYSIS

The data set was constructed in Excel (Version 1910 Microsoft Office 365 ProPlus) and statistical analysis was performed using Epi Info 7.2 (Version 7.2.3.1, June 28, 2019, CDC), using the  $X^2$  test, and Prisma Version 5.0 (GraphPad, USA) using descriptive statistics (mean and standard deviation) with p-value < 0.05.

### 3 RESULTS AND DISCUSSION

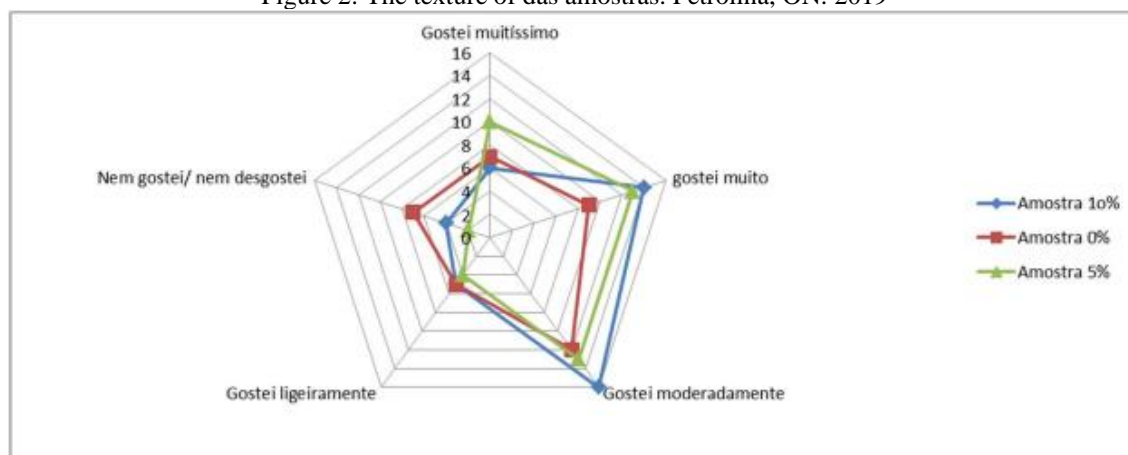
#### 3.1 SENSORY ACCEPTANCE OF THE BREAD

Of the 50 tasters who participated in the sensory tests, 42% (n= 21) were male and 58 (n= 29) were female. At least 94% (n=47) were aged up to 25 years old, and 79.17% were college students.

When analyzing the texture, comparing the samples 10% and 0% ( $P<0.0395$ ) and 10% and 5% ( $p<0.0027$ ), the sample 10% got the best results in the responses I liked it very much and I liked it moderately. On the other hand, when comparing the samples 0% and 5% ( $p<0.0003$ ), a sample with 5% of the treatment obtained the best result for a great liking, a great liking and a moderate liking (Figure 2).

Thus, when analyzing the texture parameter, it is noted that the samples with the treatment obtained a better acceptance in relation to the control, demonstrating a better acceptance with the increase of the concentration of grape flour in the bread. Different results were found by Balestro et al. (2011), in which their samples were not well accepted in terms of texture when raising the values of wheat fiber, with a reduction in the acceptance of formulations with higher concentrations. This fact can be explained by increasing the concentration of bagasse flour, a greater absorption of water and with this the change of texture. The measurements obtained by Dias et al. (2016) were similar, the formulation with 15% grape flour showed greater acceptance by tasters, accounting for 43.33% of responses, 5FBU accounted for 33.33% and 10FBU accounted for 30% of responses (a difference of 3,33 % between the two formulations).

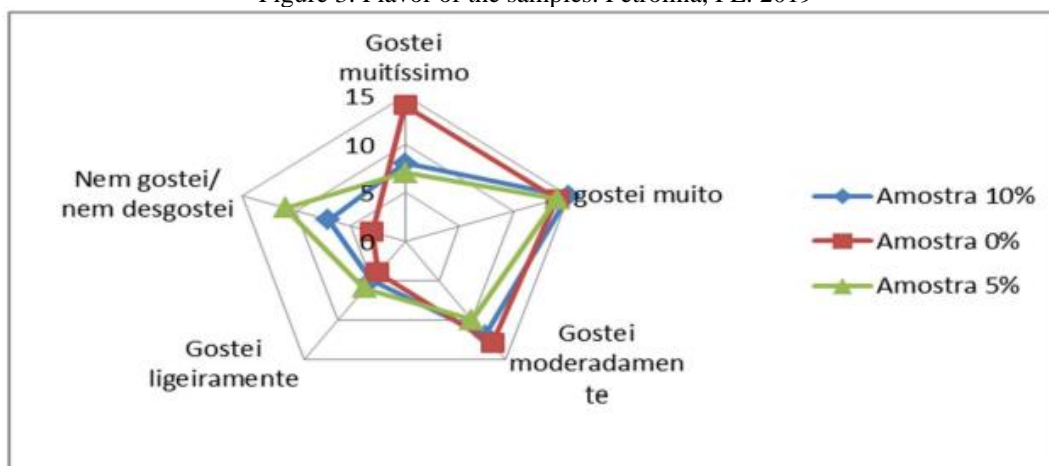
Figure 2: The texture of das amostras. Petrolina, ON. 2019



Regarding the aroma, it was verified that the sample 0% (control), when comparing the samples 10% and 5% ( $p<0.0338$  and  $p<0.0069$ , respectively) obtained a

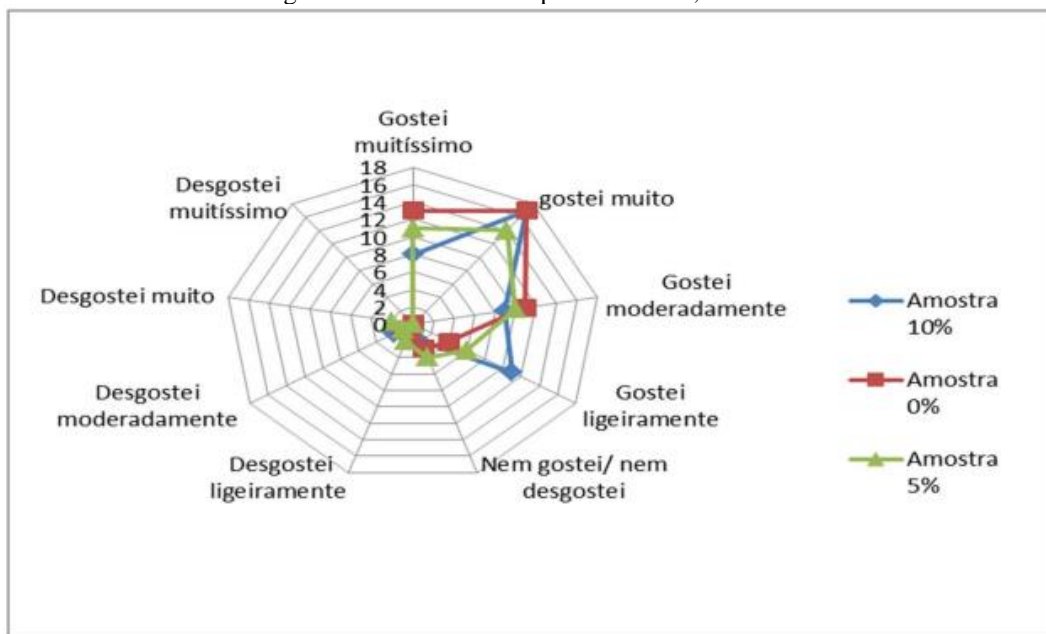
higher preference. When comparing the sample 10% and 5% there was no significant difference ( $p > 0.05$ ), that is, the characteristic aroma of the grape residue did not please the tasters (Figure 3). According to Abreu (2018), this fact can be explained because the volatile compounds responsible for the aroma in the grapes are predominantly in the shells and solid parts of the cells, for this reason grape peel flour has an intense aroma which leads to less acceptance when added at higher concentrations in certain preparations. Bennemann et al. (2006) found higher acceptance for the aroma attribute in the sample of extruded snack with 5% compared to the sample with 10% grape peel flour. It also observed that a 5% sample was preferred over the control sample (without grape peel flour), which may indicate that in low quantity, grape flour may contribute to the increase in the acceptability of the product in relation to the taste.

Figure 3: Flavor of the samples. Petrolina, PE. 2019



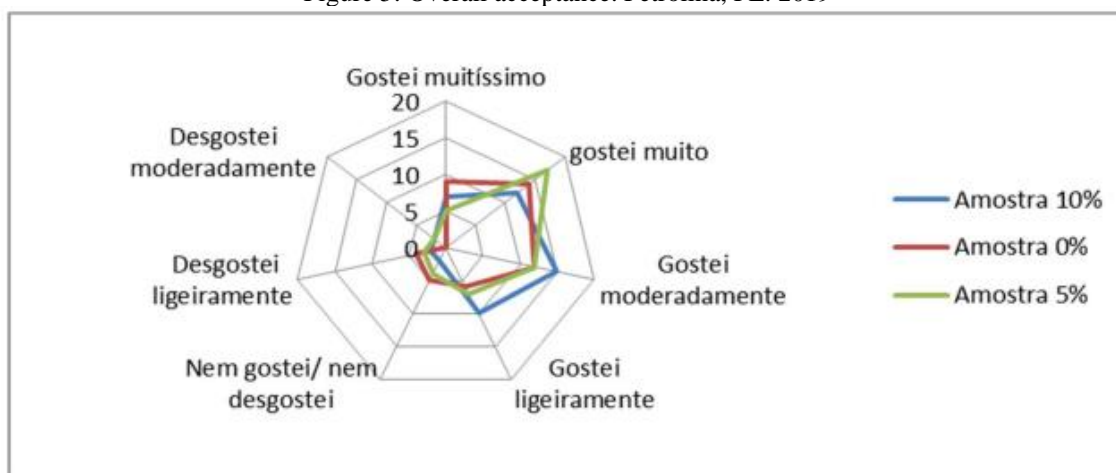
Regarding flavor, when comparing the samples 0% (control) and 5%, there was no significant difference ( $p > 0.05$ ). However, there was a preference of those tested by the 5% sample, when compared to 10% ( $p < 0.0001$ ). Regarding the treatment with higher concentration (10%) and the control (0%) there was no difference (figure 4), that is, the tasters showed that the insertion of higher flour concentration did not harm the sensory characteristics of the product. According to Santucci et al. (2003), the mixture of flour from unconventional products with wheat flour improves the nutritional quality of products and can increase their palatability making these products more accepted by consumers.

Figure 4: Taste of the samples. Petrolina, PE. 2019



The last attribute evaluated by the tasters was the global acceptance of the product, when analyzing the samples 10% and the control, the sample with higher concentration of the treatment obtained a better acceptance ( $p < 0.0044$ ). In relation to 0% and 5% there was no statistical difference, as there was no difference between treatments (Figure 5). The averages obtained by Perin; Schott (2011) were similar, and obtained grades between 7 (I liked it moderately) and 8 (I liked it very much) for samples with substitution of wheat flour for 5 and 10% of grape marc flour, and average between 6 (I liked it slightly) and 7 (I liked it moderately) for sample with 15% of bagasse flour.

Figure 5: Overall acceptance. Petrolina, PE. 2019



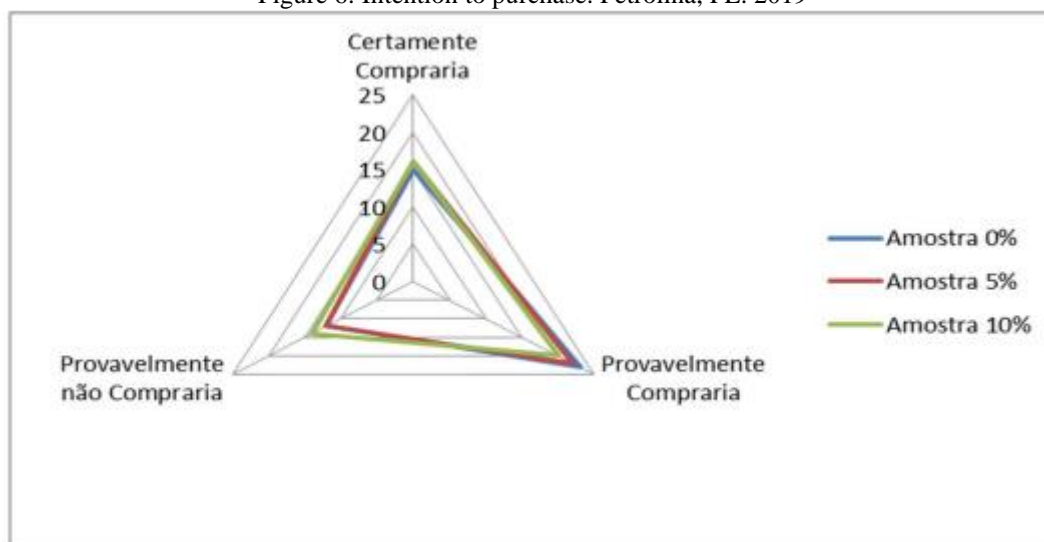
### 3.2 ANALYSIS OF THE PURCHASE INTENTION

In figure 6 it is possible to visualize the results of the analysis of the intention to buy the loaves. It was verified that there was no significant difference between the samples with 10% and the control ( $p > 0.05$ ), in the intention of purchase (probably buy).

The results obtained from the analysis of intention to buy bread formulated with 10% grape residue flour, suggest a product with market potential, in view of the fact that more than 70% of the valuers indicated that they would buy or likely to buy the product if it were for sale. According to Baú et al. (2007) a product is considered accepted, in sensory terms, when it has an acceptability index equal to or greater than 70%. Vasconcelos et al. (2006) when assessing the intention to buy bread with partial substitution of wheat flour for soybean flour (0, 5, 10 and 15%) and added oat meal (6%) observed that all formulations had higher frequency of responses between the classifications "certainly would buy" and "I doubt whether I would buy or not", but the formulations with 10 and 15% soybean flour have higher frequency of responses between the classifications "probably would not buy" and "certainly would not buy" when compared to standard formulations and with 5% soybean seed.

The intention-to-purchase test corroborated with the results of sensory acceptance, carried out through hedonic preference scale, suggesting that the product developed in fact presents good sensory quality and good market prospects if it were marketed.

Figure 6: Intention to purchase. Petrolina, PE. 2019



### 3.3 PHYSICAL CHARACTERIZATION - CHEMISTRY OF THE BREAD PRODUCED

The results obtained in the physico-chemical evaluations of the bread produced with the bagasse flour are shown in Table 2.

Table 2: Results of the physical-chemical characteristics of the breads. Petrolina, PE. 2019.

<b>Parameters</b>	<b>Control (0%)</b>	<b>Treatment (0%)</b>
<b>Water content</b>	30,2 ± 0,1	28,7 ± 0,1
<b>Ash</b>	0,89 ± 0,02	1,47 ± 0,00
<b>Total Fat</b>	7,6 ± 0,1	9,2 ± 0,0
<b>Protein</b>	7,3 ± 0,7	8,1 ± 0,1
<b>Dietary Fiber</b>	2,1 ± 1,5	3,7 ± 1,7
<b>Carbohydrates</b>	51,9 ± 0,0	48,9 ± 0,0
<b>Calories</b>	159 kcal	162 kcal/g

\*conversion factor: 5.7

When comparing the protein content between the control versus treatment samples, the bread plus 10% grape residue flour presented a higher protein content ( $p < 0.05$ ). This fact can contribute to a better acceptance of the product by printing better organoleptic characteristics to the bread, thus influencing the quality of bakery products, which depend on factors such as protein content, volume, quality of the crumb and the texture of the bread (Upadhyay; Ghosal; Mehra, 2012).

Regarding the lipid content, bread treatment presented higher concentration when compared to control ( $p < 0.001$ ), 7.6% and 9.2%, respectively. The fat was used in the same quantities for all the loaves, both control and treatment. However, bread with grape flour (10%) presented higher lipid content in relation to standard bread (control), this is due to the large amount of seeds contained in the residue, because they have high fat content (Black, 2014). Similar results were also found by Storrer et al (2017), whose bread enriched with orange bagasse flour the lipid average for bread was 7.95%, a little high compared to TACO (2014). In a study conducted by Borges et al. (2011), in which salt breads were enriched with linseed flour, the breads that in their formulations presented linseed flour in proportions of 10 and 15% showed that their lipid content was on average 2,6 times more than the bread controls without this flour.



This increase in the lipid content is beneficial for the final quality of bakery products thus making the bread softer and palatable for a soon period (black, 2014). The increase of the final value in the lipid contents observed in this study in small proportions in relation to control bread, may be a favorable factor for the maintenance of physical and sensory characteristics, as well as for maintaining the quality of the loaves during storage.

According to the Food Composition Table (Taco, 2014), the average humidity value for traditional breads is close to 28.5%. According to the Brazilian Table of Food Composition at USP, traditional whole bread has 34.7% moisture content, so the values obtained, shown in Table 2, are consistent with what was expected and were more similar to French bread. Therefore, the values obtained, presented in Table 2, are consistent with the expected, whereas the control bread presents a high humidity in relation to the treated bread and the traditional bread, and is similar to the whole bread. According to Soares et al. (2008), the analysis of the moisture content of the product is fundamental in food, since the amount of water contained in the food is directly linked to its stability, composition and quality, and the inadequate moisture content usually generate failures in the beating and cooking, little aeration makes it harder to chew, the taste can be unpleasant and have little durability, these facts can be linked to the high moisture content present in the bread dough.

Regarding the ash content, there was an average of 1.47% for bread enriched with grape flour, while control bread presented 0.89%, although there was no significant difference. Similar results were described by Storrer (2017), when they developed a bread replacing wheat flour with orange bagasse flour and obtained a percentage of ash of 2.60%, this value being close to that found in the present study. It was described in another work, where they added linseed flour in "cookies" and "Cracker" type biscuits, and observed the increase in ash content according to the addition of linseed flour, these differences were attributed to minerals present in such flour (Hussain et al., 2006; Maciel, 2006).

Therefore, according to Juarez-Garcia et al. (2006), the formulations that presented the highest values in relation to ashes were the treatment (10%), this is because fruits in general are characterized by their mineral component content, this fact would explain why when we add fruit flours the ash content tends to increase.

In the fiber analysis, all formulations presented significant statistical difference among themselves ( $p < 0.05$ ), with the highest value being the treatment formulation

(10%) (3.7) and finally the formulation with the lowest fiber value was the formulation of control bread (0%) (2.1) in which there is no grape flour in its formulation, only wheat flour.

In relation to the fiber content presented in the breads, if added a greater amount of grape flour in the formulation, greater will be the amount of fibers present, because grape flour is a flour rich in fiber as well as other fruit flours. This result can be observed in other studies performed with the substitution of wheat flour by other flour (PRETO, 2014).

In a study by Borges et al. (2011), also on breads, in which three different bread formulations were elaborated, one being control bread only with mixed wheat flour and the other two added whole linseed flour in proportions of 10% and 15%. In the loaves that included this flour, the values of total dietary fiber increased by approximately 128% and 124%, respectively, in relation to control. Similar results were obtained by Oliveira et al. (2007) where they also observed an increase in the total value of fibers in breads prepared with mixed flax flours.

Regarding carbohydrates according to the Table of Food Composition (TACO, 2014), bread of classical integral form has 45.62 g. (100 g)-1 of carbohydrates. On the other hand, the bread prepared with grape marc residue obtained an approximate number of this table of whole bread, but slightly higher presenting 48.9g (100g) of carbohydrates. According to Queji, Schemin and Trindade (2006), carbohydrate plays an important role in the baking process by collaborating in the formation of the structure, consistency and texture of the kernel, in the increase of volume and also in the aging of breads.

Bread is considered a good source of energy and nutrients for humans. According to Lima (2007), bread besides carbohydrates has other nutrients, and it is increasingly necessary to incorporate dietary fibers into the composition of breads for their great consumption and health benefits.

Regarding caloric value, treatment bread (10%) was 162 kcal/g, while control bread (0%) was 159 kcal (100g). According to the Food Composition Table (TACO, 2014), the average calorie value for whole wheat bread is about 253kcal (100g). Therefore, the calorie content presented by the sample treatment to the fibers it contains in the treatment (bread enriched with grape residue), because according to Benassi (2001) in the case of breads, the most traditional way to obtain caloric reduction is to add fiber.

#### **4 CONCLUSION**

Due to the results found, the development of bread enriched with grape residue flour proved to be a viable alternative, because there was a good acceptance, mainly of the samples with the highest concentration of grape residue (10%). It is also well accepted in the purchase intention analysis, indicating that the developed product has commercial potential, and may compete in the market with similar products available.

Thus, it is believed that the elaboration and consumption of these products can contribute to the reduction of the environmental impact generated by industrial waste and due to the functional character, promote the health of its consumers.

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## **Experiences of the use of active methodologies and the remote teaching system during the COVID-19 pandemic**

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### **ABSTRACT**

Introduction: Covid-19, caused by the SARS-CoV-2 virus, brought great loss and concern to the population. Due to the social distance, schools and companies had to suspend face-to-face activities, causing new forms of teaching and care to be developed. The use of digital technologies has become primordial, even in an online way, so that the several impacted areas could continue operating, especially education. Active methodologies have the potential to awaken curiosity, as students insert themselves into theorizing and bring in new elements, not yet considered in class or in the teacher's own perspective. As important as the acceptance of active methodologies is to plan the methodology to be used, adapt it to the content to be worked on, and the time available. Objetivo: Apresentar experiências brasileiras do uso das metodologias ativas no ensino superior durante a pandemia de COVID-19. Materials and Methods: A search for experience reports of the

remote teaching system through Google Academic was used, with the keywords Active Methodologies, Pandemic, Remote Teaching, and the Boolean operator AND. Results: Two articles were chosen to present how active methodologies were used in the remote teaching system. The use of ABP (Problem-Based Learning) methodology in a nursing course proved to be positive, since the tutor guides small groups of students, allowing a better individual follow-up of each student. The use of Google Forms and lectures with market professionals, game-based learning, debates and case studies were also effective in the Advertising, Public Relations and Design courses. Final considerations: The use of active methodologies makes teaching more interesting, instigates the students, and facilitates learning. It is necessary that teachers receive training so that these methodologies are used appropriately. In a post-pandemic education, methodologies used virtually should be used in face-to-face teaching, in order to provide students with a pleasurable learning experience. Investments in technologies, such as computers, games, and good quality internet, must be made. And, the social technological gap must be reduced, it is necessary that good quality internet reaches all urban and rural areas in Brazil, so that all students have the same opportunity to receive quality education.

**Keywords:** non-presential education, innovation in teaching, health.

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## **Evaluation of the chemical composition of iron ore fines (ter feed) in the sintering process**

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### **ABSTRACT**

The iron ore fines, also called sinter feed in metallurgy, is the ore most used in large steel mills for sinter production, being obtained in the stages after its processing. Thus, for this to occur, it is necessary that it has adequate characteristics for the sintering process. Because of this, the granulometric ranges and microstructural and chemical evaluations were determined, which quantified and determined these important properties. As well as, the factors that could be detrimental were verified, inferring to this work, satisfactory results regarding the characterization of the sinter feed.

**Keywords:** iron ore, granulometry, characterization, contaminants, sintering.

### **1 INTRODUCTION**

In the second sintering process (Goncalves, 2005), (ABNT, 2009), (Mochón, 2014), (Fernández-González, 2017) and (Bhagat, 2015), it is necessary that iron ore fines - FMF (feed sinter) have some quality parameters, such as: high iron content, low contaminant content and particle size from 6.3 to 0.105 mm, also using some pellet feed fractions, with particle size below 0.105 mm. This, according to (Telles, 2015) encourages the reuse of fine particles to form micropelotes, developing technologies that aim at a more efficient process when using materials that were previously disposed of in

industrial landfills, for not having a way to use them in the process, because its particle size is much lower than recommended.

Thus, according to (José, Coelho & Pereira, 2021), (Donskoi et al., 2016), (Wang et al., 2016) and (Mochón, 2014), by inserting sustainable practices into the synthesis, the process becomes more efficient, by allowing new means of reusing steel waste to form part of the sintering plant. Thus, avoiding additional expenses with raw materials and reducing the volume of wastes produced in the treatment of iron ore.

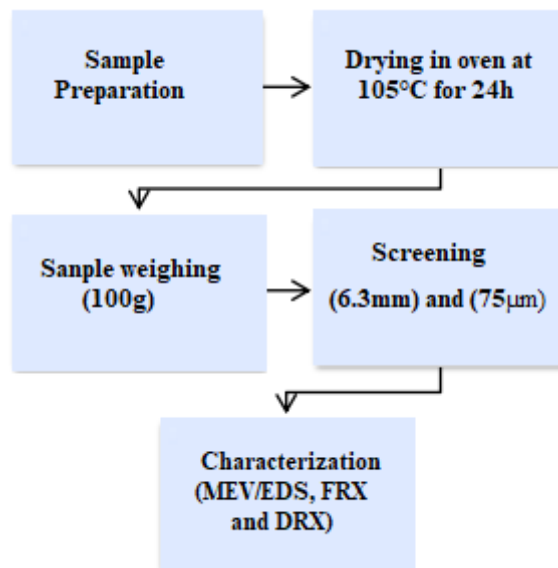
So, according to (Rzepa et al., 2016), (Goncalves, 2005) and (Mesquita Filho et al., 2018), it is not enough just to say that the material has a desired particle size, it is necessary that the chemical composition of iron is much greater than that of contaminants, because if you want the sinter to be produced, it has an iron oxide content of more than 40% and that of contaminants (phosphorus and sulphur) of less than 1.5%. Therefore, the burning of the material in the sinter, can drastically reduce or even eliminate these contaminants and enrich the iron in the sinter, because of the reduction and oxidation chemical reactions that occur during the sintering process.

However, the objective of the study is to determine the quality parameters of iron ore fines from the Mineral Province of Carajás - state of Pará, through the analysis of MEV/EDS (Scanning Electron Microscopy and Dispersive Energy Spectroscopy), FRX (X-ray fluorescence) and X-ray diffraction (X-ray diffraction), which are important for quantifying the percentage of oxides present in the sample, as well as verifying the microstructure of the material for pore presence, which are required in the percolation of gases during the burning of the mixture (feed sinter, coke moinha and limestone fines). Thus, these analyses are necessary to determine whether these iron ore fines are appropriate to form micropelotes and then the sinter product.

## **2 METHODS**

The experimental process to determine the chemical composition of the sample of iron ore fines, donated by SINOBRAS, occurred according to the flowchart in Figure 1.

Figure 1 - flowchart for characterization of the sinter feed.



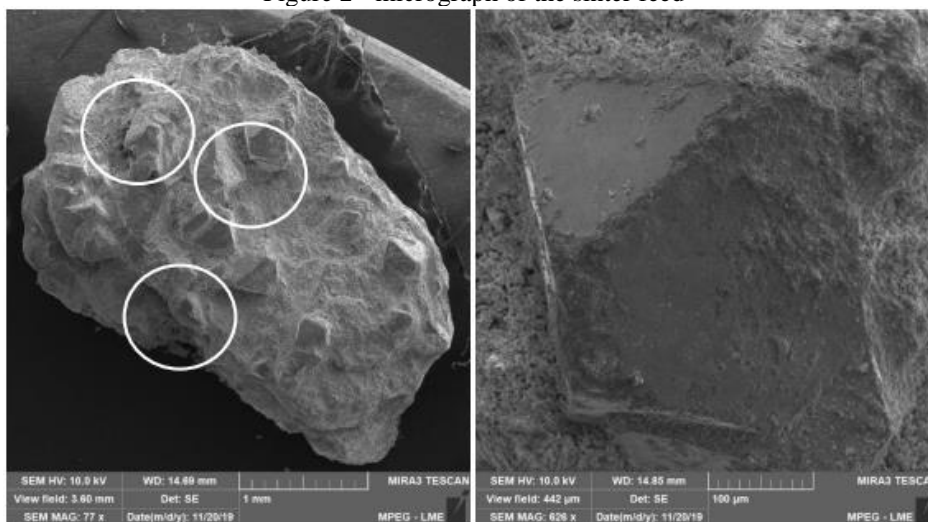
Source: Author, 2022.

### 3 RESULTS AND DISCUSSION

For the microstructural analysis and semi-quantitative chemical composition of the sinter feed, the SEM and SEM/EDS were used, respectively, using a material with a grain size of 6.3 mm. While, for the FRX and DRX analyses, the granulometry of the material was 75 µm.

The microstructural analysis of the sample by SEM, using the equipment PentaFET Precision - OXFORD Instruments, helped in identifying flaws in the structure, as well as the presence of pores in the material, demarcated in white circles. Thus, one can observe in Figure 2, the microstructure of the sinter feed.

Figure 2 - micrograph of the sinter feed

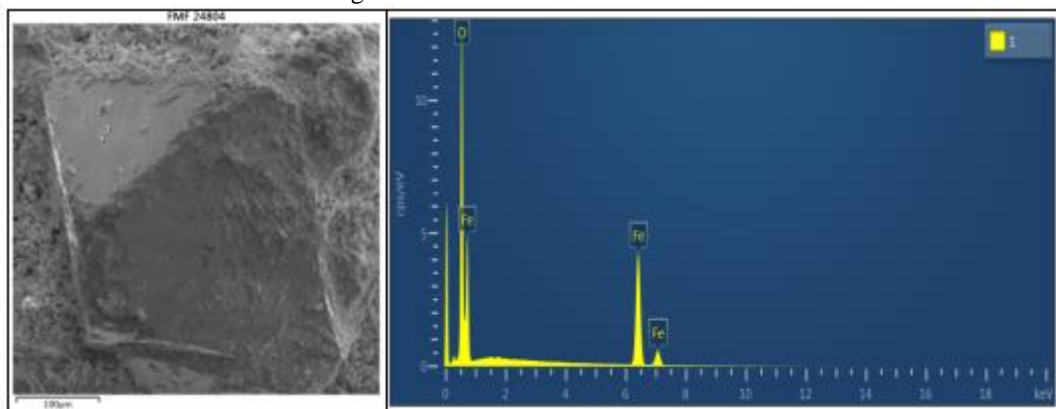


Source: Author, 2022.

The presence of these pores in the material is important for the percolation of gases in the sintering process. Thus, the microstructural characteristics of this material are in accordance with what is mentioned by (Telles, 2015), (Donskoi et al., 2016) and (Wang et al., 2016).

Another important point is the SEM coupled to the EDS, which, according to Figure 3, interprets the X-ray spectroscopy data by energy dispersion and presents the percentage of some elements contained in the material. This method of analysis quantifies the content of each element and other tools are needed to detect the existence of other oxides, such as FRX and also DRX.

Figure 3 - SEM/EDS of the sinter feed.



Source: Author, 2022.

The analysis shows that the peaks detected were only for two elements, oxygen and iron, with a percentage of 42.83% and 57.17% respectively. This shows that this method of analysis does not accurately present the content of elements present, requiring further analysis to identify other oxides, as is the case of contaminants (Mochón, 2014), (Telles, 2015), (Wang et al., 2016) and (Donskoi et al., 2016).

Through the FRX analysis, the percentage of all oxides present in the sample complements the previous SEM/EDS analysis. Thus, in Table 1, the content of each element present is shown, as well as the loss to fire (PF), which are the volatile materials eliminated during the burning of the material in a muffle at 900 °C.

Table 1 - FRX of the feed synthesis.

	Comp.	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	K <sub>2</sub> O	CaO	Al <sub>2</sub> O <sub>3</sub>	MgO	TiO <sub>2</sub>	MnO	P <sub>2</sub> O <sub>5</sub>	PF	Total
FMF	%	80,6	5,83	0,37	1,81	5,5	0,31	0,33	0,83	0,27	3,94	99,79

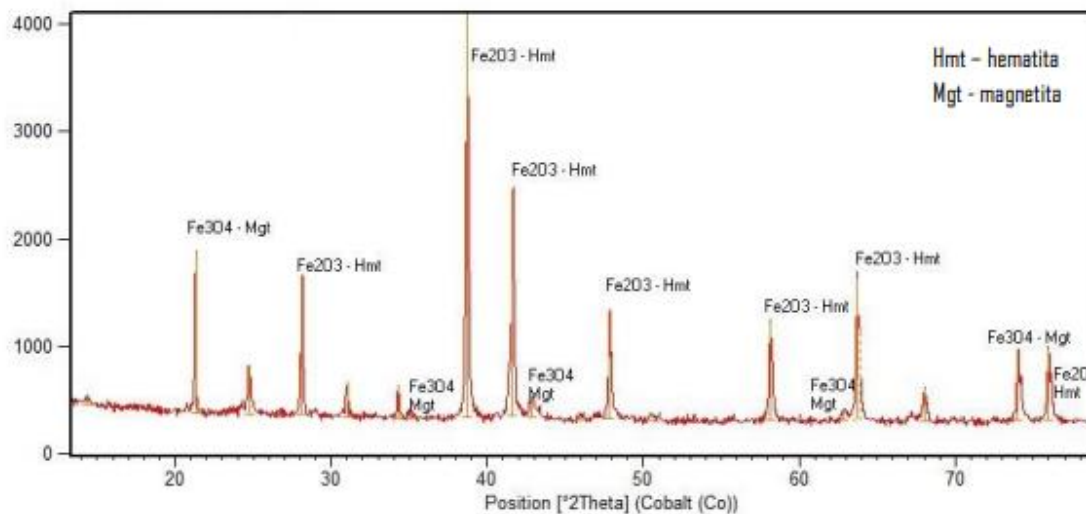
Source: Author, 2022.

Based on this analysis of the FRX, a high percentage of iron oxide of 80.6% is observed, a value that is above 40%, which is an average percentage mentioned by (Fernández-González, 2017), (Mochón, 2014), (Bhagat, 2015), (Wang et al., 2016) and (José, Coelho & Pereira, 2021). On the other hand, contaminants, such as SO<sub>3</sub> (sulfur oxide) that does not appear in the sample and P<sub>2</sub>O<sub>5</sub> (phosphorus oxide) has a value below 1.5%, which is desirable, since the presence of oxide, as mentioned by (Goncalves, 2005) and (Mesquita Filho et al., 2018) may cause tenderness at room temperature.

The analysis of other raw materials, such as calcitic limestone, rolling mill scale, and coke grind, which may be inserted into the sintering process, may, depending on their chemical composition, contain the presence of sulfur and phosphorus oxides, leading to an increase in their content. However, during sintering, these harmful oxides may be eliminated during the reduction of the iron ore, due to the high temperature reactions that occur in the sinter.

The crystalline phases of the sinter feed, were detected by XRD analysis, using the X'Pert HighScore Plus program, as shown in Figure 4.

Figure 4 - DRX of the sinter feed.



Source: Author, 2022.

The crystals identified were the oxides hematite (Fe<sub>2</sub>O<sub>3</sub>) and magnetite (Fe<sub>3</sub>O<sub>4</sub>), which is corroborated by the peaks that indicate that the material has a predominance of hematite. Thus, no other mineralogical phase was detected besides those in this DRX.

Thus, it is observed that despite using analyses that quantify the percentage of oxides, it is not possible to determine the total mineralogical constituents present in the sinter feed, since, through SEM and SEM/EDS, it was detected respectively the

morphology on the surface of the material and percentages of oxygen and iron. Already in the FRX analysis, the presence of various oxides was observed, including iron, and also contaminants, while the DRX analysis showed that there is the presence of two crystalline phases for the iron ore, which was possible to confirm by the information detected in the other analyses, following the same process of the analyses of (Mesquita Filho et al., 2018), (Rzepa et al., 2016) and (Telles, 2015).

#### **4 CONCLUSION**

With this study, it was possible to analyze the microstructure of the sinter feed, verifying the presence of porosity, which is an important factor, because these pores are necessary for the percolation of gases at the moment of firing, reduction and oxidation of the material in the oxidation of the material in the sinterizer.

In the chemical composition detected in the analysis by FRX, the materials that do not participate in the reduction process in the blast furnace, the contaminants, presented absence or low values, such as sulfur and phosphorus. But, in a way, they can be disposed of together with volatile materials or reduced at the time of burning micropelotes during sintering.

In the XRD, only the iron crystalline phases such as hematite ( $\text{Fe}_2\text{O}_3$ ) and magnetite ( $\text{Fe}_3\text{O}_4$ ) were detected, presenting a higher peak for hematite, which corroborates with the previous analysis of the XRF. Highlighting the higher percentage for iron oxide.

Thus, the feed synthesis presents its microstructural and chemical characteristics within the quality standards to obtain the sinter, mainly in relation to the high iron oxide content, which indicates the high iron content contained.

Subsequently, the sinter produced by this raw material can be used in the production of pig iron in blast furnaces.

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## **Municipal land cadastre: requirements for positional accuracy in the Maringá micro-region**

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## **ABSTRACT**

Among the materials found in the Brazilian literature, there are some manuals that guide public agencies in the elaboration of urban cadastres, from data collection methods to the required positional accuracy. However, each manager is free to choose the parameters he/she deems most convenient. Thus, this study sought to investigate how the municipalities of the micro-region of Maringá/PR have performed (or required) their georeferencing surveys for urban cadastre purposes. Moreover, it also sought information about the presence of cadastres already made, how they were prepared, the professionals involved, the presence of reference networks, and knowledge about the existing norms. The research was conducted through a questionnaire, covering different thematic axes, applied in the form of an interview in 5 municipalities. From the results it was possible to observe that Maringá stood out as the only city to have specialized professionals, besides a reference network that was more dense and better distributed than the other municipalities studied. In relation to these, several differences were observed, from outsourced surveys, the existence of a georeferenced base to SGB or even the positional accuracy criterion adopted for each one. In view of this, it was clear that there are differences in the performance of each municipality on this theme, which leads us to the conclusion that only with effective and qualified professionals on the subject, adopting efficient technologies, it will be possible to obtain reliable information on the urban registers made available by the cities.

**Keywords:** land registry, reference network, positional accuracy, urban registry.



## 1 INTRODUCTION

The Federal Law 10.257/01 that regulated the Statute of Cities, in its chapter 21, Art 39, defines that the social function of urban property must meet the fundamental requirements of city ordination that should be contained in the Municipal Master Plan. Therefore, the master plan is a basic requirement, fundamental within the development and urban expansion policy (CITY STATUTE). Part of the master plan is the georeferencing of features and information related to the municipal geographic space in order to assist in decision-making involving urban development.

The urban land registry is one of the main tools for the organization and arrangement of the features and geo-referenced information of the geographic area of the municipality. According to the manual "Notions of Territorial Multi-national Register" (CONFEA, 2016), the territorial register is defined as the official and systematic territorial inventory of a municipality and is based on the survey of the limits of each plot.

There are no specific technical standards on how to prepare or update the urban registry, but there are some technical documents that provide recommendations on how these can be structured, how data should be collected, what spatial accuracy is recommended, among others. In addition to the manual already mentioned, we can cite the manuals of "Standards and Engineering Procedures for Urban Registry in Brazil" (CONFEA, 2017) and "Guidelines for the creation, establishment and updating of the multi-purpose territorial registry in Brazilian municipalities" (Ministry of Cities, 2010) to support work on the subject. There are several recommendations in these documents cited when creating or maintaining a register. Among these recommendations is the presence of a support network to assist in topographical or geodetic surveys in the municipality in question. This support network, consisting of geodetic landmarks of reference is also described by the standard ABNT NBR 14.166/98 - Municipal Cadastral Reference Network. A support network is essential in the elaboration and updating of georeferenced municipal cadastral plants.

With the advent of technologies for acquisition and management of georeferenced geographic data, together with the expansion of cities, in 2016 the National System of Territorial Management was created, or SINTER (FEDERAL DECREE 8,764/2016), in which the union of the register with the register in a unified geographic system highlights the need for the surveys of urban plots to be referenced to a unique Geodetic Reference System (SRG) and with a defined positional precision standard.

According to Silva et al. (2018), several technical registration projects have already been implemented despite the lack of SINTER standards. These bases were elaborated according to the existing regulations, such as NBR 13.133/94<sup>1</sup>, NBR 14.166/98 and NBR 14.645-2/05 - Elaboration of "how built" (as built) for buildings - Part 2: Planimetric survey for public record, for rectification of urban property - Procedure. These standards, however, do not define the accuracy value to be met in the topographic survey of the vertices that determine the boundary of the plots.

Discussions about defining a precision pattern of geo-referenced coordinates for urban spaces are growing. Klein and Lima (2018) and Silva et al. (2018) conducted studies regarding the precision that can be obtained from topographical surveys in urban areas.

Klein and Lima (2018) take into account the technical specifications of equipment available in the market and follow the error propagation methodology usually adopted in the literature. They conclude that it is necessary to avoid the adoption of a tolerance criterion for positional standard deviation below 8 cm and to avoid the adoption of a three-dimensional tolerance criterion without studies that clearly justify this choice.

The values of 8 centimeters are also found in the studies of Luz (2013), in the booklet of Standards and Engineering Procedures for Urban Registry in Brazil (CONFEA, 2017) and in Decree 9,310/18. The value of 7 cm can be found in the booklet of the Federal Council of Engineering and Agronomy (CONFEA).

Klein and Lima (2018) state that this value of 7 centimeters presented by CONFEA seems to have an arbitrary character because it lacks studies or some formal justification, which may prove to be something impossible to achieve in practice. In addition, tolerance values for standard deviation of three-dimensional vertices and for vertices of urban real estate currencies are unknown in international standards.

Similarly, Silva et al. (2018) work to evaluate the precision of the defining vertices of urban properties through the propagation of errors by the covariance propagation method and compare the values obtained with those required by Decree 9,310/18. Decree 9.310/18 deals with the procedures applicable in the Urban Land Regularization (Reurb), covering the legal, urban, environmental and social measures aimed at the incorporation of informal urban centers into urban planning. The decree requires that the vertices are

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<sup>1</sup> This search was previously performed to update NBR 13.133 in 2021. Thus in this text the above standard will always be referred to its previous edition (1994).

referenced to the SGB and that the spherical positional error is equal to or less than 8 cm radius.

Silva et al. (2018) implemented the cadastral reference network in the municipality where the study was conducted, where the coordinates of these milestones and their respective standard deviations were collected using Global Navigation Satellite System (GNSS) technology. The densified and accurate cadastral reference networks serve as a control for topographic surveys, mainly in places where GNSS technology is not efficient given local conditions (GNSS signal obstruction, multicasting error production, etc).

This network of registered milestones is addressed in recent documents that deal with the urban multi-purpose registry: "Notions of Multipurpose Territorial Registry - CTM" (CONFEA, 2016) published by the Regional Council of Engineering and Agronomy of Paraná (CREA-PR) and "Engineering Standards and Procedures for Urban Registry in Brazil" (CONFEA, 2017). However, these have no normative character regulated by law and so there is no obligation to use them, that is, it is up to the municipality to define the requirements regarding the surveys for registration purposes.

Understanding the importance of the requirements in topographic surveys to obtain cadastres with positional quality, it was defined as the objective of this research to carry out a survey with the municipalities of the microregion of Maringá in order to investigate the requirements in obtaining georeferenced coordinates that meet the urban land register of the municipalities and as specific objectives was verified:

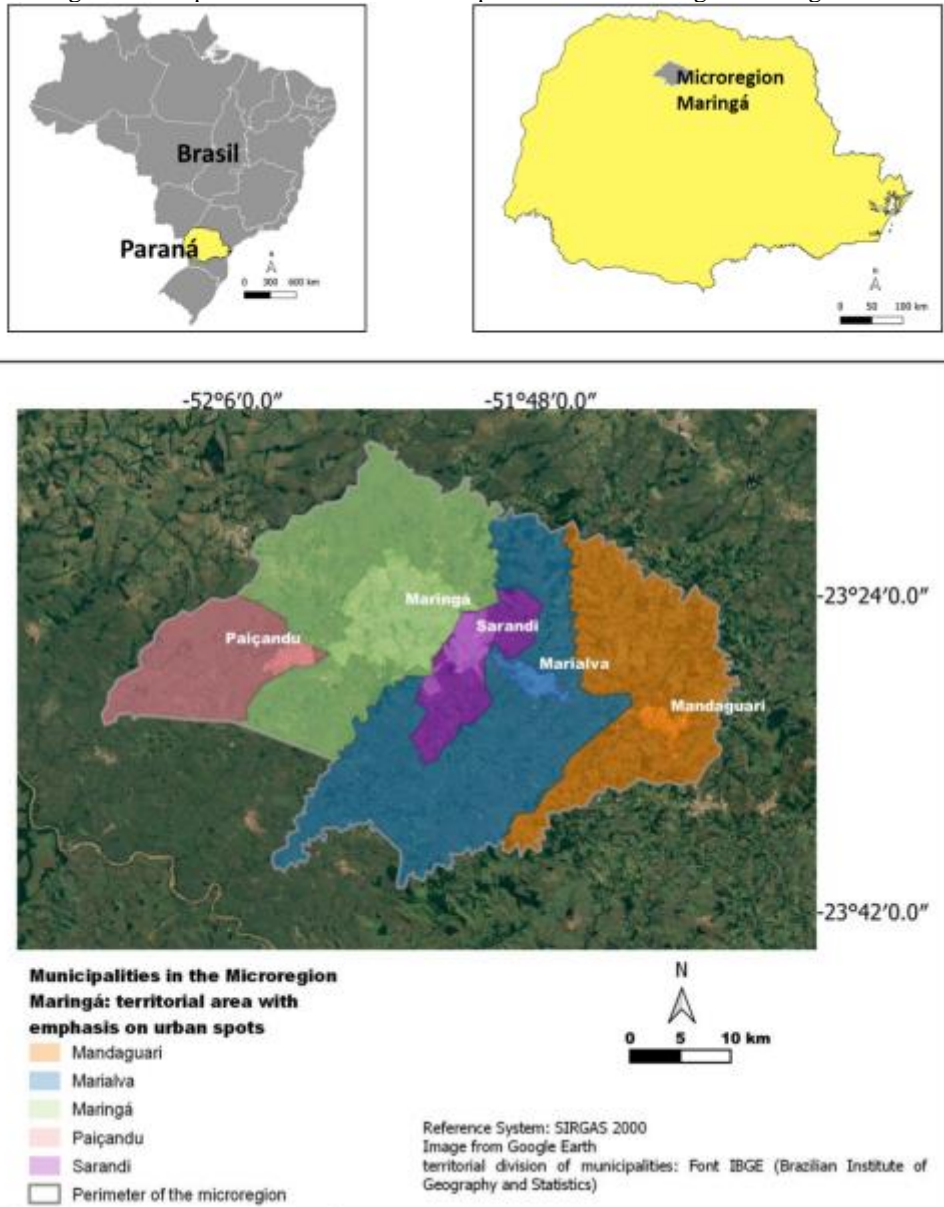
- The presence of the Cadastro Técnico Multifinalitário in the selected municipalities; the process of obtaining and updating data; who are the professionals that work in its elaboration and maintenance;
- The existence of a reference network to support topographic or geodetic surveys in the investigated municipalities;
- The knowledge of municipal officials about the existence of norms related to topographic surveys, the municipal cadastral reference network and the manuals for the elaboration of the multifunctional technical cadastre;
- The positional accuracy required in georeferenced coordinates.

## **2 METHODOLOGY**

Five municipalities were chosen to carry out this work. These municipalities represent the entire microregion of Maringá, belonging to the state of Paraná, Brazil,

following the division made by IBGE (IPARDES, 2012). Figure 1 shows the location of the study area in the state of Paraná as well as the territorial limits of the municipalities of Maringá, Sarandi, Marialva, Mandaguari and Paçandu, with emphasis on municipal urban spots.

Figure 1 - Map of location of the municipalities of the Maringá microregion



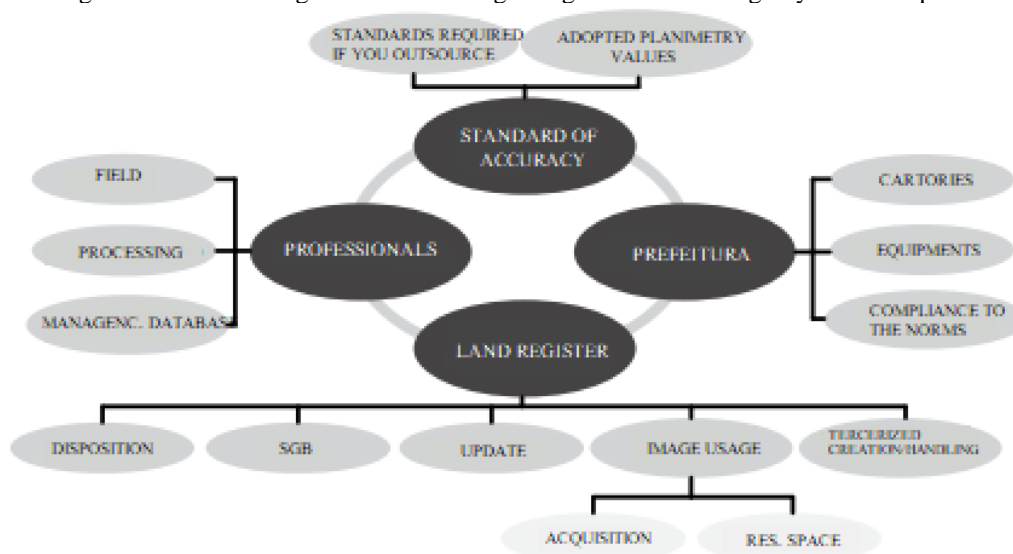
Source: Cartographic base: IBGE, accessed in March 2022; Image: Google Earth; accessed in March 2022.

The information collection process was carried out through interviews with the professionals or technical staff responsible for the urban registration of each municipality with the selected prefectures. In order to structure the interview, a questionnaire was

prepared with three distinct axes, each one containing questions related to the specific objectives of the research.

The first axis dealt with the land registry since the management of urban space, since the promulgation of the Statute of Cities, became the responsibility of the municipalities themselves. This management includes mapping and/or digital mapping of the physical space of the municipality with the realization of the urban registry. Thus, the existence of the urban registry in the municipalities and questions related to it, as can be observed in Figure 2, were evaluated by means of the questionnaire.

Figure 2 - Research organization chart regarding the territorial registry of municipalities



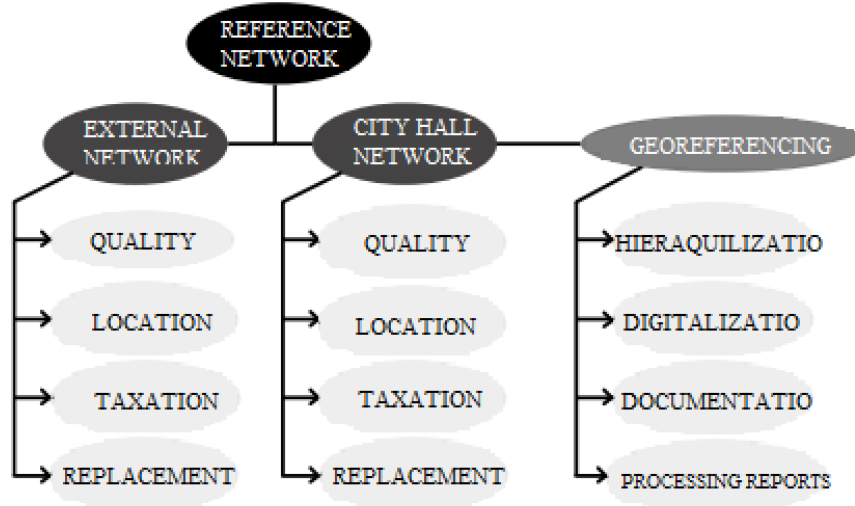
Source: The authors (2021).

The second axis addressed in the questionnaire dealt with the Municipal Cadastral Reference Network. This network of milestones is referred to in the standard ABNT NBR 14.166/98 - Municipal Cadastral Reference Network - Procedure. We investigated the presence of these landmarks in municipalities to help link topographic surveys to the urban registry. The number and location of milestones in the municipality were evaluated.

In the existence of milestones and other reference points, it was investigated whether they were implemented based on the types of structured points in the NBR 14.166/98 standard model, or whether the municipality has some other systematization or hierarchization of these milestones that is outside the norm. It was also recorded whether these points were georeferenced to SGB (SIRGAS2000, official system in Brazil) whether they were prior to the officially adopted system in Brazil or whether they were georeferenced to local reference systems.

The existence of documents and reports that attested to the positional accuracy of the geo-referenced data of these milestones was questioned, as was there any concern by the municipality in the requirement of positional accuracy of the points implanted. Figure 3 presents an organization chart representative of the issues addressed in this axis.

Figure 3 - Organization chart of the investigation regarding the reference network(s) of the municipalities



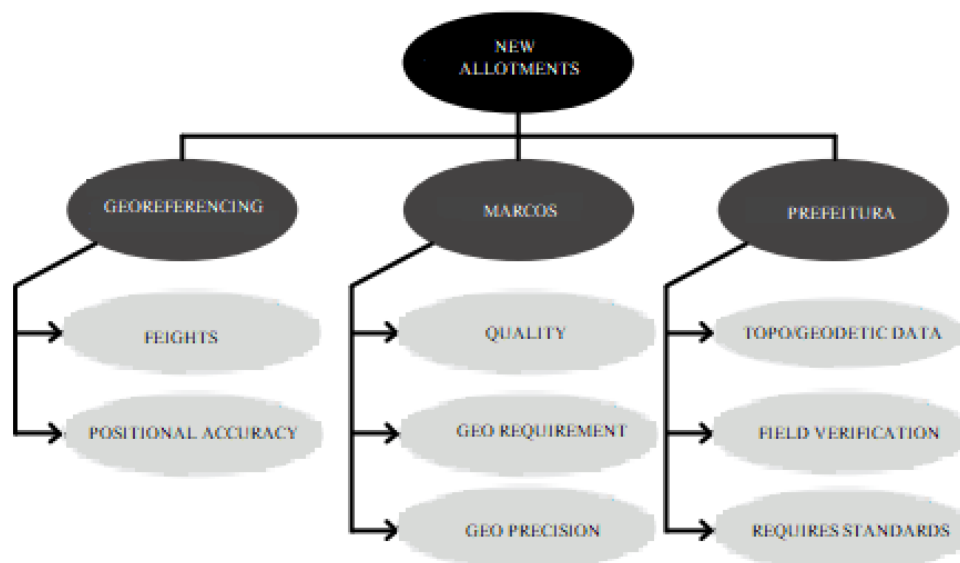
Source: The authors (2021).

The third and final axis of the questionnaire was specifically related to the standards of precision that municipalities require in surveys for the purpose of subdivision of rural areas, adjacent to the urban agglomeration that will properly regularize the urban network of the municipality. Such surveys are responsible for all the demarcation of the borders between urban lots, sidewalks, streets and streets axes, public equipment, points of interest of urban infrastructure (power poles, storm water galleries and sewage), among others.

Thus it was questioned which equipments are required in these surveys: total station, theodolites, GNSS receivers and also the positional precision required. In case of not using the GNSS technology, it was verified if it is required that the surveys follow the NBR 13.133/94 standards of topographic surveys for correction and distribution of errors. In the case of mandatory use of GNSS, the data processing requirement was verified (whether post-processing or

real-time processing). This information was also collected through a questionnaire. Figure 4 presents an organization chart representative of the issues addressed in this axis.

Figure 4 - Organization chart of the investigation regarding the opening of new settlements in the municipalities



Source: The authors (2021).

A pre-test of this material was performed prior to the application of the questionnaire.

The pre-test questionnaire was submitted to the municipalities near the municipality of Maringá, which were not those of the microregion analyzed.

### 3 RESULTS AND DISCUSSIONS

The results were analyzed following the 3 axes described in the methodology. To summarize the objective responses from the interviews, Tables 1, 2, 3 and 4 were organized. The analyses were discussed based on tabulated information and added to the discursive information obtained in the interviews.

Table 1 presents a summary of the research responses regarding the situation of the territorial register of municipalities.

Table 1 - Responses regarding the territorial registry

LAND REGISTER	Marialva	Mandaguari	Paiçandu	Sarandi	Maringá
Employees involved	9	5	1	3	14
Equipment	Theodolite, tape measure and GNSS	Measuring tape	Measuring tape	Measuring tape	Theodolite GNSS Total Station
Does the city hall have a digital register?	Yes	Yes	No	Yes	Yes
LAND REGISTER	Marialva	Mandaguari	Paiçandu	Sarandi	Maringá
Does the city hall have a digital register?	Yes	Yes	Yes	Yes	Yes
What is the format of the register?	CAD	CAD	CAD	CAD	SIG/CAD
Is the cadastre georeferenced to SGB?	Yes	Yes	Yes	No	Yes
Does it have an image?	No	Yes	Yes	No	Yes
How was it acquired?	-	Cannot inform	Aerophotogrammetry	-	Aerophotogrammetry
What is its resolution?	-	Cannot inform	Cannot inform	-	<50 cm
Does it exchange information with the land registry?	No	No	Cannot inform	Yes	Yes
Was the cadastre preparation outsourced?	No	Yes	Yes	No	No
Who updates the cadastre?	PREF	PREF	COMPANY	PREF	PREF
How often is it updated?	Continuously	Continuously	Cannot inform	Continuously	Continuously

Source: The authors (2021).

It can be analyzed that the number of employees involved with the register varies from city to city, in such a way that in Paiçandu only one employee has this responsibility and in Maringá are fourteen employees involved. Maringá stands out in this sense and in the fact that these employees are employed in sectors with greater expertise to deal with the register: the geoprocessing sector that has geographer and system developers and the topography sector that has surveyors. Only Maringá has surveyors and system developers. In other municipalities the register is the responsibility of the construction sector or urban planning and has civil engineers and architects.

As for the topographic equipment, only Marialva and Maringá have GNSS and Maringá has Total Station as well. Mandaguari, Paiçandu and Sarandi have only a sled.

Given the difference in the number of employees, as well as in the types of topographic equipment of each municipality, we sought to analyze whether there would be any relation of these differences with the size of the municipality (the urban area seen in Figure 1 and number of inhabitants) or with its Gross Domestic Product (GDP). Thus, data on the number of inhabitants and GDP were collected together with IBGE and



IPARDES. The latter with the purpose of establishing a measurement of the wealth that was produced in the municipalities in order to compare the level of economic growth. Table 1 presents the data regarding the number of inhabitants and GDP of the municipalities investigated.

Table 1 - Population and GDP of the municipalities investigated

Municipality	Population (hab.)	PIB (billions of Reals)
Maringá	423.666	19,3
Sarandi	96.688	1,7
Paiçandu	41.281	0,8
Mandaguari	34.400	1,5
Marialva	31.959	1,3

Source: IBGE (2021); IPARDES (2021).

It was observed that neither the size of the municipality (urban area and number of inhabitants) nor its GDP were related to the number of employees or equipment acquisition since Sarandi, with larger population and higher GDP than Marialva and Mandaguari, has fewer employees than these two municipalities.

All municipalities have the digital registration in CAD platform and only Maringá also develops the registration in GIS environment (Arcgis), and this format facilitates the union of alphanumeric data in the spatial features. Maringá also has an online platform that provides free information on the urban territorial registry. A more complete register is observed in Maringá when comparing it with the other municipalities.

With regard to geo-referencing, all municipalities present the register referenced to the SGB, with the exception of Sarandi. This, despite requiring the new surveys georeferenced to the SGB, as reported in an interview, has its register referenced to a local system. Maringá and Paiçandu have aerial photographic images that serve as a source of data acquisition in the preparation and update of the register, however only the employees of Maringá have information about the resolution of the images. It was also recorded that Mandaguari claims to have images, but do not have information on origin, method of acquisition and resolution.

The creation of the register by Maringá, Sarandi and Marialva was carried out by the employees themselves, unlike the other two municipalities investigated, which had their registration made by companies. As for the update, only in Paiçandu this is

performed by company and the interviewee could not tell how often the update runs. It is considered the creation and updating by the city itself a positive point because, it is understood that the performance of employees in the process contributes to the deepening of knowledge about the register itself and its information, as well as enable continuous updating of the registration and without reliance on bidding processes.

Regarding the reference networks, Table 2 presents the responses obtained for each municipality investigated in order to facilitate the comparative analysis.

Table 2 - Responses concerning the reference network.

REFERENCE NETWORK	Marialva	Mandaguari	Paiçandu	Sarandi	Maringá
Does the municipality use external reference points?	No	Don't know	No	No	No
Does the City Hall have reference points?	Yes	No	No	No	Yes
How many points does the City Hall have?	<5	-	-	-	>20
Do you know where they are?	Yes	-	-	-	Yes
Is there inspection to see if they still exist?	No	-	-	-	No
If they are removed, what is done?	Don't know	-	-	-	Don't know
Are they georeferenced?	Yes	-	-	-	Yes
Is there knowledge of accuracy?	Yes	-	-	-	Yes
Do they have reports or documentation?	Yes	-	-	-	Yes
Is it possible to find them in digital format?	Reports	-	-	-	SIG/CAD

Source: The authors (2021).

It was observed that no municipality uses reference points belonging to reference networks of external agencies, even though such reference points are present in municipalities. To cite, all municipalities have reference points belonging to the networks of IBGE, SANEPAR or registered with PARANACIDADES.

As for reference points implemented by the city itself, only Maringá and Marialva have knowledge of the points implanted and the information relevant to them (how many points, where they are, if they are georeferenced and if they are documented) However, there is no surveillance to ascertain their existence in the field. Mandaguari and Paiçandu, as seen, had their registration carried out in an outsourced way and even though such companies have implemented reference points in the municipality, in the interview it was observed that there is ignorance about the presence of those responsible.

Another point investigated was the knowledge and requirement of standards and manuals for surveying and urban land registry by municipalities. Table 3 summarises the responses obtained.

Table 3 - Answers regarding knowledge and standards requirements.

		Marialva	Mandaguari	Paiçandu	Sarandi	Maringá
Which of these standards and manuals are known to the technical staff?	NBR 13133	X	X	X	X	X
	NBR 14166			X	X	X
	CTM			X	X	X
	NPE					X
In the case of contracting for surveys, do the contracts require the use of standards?		S	N	N	S	S
If yes, which ones are required?	NBR 13133				X	
	NBR 14166				X	
	CTM					
	NPE					
	Cannot inform	X				X
In the case of contracting for land subdivision opening, do the contracts require the use of standards?		N	N	N	S	N
If so, which ones are required?	NBR 13133				X	
	NBR 14166				X	
	CTM					
	NPE					
	Cannot inform					

CTM: Notions of Multifinalitary Land Cadastre-CTM (CONFEA, 2016)

NPE: Engineering Standards and Procedures for Urban Cadastre in Brazil (CONFEA, 2017)

Source: The authors (2021).

It can be observed that the interviewees of the municipalities of Marialva, Mandaguari and Paiçandu are only aware of the standard of topographic surveys, while the interviewee in Sarandi is aware of both standards and one of the manuals: Notions of Multipurpose Territorial Register - CTM. In Maringá the standards are known in addition to both manuals questioned: CTM and the Engineering Standards and Procedures for Urban Registry in Brazil.

With regard to the requirements for the application of these standards and manuals in the area of surveying and the opening of new subdivisions, it appears that little is required by the prefectures, and yet when employees know that demands are made they have no knowledge about them. Only in Sarandi was the adoption of standards NBR 13.133/94 and NBR 14.166/98 in outsourced surveys and in the opening of new allotments.

Finally, information on the positional accuracy adopted by each municipality was collected. Table 4 presents the answers obtained in the investigation.

Table 4 - Answers regarding positional accuracy.

PRECISÃO POSICIONAL	Marialva	Mandaguari	Paiçandu	Sarandi	Maringá
Does the municipality have some standard of positional accuracy in geodetic surveys for cadastral purposes?	Not	Not	Not	Not	7cm
Are there requirements for georeferencing when opening a subdivision?	Not	Not	Yes	Yes	Yes
Are positional accuracies required for allotment surveys?	-	-	Not	5cm	7cm
Are there requirements concerning the implantation of reference points in new land parcels?	Yes	Not	Not	Not	Not
If so, what is the required precision?	None	-	-	-	-

Source: The authors (2021).

Regarding the adoption of precision standards in surveys for registration purposes, only Maringá adopts a value of seven centimeters (7 cm) among all the municipalities questioned. It was observed that even in Marialva and Sarandi (municipality whose records were made by the city itself) there is no knowledge by the interviewee responsible about which requirement of positional accuracy adopted. The same occurs for the municipalities that outsourced the service.

In the opening of new blends Maringá, Sarandi and Paiçandu require the georeferencing of these areas, but in this case they differ in the positional accuracies required. Maringá establishes 7cm as tolerance, while Sarandi establishes 5cm and Paiçandu does not give a positional precision reference. Marialva was the only municipality that claimed to require the implementation of points in the allotments but does not require that these be georeferenced to the SGB nor establish positional accuracy for them.

Maringá is more demanding than Sarandi in terms of establishing positional accuracy both for the surveys carried out by the municipality itself and for those supplied by the subdivision companies. In Sarandi, the requirement is only for the subdivision companies. When observed the value of this positional accuracy Sarandi stands out in relation to Maringá. Both are more demanding than the other municipalities, which do not make any requirement for positional accuracy in surveys, in the opening of new settlements and in the implementation of geodesic marks. None of the interviewees affirmed the realization of field conferences of the surveys carried out by third parties.

#### **4 CONCLUSION**

Through the research it was possible to conclude that all the municipalities investigated have the Urban Territorial Registry. However, it was evident that even if these municipalities belong to the same micro-region, the procedures in the elaboration and updating, the requirements regarding the implementation and positional accuracy of geo-referenced coordinates that meet the urban territorial register and even the knowledge of the professionals involved in the register regarding the Standards and technical manuals are unequal.

Maringá stands out in relation to the other municipalities in all the axes studied in the research. It has specialized professionals, registration in CAD platform and GIS georeferenced to SGB, has its own reference network with a higher number of points and better distribution and requires positional accuracy in all surveys for registration purposes consistent with the values indicated in the literature for use in urban environments for registration purposes territorial.

The other municipalities, despite having a registry, presented results below those obtained in Maringá in certain axes studied. Noteworthy is the non-georeferencing of the cadastral map in the municipality of Sarandi, the number of control points implemented by the municipality and the non-requirement for positional accuracy in georeferenced coordinate surveys. In Sarandi a positional accuracy of 5cm is required, but only in surveys for subdivision purposes.

Being in Brazil the technological options and the positional accuracy used in the determination of the georeferenced coordinates of free choice of the entities that manage the urban cadastres, this work contributed as a diagnosis of what can be the reality of the cadastre in many other municipalities of the Brazilian territory: municipality with cadastres elaborated according to survey criteria georeferenced to SGB, continuously updated and with positional accuracy defined by norms or studies in the area, and cadastres elaborated without so much rigor in their requirements.

The investment of municipalities in the acquisition of technologies, specialized training and updating the knowledge of the staff who work within the municipality in the cadastre can be a differential for the development of internal rules that establish methods and positional accuracy both for surveys carried out by the municipality itself and for third-party companies, thus generating surveys with reliability.

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## **Producer circuit of intimate apparel: a study on Frecheirinha-CE**

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### **ABSTRACT**

The purpose of this article is to investigate the use of the territory of Frecheirinha by the spatial circuit of textile production in the segment of underwear. To this end, we will trace a path whose objective is to analyze its role in the process of productive restructuring; to identify the agents involved, analyzing the articulations undertaken between them in the circles of cooperation of space; culminating in the analysis of how the spatial circuit of textile production uses and organizes the territory in question. To better understand the current paradigm of textile and underwear production we need to disentangle our gaze from the molds of traditional production. Located in the Northwest region of the State of Ceará, a small town of about 13,000 inhabitants, is home to more than 30 factories producing underwear, bed, bath and table linens, as well as a trade that depends on this activity.

**Keywords:** special circuit, production of intimate pieces, small towns.

### **1 INTRODUCTION**

The city of Frecheirinha, a small town located in the northwest region of the state of Ceará, 289 km from the capital, Fortaleza, stands out as an important producer of underwear, bed, table, bath and fitness clothing, has received special attention, because in this space, we noticed very distinct services and ways of working, for a city with only 14,000 inhabitants.

Our research points out some particularities that we will present, as preliminary results, we arrived in the "Land of the underwear"! But it has not always been this way, the city has recently become an important producer of underwear, but under what circumstances did these pieces start to be produced? Who was responsible for their elaboration? And nowadays, who are the workers who make a living sewing underwear pieces? So now, I invite you to know a little bit of the history of these pieces.

The underwear has been going through numerous transformations, they always follow the fashion trends. Another interesting fact is the evolution of technology that enabled the creation of new materials, the so-called fashion chemistry, which since the twentieth century has been making the pieces more comfortable and stylish. In earlier times,



underwear was made for the need to cover the intimate parts, dating back to 40 B.C. some form of body covering. In the middle ages, the first corselets started to circulate among women, and are still coveted by women today. One of them was the "Cota", a tunic with strings.

The other, was known as the "Beaud", a kind of corset tied at the back or sides, which tightened the bust like a breastplate and was sewn to a pleated skirt. The "Sorquerie" was a very tight "Cota" also known as a bodyguard or corset. And then there was the "Sucote", a vest tucked over the dress and tied. The purpose of these pieces, besides being useful, began to charm and enhance the feminine curves. Professor Felicity Riddy (2013) points out that there was also the chastity belt, a metallic contraceptive adjusted around the female genitalia and locked under lock and key by the suspicious and paranoid husband or lover. More than a contraceptive, it was an instrument of torture.

Some covered only the vaginal region, others didn't even leave out the anus. When it came to the crunch, women had to relieve themselves through the gaps and orifices available at strategic points, which were minimal, and protected by blades or pointed rods, to prevent the access of any malicious fingers. Without the support of hygiene, it became a focus of disease. And to think that wearing a belt could last for months. Crusader wives often wore them, perhaps to ensure that they would not be betrayed in their long absence. Riddy (2013)

When a knight left on his way to the Crusades he ordered a new belt for his wife and left without knowing that the castle blacksmith had made a duplicate of the key. Riddy (2013) Women's underpants became widespread even in the 16th century as imitations of men's. In the 16th century, Catherine de Medicis wore the culotte, still inspired by men's pants to ride horses. The culotte was a category of wide-legged pants created so that women could move more freely, without having their sex exposed. In the 18th and early 19th centuries, dancers and femmes de theatre, artists of the performing arts, the dance, delicate, insinuating, but controlled by decree-laws, were obliged to wear undergarments, because when dancing, they sometimes raised their legs above the waist.

The "panties" described above were not worn by all the people, most women did not even dream of having them. Only the women of royalty wore the culotte. All these historical characteristics take us to the present day, and the sophistication of the production of underwear. The industries invest in designs, and every 3 months, new collections are launched in the market.

Frecheirinha is no different from this reality. Located in the hinterland of Ceará, and with no industrial tradition, it appears as an interesting point to be studied. The Productive Restructuring, elects new spaces and the emergence of a new territorial division of labor, makes peripheral areas without industrial traditions appear as new spaces of production, such as the city of Frecheirinha-CE, locus of our research, Located in the northwestern portion of the State of Ceará, 289 km away from Fortaleza, it is connected to the capital by the federal highway BR 222, the referred highway connects the capital of Ceará to the city of Marabá, in Pará passing through the States of Piauí and Maranhão in a current extension of 1811.6 km. The municipality according to IBGE data has an estimated population in 2020 of 14,473, of which almost half live in the municipal seat.

The city of Frecheirinha-CE, is inserted in the industrialization process late in relation to planning policies for the Northeast of the 1960s. Only in the mid-1990s, it is identified in this space government incentives for the development of industry, from there it becomes an important space for encouragement and capital investment in the Northeast, circumscribed in the circuit of intimate fashion. (Exame magazine Small and medium enterprises 09/ 2014.) Currently, it is configured as an important production circuit of 'lingerie' of the Brazilian Northeast, it follows a national trend, given that Brazil is now the 7th largest textile park in the world and has more than 30,000 formal companies, participating with, about, 4.4% of national GDP and with annual revenues of US\$ 33 billion (data from 2020). The national production is about 6.4 billion pieces, and 99.0% of the Brazilian market is still supplied by national companies (ABIT 2016; IEMI, 2020).

It is one of the sectors that offers the most jobs in the country, about 1.6 million people, and 80.0% of these jobs generated in the textile chain are centered in the clothing segment, thus presenting a strong social impact. The intimate fashion sector has been gaining representative space in this chain. And it is in this context that one of the main productive circuits of the Brazilian Northeast emerges in the city of Frecheirinha-CE. Garcia (2008), the 'lingerie' has gone through a series of temporal transformations, following the cultural changes and the demands of a new woman that was emerging, especially during the twentieth century.

The technological evolution has enabled the emergence of new materials, which made the 'lingerie' more comfortable and durable, two requirements of modern life. According to the Instituto de Desenvolvimento Industrial do Ceará (Indi), which is part of the Federação das Indústrias do Estado do Ceará (Fiec), last year the state was the

highlight in exports in the underwear sector, ranking third in national production (14.4%) - with 14.16% in net revenue, 14.62% in costs and expenses, and 13.65% in Value of Industrial Transformation (VTI).

Regarding apparel exports, Ceará ranked seventh in Brazil, with a participation of 2.6% of the national total - representing US\$ 3.4 million. The data are part of the "Apparel Sector Profile 2020". In this question we investigated the economic assets of the 08 (eight) participating industries, we noticed a large majority of establishments that fit into small size, followed by micro enterprises. So for better understanding we will show such concepts, based on SEBRAE.

According to SEBRAE, the General Law for Micro and Small Companies was instituted in 2006 to regulate the provisions of the Brazilian Constitution, which foresees the differentiated and favored treatment for micro and small companies. It was conceived with the broad participation of the civil society, business entities, Legislative and Executive powers, and has already gone through four rounds of changes, always to contribute to the development and competitiveness of Brazilian micro and small companies, as a strategy for job creation, income distribution, social inclusion, reduction of informality, and strengthening of the economy. Through the General Law, a specific tax regime for small businesses was instituted, with a reduction in the tax burden and simplification of the calculation and collection processes, the Simples Nacional. In addition, the law provides benefits to small businesses in various aspects of daily life, such as simplification and debureaucratization, easier access to market, credit, and justice, and stimulus to innovation and exports.

SEBRAE states on its website and in documents available for consultation that the micro-enterprise will be the "entrepreneurial company", the simple company, the individual limited liability company and the entrepreneur, duly registered in the competent bodies, which receives in each calendar year, gross revenue equal to or less than R\$ 360,000.00. If the annual gross revenue is higher than R\$ 360,000.00 and equal to or less than R\$ 3,600,000.00, the company will be classified as a small business.

These values refer to revenues obtained in the domestic market. The small company will not lose its classification if it obtains additional revenues from exports, up to the limit of R\$ 3,600,000.00. The General Law also created the individual microentrepreneur, a self-employed person who is legalized as a small businessman opting for Simples Nacional, with annual gross revenues of up to R\$60,000.00. The micro-entrepreneur can

have only one employee and cannot be a partner or owner of another company. In Frecheirinha about 76% of the industries surveyed are small industries. These industries correspond to 33% of the total number of registered establishments in the city. The others are considered individual micro-enterprises, most of which have only one employee. All of them, without exception, are family-owned and family-managed companies.

As for the time in the market, among the 8 selected companies, 50% have been in the market for more than 25 years, which proves that micro and small companies have a high market time rate. The others are between 3 and 8 years old in the city, and are expanding their activities every year. The industries in Frecheirinha are represented by their factory outlets throughout the Northeastern territory. A detail important detail is that the industries that started the activities in the city, still remain in the market among the main producers of underwear in the city. In relation to representation in local, regional and national markets, percentages were assigned for each segment, and the following results were obtained: 100% of the industries surveyed operate in the local market, of which 83% have their own stores, to resell their products directly to consumers, and 17% use representation services for their products.

In the regional market, 42% of the industries have their own stores or rent stores outside the city, 46% resell their products to stores of the same segment, the so-called "multi-brand" stores. And the others, 12% have their products commercialized in department stores. In the national market, of the selected industries, only 12% are able to resell their products throughout the national territory.

When it comes to the size of the industry, linked to the number of employees, we estimate that on average, around 60% have up to 10 employees, followed by 30% between 11 and 15 workers, and only 10% of these have more than 20. And in relation to gender, the predominance is female labor, but about 40% of employees are male, especially in the management and administration of industries.

The female participation in this sector, according to the report of the managers, is fundamental, both for their performance, for having a certain tendency to work with this, and for their creativity and care with the details, which are of great importance in the result. Which will be described in more detail below. The remuneration of employees occurs in a traditional way, not differentiating employees by ability and competence, there is a practice of participation in the results by productivity demand, inside each factory the workers are divided into small cells, intended for x amount of pieces, and if the cell can

beat the goal, all employees of this small group receive by productivity.

This work was designed to show the industrial potentialities at the margin of the big capitals. Frecheirinha is considered an important producer of intimate fashion and its representativeness is recognized throughout the country. Throughout our journey, we observed several relevant aspects exposed in this dissertation. Why Frecheirinha? Could we answer this question? The city is an economic attraction in the northeastern inland, located in the semi-arid region, with no industrial tradition, and it has no industrial tradition and is currently configured as an important center for the production of underwear.

We have left many 'loose ends' that can and should be researched by others interested in the subject, the city presents a multiple granary to be thought about and described, for science has the luxury of questioning its own discoveries.

Truth is open to question, and can be replaced. In general, science becomes a frustrating knowledge, but the fascination for the real knowledge ends up overcoming the difficulties and the mutations it is subject to. Thus, we admit that we need to be reviewed, and our analyses can be seen from other points of view, we seek to bring out and show the importance of the city in the Brazilian commercial scenario. The preliminary results represent, in fact, the first efforts to build a consistent theoretical outline and develop an adequate interpretation of the object studied, through the description of its main characteristics. Since our object encompasses the studies aimed at the understanding of textile industries in its segment focused on the production of underwear.

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## **Automating customer service via messaging application at a private health plan operator**

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### **ABSTRACT**

In the health sector, customer service through digital channels is still a little explored way for companies to communicate and get closer to their customers and improve their processes. In this sense, this case study reports the experience of the incorporation of an instant messaging application in the process of authorizing tests and procedures at the private health plan operator Unimed Joinville. Data collection was carried out by documentary research and in-depth interviews with Unimed Joinville professionals involved in the implementation of the application. The data analysis was based on the content analysis technique. The results indicated that the main motivation for the migration from telephone service to online service was the volume of errors related to authorizations by telephone. It was observed that the incorporation of the WhatsApp application required the use of different platforms and equipment to meet the organization's needs, and that the use of the tool was expanded to other sectors of the organization. The main challenges faced in the process involved the lack of control over the technology and the adequate support from the IT area. Thus, it became evident the need for organizations to conduct the correct survey of the tools that best meet their needs and to have an information technology team to support them whenever necessary.

**Keywords:** TIC, health insurance carriers, messaging application, customer service.

### **1 INTRODUCTION**

People are increasingly connected on the 'internet'. In 2019, Brazil had about 134 million Internet users, or 74% of the population aged 10 and over. And in 2020, the number reached 152 million Internet users, corresponding to 81% of the country's population aged 10 years or more (NÚCLEO DE INFORMAÇÃO E COORDENAÇÃO DO PONTO BR, 2020). Such condition, drives organizations from various sectors to gradually join the use of digital channels to make communication with the customer easier and more agile.

A survey on the use of information and communication technologies in Brazilian

health establishments, indicated that, of all the establishments surveyed, 96% used computers and 92% had access to the 'internet' in the last 12 months and 73% have no department or area of information technology. In addition, of the total number of healthcare facilities with access to the Internet, 36% have neither a website nor social networks, 29% have both a website and social networks, 13% have only a website, and 13% have only social networks (CETIC.BR, 2020).

Thus, it is possible to consider that customer service through digital channels, in the health sector, is still a little explored way for companies to communicate and get closer to their customers. As well as to improve their processes. For this reason, it is important to report the experiences of the incorporation of these technologies to encourage and contribute to institutions that intend to implement similar systems.

In this context, the objective of this research is to report the experience of the incorporation of an instant messaging application in the process of authorizing exams and procedures at the private health plan operator Unimed Joinville, which began in July 2019. Specifically, it was sought to identify the motivations, stages, and challenges faced during the process in which the organization reinvented itself through the application of a new customer service channel.

## **2 METODOLOGY**

This is an applied research, of qualitative approach, with descriptive objectives, carried out through a case study. The research was reviewed and approved by the Research Ethics Committee of the Hans Dieter Schmidt Regional Hospital, according to opinion no. 4,733,634. The organization studied was Unimed Joinville, a medium-sized private health plan operator, similar to the medical cooperative, established in 1971.

The procedures for data collection occurred in two stages: literature review, documentary research and in-depth interviews. The bibliographical review aimed to elaborate an overview of the theme and provide resources for the theoretical foundation and data analysis. The documentary research involved obtaining data referring to the implementation of the messaging application in documents from the researched institution, such as reports, instructions to employees, and communications to beneficiaries to complement and reference data obtained in the interviews.

The interviews aimed to identify the motivations of the operator, the stages and challenges of the process with people involved in the implementation of the messaging



application. Therefore, the technique of in-depth interviews was used with four employees of the institution. For all the interviewees, the same 13-question interview script developed by the authors was used. The audio was recorded for later transcription in full. To analyze the interviews it was used the technique of content analysis of Bardin (2011).

### **3 RESULTS AND DISCUSSION**

#### **3.1 OPERATOR MOTIVATIONS**

Until the first half of 2019, the beneficiary could choose to request authorization for the exam or procedure in person, through the operator's app, the institutional website, or by phone. Most requests were made in person or by phone. In the phone service, the beneficiary would contact an employee of the operator, pass on the requested information, and the operator would carry out the process in real time. Therefore, it had as benefits the agility and practicality of the demand being met at the time of the call.

However, this format was also more prone to errors, mainly because the beneficiary himself provided the information.

E3: [...] many times the patient didn't understand the doctor's handwriting or the procedure codes. So, he would say something else and we would authorize it. When he got there to (SIC) perform, it was another exam. Sometimes, then, there was even the risk of having an incorrect preparation, because of a wrong authorization.

There were only three employees responsible for answering the phone, which became insufficient to meet the demand, generating some delay to get to speak with the attendant. When the information on the form was incomplete or the beneficiary omitted some information, for example, the clinical indication, the request remained under analysis and it was necessary to contact the requesting professional, generating delays. Besides the fact that it was not a toll-free call.

Due to the challenges faced by Unimed Joinville with the telephone channel, the organization decided to review this process. Considering the advent of instant messaging applications, the operator chose to use WhatsApp® as a means of communication with the customer, in order to make contact easier.

WhatsApp® is an instant text or voice messaging application that enables the sharing of documents, photos, and videos (WhatsApp, 2021). The app has end-to-end

encryption, providing greater security for the user, both for those sending and receiving the message.

In 2019, Brazil was considered the second country with the most users of the WhatsApp® app, losing only to India. In market penetration, in Brazil, it can be said that about 90% of 'smartphone' users have WhatsApp® (CLARK, 2019).

WhatsApp Business® began to be used by Unimed Joinville in July 2019 to replace the phone service. WhatsApp Business® is an adaptation of WhatsApp® for users with a business profile, that is, linked to a legal entity. This version is designed to help organizations, especially small businesses, communicate with customers. Thus, the features available as a business profile help to expose important information about the organization, such as the company's address, e-mail, website, and social networks. As well as, the use of labels, for better organization of conversations, and messaging tools that assist in quick feedback to the customer (WhatsApp, 2021).

### 3.2 THE IMPLEMENTATION OF THE MESSAGING APPLICATION

According to the interviewees, the change in the process of requesting authorization from the telephone service to WhatsApp Business® occurred gradually.

E1: Yes, there was a request from Management that this be done cautiously, so that it wouldn't impact customers. And so, when we took it off the phone, we started to warn customers beforehand. We also put a recording in the 0800 informing, we warned all our service fronts [...].

Two mobile phone numbers were released for beneficiaries to forward their authorization requests.

E1: as WhatsApp Business® is a tool that does not allow many interactions with several people simultaneously on the same number, we had to provide two numbers for customers.

From the implementation of WhatsApp Business®, the main benefits were the traceability of orders and reduction of errors in authorization requests, because by sending the photo of the medical order it was possible to verify the correct coding.

E3: [...] the number of wrong requests decreased a lot. It's easier for the attendant now, also because if he doesn't understand the letter he can, right, go to other providers,

some clinic, telephone, send request by WhatsApp® to the (sic) doctor. So, it's much more practical.

In order to access the conversations, it was necessary to mirror the cell phone to the computer, allowing only two collaborators to carry out the consultations. However, there was a large number of requests through this channel and some customers ended up sending messages to both numbers, generating duplicity in the requests. Also, messages were answered in order of arrival, that is, the most recent messages had priority, and were answered first. So, the beneficiary who sent several messages were ahead of others who had sent only one message and were waiting to be answered.

Other difficulties were: the impossibility of archiving conversations or obtaining indicators of the services, because the application did not allow these actions, the language for communication between attendant and customer was not standardized, using colloquial language, and periods of instability of the 'internet', which made the system slow.

Based on the analysis of these issues, the coordination and management of the area involved observed the need to change the message management tool for receiving authorization requests. The platform of the technology company Onzap was chosen to be added to WhatsApp® after benchmarking with other operators in the Unimed System.

The company Onzap used the technology called robotic process automation (RPA), which in Portuguese can be translated as "robotic process automation". According to Silva and Barion (2018), it is the automation of an information system, where it is possible to use artificial intelligence to solve tasks that need precision and speed. Onzap was an independent organization that was not tied to Facebook®, which owns WhatsApp® (SYNGOO, 2021).

E2: [...] because Onzap's platform was not a Facebook® released platform, they were pretty much using a WhatsApp Web®, so they didn't have a Facebook® credential [...].

With the use of APR it was possible to use a single mobile phone number, the permission for more attendants to provide services simultaneously, the issuance of reports and indicators of the services, standardization of language, increased time limit for sending a response, the possibility of saving conversations and documents.

Another relevant point of APR was the possibility of transfers, because it allowed other sectors to join the service via WhatsApp®.

E2: [...] then entered (sic) two more sectors, the Diagnostic Imaging Center and the Laboratory, where (sic) we created an IVR, had the options to select. Later, Unimed Personal also entered and there we optimized our service [...].

The Audible Response Unit (ARU) is an automated service that offers convenience to the customer through a menu that allows the identification of options typed or spoken during the interaction with the company, via telephone or messaging application (COSTA; FELIPE; RODRIGUES, 2008).

Despite the several improvements provided through the use of RPA technology, new challenges appeared. Request errors began to appear, where for the attendants, the documentation of beneficiary A, appeared in the conversation of beneficiary B, and vice versa, no longer being the most appropriate tool for the service performed.

It was also necessary that the cell phone was connected to the charger 24 hours a day, because the messages sent by the beneficiary were directed to the cell phone, and then these messages were sent to the platform. With this, during the updates of the cell phone and WhatsApp® itself, because with pending updates the conversations were not forwarded to the attendants through the system.

From this, Onzap itself suggested that Unimed Joinville change its message management tool to the application programming 'interface' (API) technology, which in Portuguese means 'interface' of application programming.

API technology enables the integration of systems through the communication of various codes providing benefits such as data security, monetization of accesses, and ease in the exchange of information between systems (FERNANDES, 2018). This technology is not offered directly by WhatsApp®, but by partner providers. According to the interviewees, after consulting with several companies that offered services with API technology, the company Blip, a partner of Facebook ®.

With the use of this new tool the interviewees cited as improvements: the stability of the system, ease of use, compliance with the rules of the General Law of Data Protection, greater control of indicators, the exemption of the use of a cell phone, the possibility of more interactions with the customer and the adhesion of new sectors.

Two disadvantages were cited. The first is the lack of autonomy to make changes in the IVR service. Currently, support from the Information Technology (IT) team is required. While, in APR, an administrative assistant could make any necessary changes to the flow.

E1: Now all the adjustments we need, we usually need (sic) to count on the help of (IT). So, in our IT sector, we still don't have someone specifically dedicated to this demand, to this activity. This competes with other demands of the sector and, many times, it is not a priority.

The second disadvantage is that when the beneficiary sends a message, after waiting 24 hours to be answered, the conversation is terminated and the system does not allow the attendant to send a new message to the customer. Consequently, it is necessary to contact the client by phone and ask him to send a new message in order to be able to start the service. To solve this problem, it is necessary to purchase a package that allows the organization to become an active agent, and not only a receptive one. Thus, the agent can send a message so that the beneficiary accepts or denies the interaction. Unimed Joinville is seeking this adjustment, according to Facebook® criteria.

E2: [...] as we used to use practically a WhatsApp Web® by Onzap, we had the possibility to contact the beneficiary, with Blip this is possible, but we have to buy separate package. And in addition, there are several criteria for Facebook®, such as a ready message, which we have to shoot first to the beneficiary to see if they accept this interaction, and then we actually make contact with the beneficiary.

The interaction between company and customer is referred to as WhatsApp® templates, which are reusable message formats that can be sent by companies through API technology. However, besides being a function that needs to be paid for the platform, it is mandatory that WhatsApp® performs the approval of the message template, only then will it be possible for the organization to perform an interaction with the user (FREITAS, 2020).

### 3.3 CHALLENGES FACED DURING THE INCORPORATION OF THE APPLICATION

Considering that the development of the API technology occurred in 2018, the biggest challenge in the incorporation of the WhatsApp® application occurs due to lack of adequate support from the information technology (IT) area of the company in the analysis of the available tools and the suitability to the reality of the company. The adversities faced with the use of WhatsApp Business® and the RPA platform could perhaps have been avoided if there was a more timely assistance from the (IT).

E1: we parameterized the tool (APR technology) ourselves because we did not have any consulting since the beginning when it was the Business, we did not have any consulting or anything, so we were gradually discovering it, we were discovering it by ourselves and learning from mistakes.

Currently, with the use of API technology, the Beneficiary Service Management sector is receiving support from (IT). However, according to the interviewees, the challenge faced in this aspect is that there is not a person available to promptly meet the demands that arise or even to assist in the necessary improvements in the message management tool.

#### **4 FINAL CONSIDERATIONS**

Based on the results of this research, it is clear that with the help of a consulting firm in information technology, it would be possible that the entire restructuring process could have been easier, because many challenges were faced to reach the application of the API technology. It is suggested, therefore, that health insurance carriers that choose to migrate to customer service via messaging applications should conduct a prior investigation of which technology best meets the needs of the organization, and also have an information technology team to provide whatever support is needed.

Due to the scarcity of information regarding the use of messaging applications for customer service in health insurance companies, it is suggested that future research discuss this process in other companies or address customer satisfaction with the use of this service channel.

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## **Epidemiological indicators of cases of Classical Swine Fever occurring in Brazil in 2019 and their implications for the global pork market**

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### **ABSTRACT**

Classical Swine Fever (CSF) is an infectious disease, caused by Pestivirus and highly contagious, considered of mandatory notification by the OIE. Considering the cases of



CSP that occurred in Brazil in 2019, this article sought to correlate the epidemiological indicators recorded in the national territory with risk factors that predispose to the incidence of this disease, as well as with the components of the epidemiological chain that are associated with prevention and the consequences for the economy of the sector. The study revealed that in the first half of 2019, 667 cases were confirmed. In contrast, in the second half, 79 cases were confirmed, with the states of Piauí, Ceará, and Alagoas recording higher prevalence of the disease. In the analyzed period, in the regions of disease incidence, 1303 and 336 pigs were susceptible to the virus in the first semester and second semester, respectively; that is, they were exposed to the risk of getting sick. Therefore, analyzing and understanding the health indicators of CSP in the Brazilian territory (in space) and in the year 2019 (in time), means a way to ensure that the Brazilian pork market continues to grow, in addition to developing and improving plans to control, prevent, and eradicate the disease.

**Keywords:** pestivirus, swine farming, incidence, prevalence.

## 1 INTRODUCTION

Pork is the most consumed source of animal protein worldwide. Brazil has an organized, quality pork production chain that is able to offer this animal protein to all Brazilians - on average 16 kilos per person - and still exporting to all continents. The Brazilian performance is significant when compared to the world average (Associação Brasileira de Proteína Animal, 2021).

Currently, Brazil ranks 4th in the world as a pork producer, with approximately 4.436 million tons produced in 2020. Of all this production, 77% is destined for the domestic market, and 23% is exported. Around 1.024 million tons were exported that same year, placing the country 4th in the world in the international market classification based on data from the Poultry and Pork Intelligence Center of the Brazilian Agricultural Research Corporation (Empresa Brasileira de Pesquisa Agropecuária, 2020).

Pig farming is an important economic activity for Brazil. In recent years, this activity has undergone improvements as a result of technological advances in agribusiness with increases in productivity and decreases in production costs.

The Brazilian production of pigs stands out for the large extension of geographic spaces, allowing the expansion of the herd and, also, aspects such as easy access to grains for feed production, the presence of water and favorable climate (Empresa Brasileira de Pesquisa Agropecuária, 2020). According to the Food and Agriculture Organization of the United Nations, 2013, the availability of agricultural areas is centered in a few countries; about 90% of the land for agricultural expansion is in Latin America and Sub-

Saharan Africa. In addition, countries like China and the United States no longer have new areas available for farming, making the costs of Brazilian pork production lower compared to the costs of these same countries.

In Latin America, Brazil presents itself as an important world food producer, with great potential for expanding supply. In 2012, there were 246,629 thousand hectares in agricultural production, 28% in crop production, 69% in livestock production and 3% in forest planting, according to data from the Agricultural Census (Brazilian Institute of Geography and Statistics, 2015).

Concomitant to the increase in production, the demands of the consumer market with the required food safety parameters are also growing, whether at the national or international level. Food safety has been widely discussed by countries that import meat, which are concerned about having a safe, healthy food, free of contaminating microorganisms and of good origin. In the international context, institutional arrangements that address traceability in the food production chain are developing rapidly due to concerns related to animal health, the threat of bioterrorism, food safety, international trade, consumer demand, and the scalar management of the supply chain (Tonsor & Schroeder, 2006).

Classical Swine Fever (CSF), also known as Swine Fever, Hog Cholera, or Classical Swine Fever, is a highly contagious infectious disease caused by an RNA virus with cosmopolitan distribution, belonging to the family Flaviviridae and the genus plague, virus, which affects domestic and wild pigs. It is not a zoonosis. CSP is characterized by a wide variety of clinical signs and lesions with a predominance of the hemorrhagic type (Oliveira et al., 2014).

The disease has a worldwide distribution, but some countries are free or have free zones. Currently, the occurrence of outbreaks of the disease in Brazil is limited to the non-free zone. The country has about 95% of the industrial production of pigs in an area recognized as free of the disease by the World Organization for Animal Health (OIE), which includes much of the national territory (Gava, 2019).

The main route of virus transmission is by direct contact between infected and susceptible pigs, or by eating pork products contaminated with virus from human food leftovers. This virus can survive cold environments and some categories of processing, such as cured and smoked meats. The movement and introduction of infected pigs into the herd are the main ways of spreading the disease, for which there is no treatment.

Therefore, affected pigs should be slaughtered and carcasses should be buried or incinerated (Gava, 2019).

The increase in production allows animals to be more susceptible to diseases, which can generate a great economic loss in the sector. In this sense, prevention measures aim to minimize the possibilities of CSP entry, favoring the Brazilian scenario. Understanding biosecurity and its importance in this process is essential to maintain the development of the activity in a sustainable and profitable way. This is a tool of growing importance in agribusiness, proving to be essential for the survival of technified farms (Barcellos et al., 2008).

However, to continue being recognized internationally for its production, Brazil seeks to eradicate the disease throughout its territory. This is a challenge for swine farming in Brazil, because ensuring total or partial control throughout the territory depends on inspection and, especially, knowledge about the disease, in addition to attention to all epidemiological issues. In this scenario, the emergence of diseases such as classical swine fever and African swine fever in Brazilian swine herds can hinder the country's performance in the export market.

The objective of this work was to survey the epidemiological indicators of incidence, morbidity, lethality, and mortality of Classical Swine Fever in Brazil in the first and second half of 2019, and to correlate these indicators of disease measures with the risk factors that predispose the emergence of this disease with the epidemiological chain and its consequences for the economy of the sector.

## **2 METODOLOGY**

The present study was conducted based on an exploratory bibliographic research with the scientific databases Scielo, Google Scholar, Medline and Lilacs, with a time frame of publication between 2003 and 2020. We also used the database of the Ministry of Agriculture, Livestock and Supply website, with the details of the records of cases of CSP occurring in the first and second half of 2019 in Brazil reported to the World Organization for Animal Health. The following keywords were used for the search: classical swine fever, epidemiology, swine farming, world market, pork, and biosecurity.

The study included reports, swine fever control plans, technical notes, manuals, tables, graphs, and statistical indicator panels from the Ministry of Agriculture, Livestock, and Supply. From the collected material, a qualitative analysis of the selected articles and

documents was performed, seeking to highlight the incidence, morbidity, lethality and mortality of CSP in Brazil in the first and second half of 2019, correlating these indicators of disease measures with the risk factors that predispose the emergence of this disease with the epidemiological chain and its consequences for the economy of the sector.

### **3 RESULTS AND DISCUSSION**

CSF is a highly infectious disease that has a high rate of spread and is often fatal to pigs. Also known as Swine Fever or Cholera, it affects domestic and feral pigs. The reservoir of the disease is domestic pigs and feral pigs, which are the natural reservoirs of the virus (Ishizuka et al., 2020).

This disease is serious in swine, but is not transmitted to humans or other species. It is a disease of compulsory notification to the World Organization of Animal Health, with high morbidity and mortality, resulting in significant consequences to animal welfare and socioeconomic, health and environmental losses (Oliveira et al., 2014).

CSP is caused by RNA viruses of the family Flaviviridae, genus Plague, viruses, with three genotypes currently described. The disease has worldwide distribution, but some countries are free of it (Gava, 2019b). Much of the Brazilian territory, where pig farming is technified, is considered a CSP-free zone without vaccination (Zanella et al., 2016). CSP is characterized by a wide variety of clinical signs and lesions with a predominance of the hemorrhagic type. The infection causes major destruction of monocytes, lymphocytes, and mature neutrophils, causing immunosuppression. There is also a severe reduction in the number of platelets, leading to increased clotting time and generalized hemorrhages, typical of the classic manifestation of the disease (Megid et al., 2016).

The disease is presented differently in the acute, chronic and congenital forms. In the acute form, the pigs are affected with a highly pathogenic and virulent strain that can be acquired or congenital. The clinical signs are high fevers, anorexia, lethargy, occasional vomiting, dyspnea, coughing, and crowding of piglets. The chronic form is caused by a strain of lower pathogenicity and virulence, and in partially immune herds. The signs are apathies, intermittent fever, diarrhea, shaggy hair, apparently eventual recovery, and death after about three months. In the congenital form, which occurs in fetuses and piglets, maternal infection occurs early in gestation and causes fetal death, reabsorption of the fetus, birth of malformed piglets, or neonatal mortality (Ishizuka et al., 2020).

A prevention measure applied to the source of infection is to identify the herds to

then adopt the sacrifice and subsequently perform emergency vaccination (official needle) depending on the sero-epidemiological condition. Vaccination against CSP will only be performed if the emergency use of the official vaccine is authorized by a specific plan approved by the Ministry of Agriculture, Livestock and Supply, which includes extension and delimitation of the geographical area where vaccination will be performed (Ishizuka et al., 2020).

Actions aimed at preventing, minimizing, or even eliminating the risks of contamination by CSP, inherent to pig production activities, involve the care with feeding, cleaning and disinfection of objects and trucks, prohibition of the use of food scraps, and the correct management of waste, carcasses, and garbage (Bronsvort et al., 2008; Ribbens et al., 2004).

The transmission of the disease occurs mainly by direct contact between infected and susceptible animals via oronasal route. It can also occur indirectly through people, vehicles, contaminated and undercooked meat fed to piglets, or even by airborne transmission over short distances (up to 1 kilometer) (Bronsvort et al., 2008; Ribbens et al., 2004).

According to Ishizuka et al. (2020), pigs infected with virus strains of low pathogenicity and virulence eliminate it continuously for months in the absence of clinical signs. Therefore, for the safety of the swine herd, attention to biosecurity, hygiene, and active immunization of the herd is necessary.

The diagnosis of the disease is based on its signs, history, and epidemiological indicators. Thus, the clinical diagnosis is likely, and its confirmation by official laboratory tests is essential, because the CSP is a disease of great economic impact, without available treatment. It is important to emphasize that, in case of detection of outbreaks, the sanitary sacrifice of sick animals and their direct and indirect contacts is performed, in addition to other sanitary defense measures provided in legislation (Ministry of Agriculture, Livestock and Supply, 2019a).

CSP is a disease of importance to domestic pigs, and is on the World Organization for Animal Health's "A" list of notifiable diseases, even if they pose no risk to human health. The "A" list includes communicable diseases that have the potential for rapid and serious spread regardless of national borders. In addition, this list includes diseases that have serious socioeconomic or public health consequences and are of great importance for the export of animals and animal products (World Organisation for Animal Health,

2020).

The World Organization for Animal Health is responsible for certifying the health status of all countries that export animal protein. Therefore, upon the occurrence of these diseases, notification is mandatory. The sanitary status of the country is given according to the type of infectious agent present or not. The countries are considered as free, endemic or with the presence of the disease in all, or part of the territory. This sanitary condition is the main reference for the safe trade of animals and their products between countries (Gava, 2019b).

According to the occurrences of cases of CSP in Brazil, the infection was endemic in several regions until the 1980s, when Official Programs of the Ministry of Agriculture for Combat and Eradication were implemented (Oliveira et al., 2014).

According to the Strategic Plan for CSP-free Brazil, the infection is in the process of eradication, and the country can be divided into two distinct areas: an area free of the disease and concentrating 80% of the national herd with the main farms and swine industries; and a region where isolated foci of the disease still occur (Roehle et al., 2012).

In recent years, outbreaks of the disease have occurred in some states in the Northeast and Northern regions of Brazil. However, efforts are being employed to make the whole territory an area free of the disease (Oliveira et al., 2014).

In Brazil, there are two zones with different animal health situations regarding CSP: a free zone where no cases of the disease are recorded, which corresponds to the states of Rio Grande do Sul, Santa Catarina, Acre, Bahia, Espírito Santo, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Paraná, Rio de Janeiro, Rondônia, São Paulo, Sergipe, Tocantins, the Federal District and the municipalities of Guajará and Boca do Acre, the southern part of the municipality of Canutama and the southwestern part of the municipality of Lábrea and the state of Amazonas; and another zone that is not free or infected, with presence of the disease in the states of Alagoas, Amapá, Amazonas, Ceará, Maranhão, Pará, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, and Roraima.

Since October 2018, with the intensification of surveillance in the zone not recognized as free of CSP in Brazil, the detection of suspected and confirmed outbreaks of CSP in the state of Ceará and Piauí in the year 2019 has risen. Surveillance for the detection of suspected CSP continues throughout the country, and the mobilization of animals and risk products from the infected zone to the free zone is prohibited (Organización Mundial de Sanidad Animal, 2019a; 2019b).

Much of Brazil's pig production is located in the CSP-free zone without vaccination. The most recent outbreaks have occurred in the Northeast region and are located in the area considered endemic for the disease. In 2019, according to data from the official website of the coordination of information and epidemiology in animal health of the Ministry of Agriculture Livestock and Supply (2019b), outbreaks of the disease were detected in the state of Ceará, Piauí and Alagoas. However, the national swine herd is considered to have optimal health, and the control measures used ensure high productivity. Even so, it is necessary to prioritize fast and efficient diagnostic systems, as well as to support sanitary defense (Zanella et al., 2016).

In contrast to the states where the sanitary status is positive, pig farming is intensified and actively participates in the economy, making Brazil an important country in pig production. The North and Northeast regions of Brazil face difficulties in eradicating the disease, given that some cultural practices in the region leave the sanitary focus aside (Oliveira et al., 2014). Such regions have precarious sanitary conditions, with small herds. Commonly, there is production of different species in the same area. In addition, the loan and contact of animals between properties are common practices, with no record/control (Silvia Filha, 2008).

Based on this "sanitary status" in Brazil regarding swine production, the importance of the epidemiological study on CSP is understood. Epidemiology can be defined as the science that studies the health-disease process in human communities, analyzing the distribution and determining factors of diseases, health harms and events associated with collective health, proposing specific measures to prevent, control or eradicate diseases, and providing indicators to support the planning, administration and evaluation of health actions (Rouquayrol & Goldbaum, 2003).

From the epidemiological indicators, the occurrence of disease can be evaluated under three aspects: who is affected (animal category, type of farm), when the disease occurs (temporal relationship, if there is a period of increased occurrence, for example) and where (spatial relationship, if the disease occurs more in a particular region, for example). After this initial description, the association of disease occurrence with some previously determined risk factor can be evaluated (Corbellini & Todeschini, 2011).

There were 667 confirmed cases of CSP in Brazil in the first half of 2019. In the state of Ceará, 85 cases were recorded in January, 97 in February, 176 in March, and 21 in April. In Piauí, there were 20 cases in February, 116 in May, 63 in April and 89 in

March (Organización Mundial de Sanidad Animal, 2019a).

In the second half of 2019, 79 confirmed cases of CSP were reported in Brazil. In the state of Ceará, 10 cases were recorded in July and 22 in August. In the state of Alagoas, there were 32 cases in September and 4 in October. In Piauí, there were 11 cases in October. In this same period in the regions where these cases were recorded, 1303 pigs were susceptible in the first semester, and 336 pigs were susceptible in the second semester, that is, they were exposed to the risk of becoming ill with CSP (Organización Mundial de Sanidad Animal, 2019b), as shown in Table 1.

Table 1 Distribution of Outbreaks of Classical Swine Fever in Brazil in the year 2019

Location	No. Susceptibles		Number of cases		Deaths	
	1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester
	Alagoas	---	38	---	36	---
Ceará	673	269	379	32	270**	25**
Piauí	630	29	288	11	244**	10**
<b>Total</b>	<b>1303</b>	<b>336</b>	<b>667</b>	<b>79</b>	<b>514**</b>	<b>37**</b>

Note. The information such as location, susceptible animals, amount of cases and deaths were taken from the documents: Organización Mundial de Sanidad Animal (2019a; 2019b). \*\*Animals that died from the disease. All susceptible animals that did not die from the disease were eliminated.

The general health situation of the Brazilian swine herd is excellent when compared to the situation in other producing countries (Sobestiansky & Barcellos, 2007). However, in these regions, infections occur in small properties with non-technological production, where there are usually subsistence farms with no structure for meat trade. Small-scale pig production can play an important role in the dissemination of diseases due mainly to the lack of information on diseases and their clinical signs, procedures for offering meal residues to animals and biosecurity measures (Schembri et al., 2015). Extensive pig farms are common in the Northeast region of Brazil, where outbreaks of CSP have occurred. According to Oliveira et al. (2014), subsistence farms should be given particular attention, prioritizing serological surveys.

It is known that extensive pig breeding systems may be more likely to experience CSP infections, as outbreaks of the disease are commonly initiated when a domestic pig comes into contact with infected material originating from wild pigs. Subsistence producers usually have low productivity and little technology (both genetics, nutrition and management techniques) on their farms. Usually, they use family workers and exercise varied agricultural and livestock activities (Marafon, 2006).



Feeding domestic or wild pigs with human food leftovers is typical of this type of pig farming. In addition, there is the risk of feral pigs having access to contaminated pork products improperly disposed of in landfills. Since the early days of swine farming, it has been known that most diseases can be avoided by simple management practices, provision of adequate feed, sanitation, and disease prevention practices (Brum et al., 2013).

Therefore, the care taken with feeding the domestic and wild pigs, avoiding that they have access to human food leftovers, is a relevant factor to avoid infection by swine fever. This risk is exacerbated in the population of this region where a significant portion of pig slaughtering is performed clandestinely under precarious hygienic conditions, and whose meat reaches the consumer without any sanitary inspection (Braga et al., 2013).

The knowledge of the records of cases of CSP in Brazil is extremely important not only for the economy, but also for public health, since it can direct and enable the adoption of control and prophylaxis measures, reducing financial losses and the risk of zoonotic transmission caused by these diseases (Braga et al., 2013).

The imposition of trade barriers on pork exports has led to an intensification of measures aimed at improving the health profile of herds (Rodrigues et al., 2009). The swine market in Brazil has been increasingly concerned with the sanitary status of the national swine herd. However, the use of biosecurity measures can prevent major economic losses.

Given the above data, which were consulted in the Semestral Report for the Notification of the Presence of Diseases on the World Organization's List for Animal Health in 2019, provided by the website of the Ministry of Agriculture, Livestock and Supply, one can calculate the rates of Prevalence, Incidence, Mortality, Morbidity and Lethality of CSP in Brazil in 2019, as shown in Table 2.

Table 2 Prevalence, Incidence, Morbidity, Lethality and Mortality rates of CSP in Brazil in 2019

Rates	Alagoas		Ceará		Piauí	
	1°	2°	1°	2°	1°	2°
	Semester	Semester	Semester	Semester	Semester	Semester
Prevalence	---	94,73%	56,31%	11,89%	45,71%	37,93%
Incidence	---	94,7%	56,31%	11,89%	45,71%	37,93%
Morbidity	---	94,73%	56,31%	11,89%	45,71%	37,93%
Lethality	---	5,55%	71,24%	78,12%	84,72%	90,90%
Mortality	---	5,26%	40,11%	9,29%	38,73%	34,48%

Note. The information such as location, susceptible animals, amount of cases and deaths were taken from the documents: Organización Mundial de Sanidad Animal (2019a; 2019b).

By analyzing Table 2 prepared with the data from the Biannual Report for the Notification of the Presence of Diseases of the World Organization for Animal Health List in 2019, it is noted that CSP presents high morbidity and mortality, resulting in significant consequences to animal welfare and socioeconomic, health and environmental losses. All animals in the herd must be sacrificed, even if they do not present the disease. Confirmed cases and pigs that have had contact should be killed, and protective measures for other groups should be adopted, such as slaughtering infected animals, restricting transport of pigs, or vaccination, depending on the disease control regulations in place (Penrith et al., 2011; Lepoureau et al., 2003).

Frequency measures, i.e. prevalence rates and incidence rates, are essential for studying the occurrence and frequency of diseases. About prevalence, it is understood as the proportion of individuals with the disease at a given time. Of the cases that occurred in the first half of 2019, it can be said that there was a high prevalence of the disease in the period: around 56.31% in the state of Ceará and 45.71% in Piauí. However, there were records of a drop from the first to the second semester, which may be related to the prevention and eradication measures adopted for contingency of the disease in these regions (Organización Mundial de Sanidad Animal, 2019a; 2019b).

The incidence refers to the number of new cases of a healthy individual developing the disease in a population in a period. Thus, the data show us a drop in the incidence of CSP in the states of Ceará and Piauí. On the other hand, in the second semester, outbreaks occurred in Alagoas, increasing the incidence rate of the disease in this region. Alagoas had no records of CSP cases in the first semester, and in the second semester it registered 36 cases. One of the factors that may have facilitated the entry of the disease in herds is caused, above all, by its geographical location.

The lethality is the ratio between the number of deaths caused by a disease and the total number of individuals affected by it in a given area and during a certain period. According to the data in table 2, the lethality rate is very high, exceeding 70% in the second semester in the state of Ceará and 80% in Piauí. This means that the disease is serious and kills many individuals.

Furthermore, the morbidity, mortality and lethality rates of CSF are high in non-immunized pigs and in acute infections, with lethality rates approaching 100%. This rate is lower in subacute cases and chronic infections, because it affects a smaller number of animals in the herd. Some variations can be observed if the disease is endemic in the herd

or the animals are previously vaccinated (World Organisation for Animal Health, 2009; Megid et al., 2016).

As this is a highly contagious disease that is difficult to control in regions with a high concentration of pigs and areas with wild pig populations, it is necessary to pay attention to predisposing factors that favor dissemination: existence of non-technified breeding; high animal density; very close farms; lack of sanitary management; lack of control or discipline in the commercialization system; agglomerations (fairs, auctions, exhibitions); mixing of animals of different ages or origins; feeding with kitchen waste or garbage; lack of active surveillance actions such as serological monitoring that favors the presence of permanently infected sows or immunotolerant piglets (carriers); lack of a rapid notification system of suspected cases; lack of biosecurity; lack of health education programs for breeders and intermediaries, among others (Ishizuka, 2011; Ribbens et al. , 2004).

Thus, pig producers who live with the presence of CSP in their farms suffer irreversible losses, hence the importance of strategies to eradicate the disease throughout the territory. In this sense, health education is a tool of preventive veterinary medicine that aims to change the attitude of social actors in the production chain regarding the prevention, control and eradication of animal health problems (Ministério da Agricultura Pecuária e Abastecimento, 2016).

In addition to losses in the field of exports, the losses also affect, mainly, sectors of society in which the raising of pigs represents the only source of animal protein or the main source of family income. Therefore, an attentive animal health surveillance is essential, and the awareness of all the players involved in pig farming is extremely important. According to the Standardization Manual National Pork Health Program, this awareness about socioeconomic aspects, clinical signs, transmission, damage, prevention and risks caused by diseases can be achieved by means of communication, lectures, educational materials, leaflets, booklets and posters. These resources must be aimed at the target audience in a clear and objective language. All this will contribute to early detection and quick reaction to the outbreaks of CSP.

In this scenario, according to the Strategic Plan for CSF-free Brazil, which aims to eradicate CSF in the non-free zone of Brazil, the eradication of this disease in the country will also contribute to improve the image and access to markets for domestic livestock products, considering it is an eradicated disease in most developed countries, including

all major exporters of pork.

Therefore, effective programs are necessary to eradicate CSF, since the control in large territorial areas is complex, the spread of the disease is aggravated by transport and it is possible to consider that the actual incidence of the disease exceeds the notifications (Oliveira et al., 2014).

#### **4 CONCLUSION**

In Brazil, the CSP-free zone has states that actively participate in the economy through intensified swine production. To this end, these states constantly develop prophylactic measures, following rules that make the positive sanitary status possible. On the other hand, in the non-free PSC zone, sanitary aspects are left aside due to cultural practices in the region, making it difficult to eradicate the disease. Eradicating the disease throughout the Brazilian territory ensures that the Brazilian pork market continues to grow, and the production of pigs is increasingly intense, since, today, the country has a good sanitary level, recognized internationally for its production.

It should be noted that, with this increase in production, the animals are more susceptible to different diseases, which can generate a great economic loss in the sector. In this sense, biosecurity measures aim to minimize the possibilities of the entry of CSP, favoring the Brazilian scenario with a good sanitary status of the swine herd around the world. Furthermore, small pig farms can make CSP control difficult, as they generally have low biosecurity levels and commonly report the presence of aselvauged pigs on their properties, which are considered reservoirs of disease. Therefore, it is extremely important that information about diseases and prevention measures reach these small producers in order to prevent them from being the gateway for the CSP virus, since they have difficulty in accessing information or even ignore the necessary information essential to prevent an outbreak of the disease.

Therefore, CSP is a challenge for swine production in Brazil, because ensuring total or partial control throughout the territory depends on surveillance, accurate diagnosis, laboratory support, knowledge about the disease, qualified labor, and agility in notifications, avoiding underreporting. All these measures must be improved consecutively in view of epidemiological issues. The subsistence farms must have particular attention, prioritizing serological surveys in order to ensure safety to the free zone of PSC, in order to make Brazil free of the disease.

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## **Analysis of discurso and bank advertising: a case study**

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### **ABSTRACT**

This article aims to present three advertisements inserted in printed magazines of national circulation and analyze them from the perspective of Discourse Analysis according to the thought of Michel Pêcheaux, French scholar considered the father of Discourse Analysis. The article makes a brief analysis of this French current of thought; presents considerations about advertising and economy; analyzes the advertisements; and makes considerations about the theme in question and its implications.

**Keywords:** speech, advertising, technology, bank.

### **1 INITIAL CONSIDERATIONS**

In the middle of the globalization phase where information takes a prominent place in the informational scenario, advertising has also assumed a prominent position in all media present in the technical-scientific-informational environment. It is worth highlighting here the digital media, which account for a significant portion of all advertising today.

In this article, the objective is to present a brief conceptualization of Discourse Analysis; the importance of the print media in advertising in national circulation; included texts of large banks that were prominent in national advertising; and considerations about the content and the influence of this category of advertising on its readers.

We chose two weekly magazines of large national circulation, whose reach and audience are paramount to this study: *Veja Magazine* and *ISTOÉ Magazine*. The first magazine belongs to Abril Group, a communication conglomerate with several activities and considered the second largest information magazine in the world, although its weekly circulation is controversial. The second magazine, on the other hand, belongs to Editora Três, whose circulation is around three hundred thousand copies per week, which still represents in digital times - a shiny slice of the market, given the great competition in the sector, which is starting to give way to digital media, which in a short space of time, promises to occupy one hundred percent of the market.

Thus, we perform a quantitative discourse analysis of three advertising pieces



sponsored by Banco do Brasil S.A., Banco Santander and Caixa, two national and one international, in the period from December 2015 to May 2018, a period in which Brazil, according to information published in the same media and widely published in the others, faced economic, political and social crisis, with clear reflections on national and international trade.

A discourse analysis will be used to observe the objectives present in the advertising pieces inserted in the analyzed magazines. An interdisciplinary study based on Michel Pêcheaux, considered the precursor of Discourse Analysis, whose studies were essential to understand language as a system and relate it to the social, historical, political and ideological context in the communication panorama and its implications.

## **2 DISCOURSE ANALYSIS**

To begin the conversation, it is necessary that we understand Discourse Analysis (DA) as an essential tool in the understanding of the process of knowledge construction through linguistics and its relationship with other sciences, which leads to refining the analysis and strengthening structured thinking.

Bardin (2011), after a brief historical explanation of Discourse Analysis, briefly exposes its scope in a clear and objective way:

Content analysis, if it multiplies the applications, marks a little step, by focusing on technological transposition, in terms of methodological innovation. But it notes with interest the attempts being made in the broad field of communications analysis: lexicometrics, enunciation, linguistics, conversation analysis, documentation and database, etc. (BARDIN, 2011, p. 31)

There is a change in the behavioral patterns that drive the directions of advertising, which leads to change in its media format, requiring that discourse analysis can also reach these new media. Such analysis is necessary in this new geographic space with its terrifying speed, which threatens even our comfortable physical space. One has to wonder where print is going in the middle of the digital age, where cyberspace reaches the top of the connections established in a short time of profound innovations.

For Pêcheaux (1990), considered the father of French Discourse Analysis, discourse is a form of ideological materialization, treating the subject in the process as alienated, since he has no will of his own. From this understanding, language would permeate the various spheres of society, and the subject would be a deposit of ideology. (FERREIRA DE MELO, 2009, p. 3)

Another relevant aspect for Pêcheaux in discourse analysis is precisely ideology. Ferreira de Melo (2009, p. 14) corroborates that ideology transpires in discourse through ideological investment, that is, the transmission of the message is performed by a subject who presents himself surrounded by ideologies and emphasizes that the "discourse as an object constructed by discourse analysis should be seen as a process that takes place on the language, and the linguistic event as an ideological investment of the subject that is inscribed and dispersed in the discourse". (2009, p. 14)

Thus, history, which brings with it the whole social aspect constructed temporally and contextualized in absolute reality; and the subject with its ideologies provide discourse analysis with the various contradictions that entangle in a diverse context, but endowed with meanings.

By choosing the French scholar and his theory, the idea is precisely to establish this intense social relationship between subject - time - space, resulting in a more refined analysis and places language as a means to achieve social goals. In the French tradition proposed by Pêcheaux, the social context, the cultural and historical aspects act with a primary importance for the understanding of the meaning and scope of advertising.

The advertising textual style is present in our daily lives through various means of communication. In this specific case, we used the written advertising, present in magazines of national circulation, whose days are counted as apocalyptic, in view of the catastrophic forecast of the end of these editions, all migrating to digital platforms. However, the pleasure of reading by flipping through pages still enchants many readers and lovers of this ancient practice, which, it is hoped, will not be completely changed, for the sake of future generations.

### **3 DISCOURSE, ADVERTISING, AND ECONOMICS**

In times of crisis, of all types and forms of outreach, the discourses vary to achieve their goals and act as opinion formers or interfere directly in individual choices related to consumption. This is the great function of advertising, which makes a product or service known by thousands of people.

Advertising can be used to inform or convince, and it covers diversified audiences, depending on the mechanism used and to which social class it is directed. It generally uses simple and direct messages, with the use of images and lots of color. The texts, nowadays, are short and direct. Hence the choice of bank advertising, whose information

needs to be direct, but at a level that can reach various social classes, unless the advertising is specific to a class of customers with comprehensive access to that message, as we will see later.

To exercise the necessary persuasion, an essential characteristic of advertising, it is necessary to use a discourse that convinces the reader that the product or service being offered is essential and extremely necessary. For this goal to be fully achieved, the brand needs to be linked to a good discourse, which conveys confidence and security, especially when it comes to banking institutions.

Therefore, the use of short messages, arguments, and theories that lead to the convincing of the reader are linguistic aspects of the persuasive discourse. However, advertising is composed of other systems, as we can better observe:

Advertising is a semiotic genre developed in consumer society, argumentative in nature and perlocutive purpose, used by producers of goods to make them known to individuals (usually through the media), persuade them and influence them in order that they acquire them [...] Advertising is not a language: it is a semiotic genre that uses any language and that, with amazing frequency, uses the combination of various communicative procedures (music-word, music-word-image). (GUTIÉRREZ ORDÓÑEZ, 2002, p. 262)

In this case in particular, we work with the advertising contained in the printed media, being these communicative procedures considered iconic signifiers, as well as in the composition of the printed media are also present the linguistic signifier and the logo.

Moving on to the economic horizon, the Valor Econômico digital magazine presented studies that show that for every one real invested in advertising, ten reais and sixty-nine cents are generated for the economy as a whole, which leads to a significant increase in the Gross Domestic Product (GDP) in the same proportion. Considering that the average amount invested in print advertising is around thirty-three billion reais, the impact will be around three hundred and fifty-eight billion reais, about. These values oscillate, but it can be observed that, even with the economic crisis, these values have not decreased, according to the magazine cited.

Banking institutions seem not to feel the devastating effects of the financial crisis, increasing their investments in advertising. According to studies by the G1 Economia portal, the profits of Brazilian banks showed a surprising growth of 14.6% in 2017, after a setback in 2016. This setback has not diminished advertising boldness, perhaps it has increased it, since it culminated in the conquest of new customers and the sale of old products, simultaneously, in which competitiveness with digital banks, fruits of

technological development, becomes fierce.

Here we highlight Banco do Brasil S. A., Santander and Caixa, whose advertisements are analyzed here. The first two occupy the third and fourth positions in profits, respectively. If we consider only these three banks and their investments in advertising in 2017, taking into account the studies presented by Kantar Ibope Media, Caixa appears in eighth position in media investments, for a universe of 61,380 advertisers, being the only bank to appear among the ten largest investors in advertising in the year mentioned. The Kantar agency solidifies its research as "Advertising Investment", considering that it aims at concrete financial returns. Thus, 3.4% of all investment made in 2017 was directed to printed magazines, which have a universe of 2,087,209 assiduous readers. Of the total investments made by financial institutions, the amount represents 7.7% of the total invested in 2017 in this type of media alone.

#### **4 ANALYSIS**

These are three advertising pieces composed of linguistic as well as iconic signifiers. They present distinct characteristics in their formats, occupying one or two pages, containing advertising from Banco do Brasil, Santander and Caixa. The texts are presented in several graphic formats, whose content exposes the facilities, products and some benefits of the banking institutions, aimed at customers and non-customers, treated in some banks as account holders. The discourse is direct and objective, and may include catch phrases related to well-being and life. We will see below the three cases and their respective analyses.

The first advertising piece (Revista Veja, 23/12/2015, p. 28 - 29) is from Banco do Brasil with emphasis on a special management called "Estilo", a sector of the institution that serves its best customers in a differentiated way, because they are potential account holders. It is a mixed economy society where the Brazilian Union owns 54% of the shares, and is the largest bank in Latin America with more than 200 years of history. It was founded by Dom João on October 12, 1808, when only four countries had banks: Sweden, France and England. It has more than five thousand branches and more than one hundred thousand employees. Its net profit in 2017 was 11.1 billion reais, according to information from the institution itself.

In some very specific cases, the service can be provided by an exclusive manager. The central text is presented in the format of an electronic screen, suggesting that it is a

modern digital media, and can be of any format. Further down, in white letters on a black background, a complementary text highlights the advantages that the "Style" client can have. Let's go to the text:

The same close and personal service as always. And, now, in the palm of your hand.

Banco do Brasil Digital Style. You connected to the good things in life.

Extended service from 8am to 10pm; complete financial advisory services with specialists in investments, pension plans, insurance and home loans; online access to the manager; and service via instant messaging, chat, videoconferencing, e-mail and telephone. Everything for you to enjoy the good times of life. (Veja magazine, 23/12/2015, p. 28-29)

The central text defines the position that the institution presents regarding the personal service, but using the digital media, highlighting that the time used to perform the banking functions decreases, which can mean a use of time with other more pleasant activities of life. The bank's logo makes no reference to the institution, highlighting only the word "Style", transmitting the idea that this customer is treated differently from other bank customers as a unique personality in a banking system that tries to convey the notion that the bank also sees people, instead of just numbers and resources.

The capitalist society has suppressed being for having, and this is verified in the advertising under analysis, since it is a personalized customer, which is reiterated in the complementary text, these being the advantages of being a "style" customer, presented here as a form of service, but also of life. Thus, it offers all kinds of services, always highlighting that the bank is complete and offers direct access not only to the manager, but to all modern ways of communication, whether instant messaging or other means, besides, of course, the telephone and its calls, which banks avoid at all costs, considering that impersonal service presents itself more profitable for banks.

The complementary text inserted in the piece, concludes with a sentence with the function of establishing the link between current technology and the human client, transformed into a code or a password. It is clear in the text that everything has been thought out and worked on so that the human can enjoy the good things in life, because the financial assets are being very well taken care of by the institution.

Thus, the debate about the use of time and its real use is resumed as essential to the experience of being, glimpsing a supposed enjoyment of the best that life has to offer. It is also reaffirmed that the purchasing power becomes a definer of this integral use of life, besides reinforcing that time can be dominated by us. This idea, in practice,

does not reflect the real and immediate context, or perhaps, it only means a balance of time that can be fully spent to make more profit. Both the client and the bank.

The second advertising piece (Revista Veja, 23/12/2015, p. 57) belongs to the Santander bank, which has worldwide headquarters in Spain and is the largest bank in the euro zone and one of the largest in the world. It has been operating in our country since 1982 and is the third largest private bank in Brazil, according to information from the institution itself.

The advertisement occupies only one page of the magazine and makes a clear allusion to modern electronic equipment in the image that illustrates the advertisement: a woman using a cell phone at the same time, while manipulating a portable personal computer, showing dexterity in working with both machines. The human figure has a wide smile on her face as a sign of clear happiness, next to the following text:

You are making a life for yourself.  
Meanwhile, what does your bank do for you? We not only understand your moment in life, but we have a proposal for it:  
Santander Master. Up to 10 interest-free days per month on overdrafts, so that the unexpected does not hinder your growth.  
Santander Esfera. Offers at stores, restaurants and double bonus when you swipe your card at the GetNet machine, to make your money worth more. Open your account.  
Search for Santander Van Gogh  
Your bank can be simple, personal and fair (Veja Magazine, Dec 23, 2015, p. 57)

The text starts with an unopposed statement that the financial individual is growing, evolving, asserting himself more and more on 'having' and needs to enjoy his life more. Thus, the bank needs to perform its functions and do more for the growing one. By assuming a position of guilt, a reparation is offered that consists in understanding this very important moment, which does not foresee any loss of time. The institution starts to present proposals that can make life easier for those whose time is too precious.

Three of the bank's products are offered, which take up most of the advertising text. These products will help the client or account holder to better organize his or her life. The idea of making a play on words by including the word 'life' in the advertisement, will be to add a human character to the technological one, since the advertisement has enriched the image and needs to base its text, which is auxiliary. In a context where time is a valuable commodity, even the advertisement needs to be direct and this offers a privileged space to semiotics, because as we advance and value this time lapse more, reading can be fatal for the reader.

The products are the bank's calling card, but at the end of the product's exhibition, there is always a special call that invokes personal appreciation. The product should not hinder the individual's growth, so the institution needs to facilitate its use. Here we see a subliminal sign of the financial crisis, without necessarily talking about it. In difficult times, the use of mechanisms that lead to prolonging personal resources leads clients to use resources that banks make available at rates that are not always clear. By acquiring the amount, a spiral is set in motion that inevitably leads to indebtedness. And so on and so forth.

So much so that the next product claims that everything is being thought out so that your money will be worth a lot more. That it will also last longer. The bank only values your scarce resource. And if the financial institution is good, you need it. The invitation to open an account with it is inevitable and direct.

The bank works with classes to reach various publics. The management sector called "Van Gogh" is exclusive for clients with incomes between four and ten thousand Reais and investments above forty thousand Reais. It uses the name of an Impressionist artist, which conveys to the customer the idea of art as one of the bases of the bank, if we consider that most banks make some investment in arts or shows to remove the view of institutions that are technical and act only financially.

At the end of the advertisement, the bank states that the customer has the right to a "simple, personal and fair" bank. This statement has no practical basis whatsoever, because there is no such thing as a simple bank. Everything is always very complicated when dealing with banks. On the subject of personality, there was a time in the past when you had to get to know your customers in order to establish a bond of friendship and financial loyalty. Technology was hardly a factor in institutions. With population growth and the technological era, this factor was put aside for quite some time. Now, the idea of personal banking is resumed, using modern technological means to establish this relationship. Functional applications put us in the bank and we can perform all day-to-day actions using a cell phone. This is a personal bank where the only human being present in it is us, who are performing the functions that the bank should do for/to us as customers.

To conclude this analysis, the bank is fair. When we access the website of the analyzed bank, we can see that the fees charged for the services may not be so fair, although it is said that they may be legal, since the financial, economic and maybe even political system is controlled by the big international financial institutions, which, in some

cases, indirectly control even the national ones. Fair here refers to the fees charged for services, and may not reflect the hidden truth.

The third advertising piece analyzed here (Revista ISTOÉ, 05/23/2018, p. 24 - 25) belongs to Caixa, a financial institution that operates as a public company belonging to the Federal Government. Founded on January 12, 1861 by Emperor D. Pedro II, it is responsible for federal social programs, the Guarantee Fund for Length of Service (FGTS), the Social Integration Program (PIS), the Student Financing Fund (FIES), various banking services and lotteries, directly linked to the Ministry of Finance and assisting the Federal Government's credit policy. The advertisement occupies two pages of the print magazine, the first page being occupied by an image of a floating branch traveling the Amazon rivers, the second page containing the text that is part of this analysis, transcribed below:

At Caixa, sustainability is more than just talk.  
It is a commitment.  
Helping to protect springs and rivers.  
Caring for forests.  
Supporting the production of clean energy and the construction of sustainable housing.  
Adopting socio-environmental requirements when granting credit.  
Promote the development of communities and social inclusion.  
The practice of sustainable actions permeates all of Caixa's operations.  
It is a commitment we insist on keeping with people and with Brazil. (ISTOÉ Magazine, 05/23/2018, p. 24-25)

The text is deeper and more sentimental, for it reaches the environmental debate present in our current society. And it states that this is not just a "speech", but a commitment established by the banking institution. We can evaluate that, because it is a public company, the obligations are more demanded and inspected, which leads to the socio-environmental discourse, which integrates the human being with nature.

In the advertisement there is not the sale or offer of a product of the bank, but an accountability of one of the actions of the institution, which is sustainability. This bias is explicit in the list of actions developed: protection of springs, projects that prioritize the environment, clean energy generation, sustainable housing, and social inclusion. This is the surprise of the text, given the rarity with which banks support community inclusion and development initiatives. It may sound contradictory, but for this analysis, if we look for actions in this direction, the overwhelming majority of them come from public or mixed capital banks. The contradiction lies in the fact that banks are classified only as institutions whose function is to take possession of individual resources under



the justification of taking care of them in order to yield better returns.

The bank states categorically that these actions are part of the bank's policy that even permeates its actions, citing the bank's name as an affirmation of the social and environmental responsibilities that the brand represents in a universe where having reigns. For many, these actions reiterate that people are important; that these people have a reality that should assure them the minimum for their survival. It may be that, in the case indicated, the riverside dwellers are the targets of this process, or even quilombola communities, as well as excluded groups that are not only Amazonian. The fact is that advertising differs from other advertising as a whole, affirming the existence of another side of the coin that few people know about. The final sentence that closes the text mentions the bank's affirmation of its commitment to people, understanding that customers are not only customers, but human beings. And besides this commitment, it reaffirms the second, which, more comprehensive, has a double meaning: commitment to Brazil as a government, an institution of organized power; and to Brazil as a nation, a country with diverse riches and a history that cannot be forgotten. It is in this Brazil that Brazilians find themselves, that they feel unique. Advertising reaches not only the customers, but the Brazilians, in the form of a commitment maintained under the economic and social order, with the people and with the national environment.

## **5 FINAL CONSIDERATIONS**

By analyzing the proposed advertising pieces from the perspective of Discourse Analysis, the proposed goal was duly completed and richly contributed to understand a little more of the bank advertising that is present in our media today. Although we observe that the printed media are giving way to the digital media, advertising presents textual diversities according to the objectives of the contractors and their performance in the market.

Discourse analysis undertakes a task of utmost importance in carrying out analyses of the various types of advertising and their function in the advertising market. These analyses serve to guide thoughts whose analyses go unnoticed or often only serve the interests of commerce and the banks' economy.

Banking institutions establish relationships with their clients that are not personal, much less direct. It is a service established through a contract that determines obligations and payments for services rendered, from the simplest to the most complex. Nothing

comes for free. And the fees for the services are not always fair and honest.

Banks are increasingly investing in digital technology solutions in which customers perform the functions of the bank and pay for them. On the other hand, banks increase their profit margins and lay off employees inhumanely and cruelly, an act characteristic of financial capitalism, which dominates global society and is responsible for globalization as it is known and experienced today.

The contribution of this article, far from causing disgust with financial relations, is to show that these relations are not always loyal, unless one or another case comes to show us that a different economy can still exist, one that cares about people and their environment, as observed. In fact, a new economic relationship is slowly beginning to be organized, called the solidarity economy, by credit cooperatives, in which one is not a client or an accountholder, but a cooperative partner. This may be the way out for the end of commercial exploitation, or capitalism will find a way out that will overcome this space, eliminating competition.

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## **Assessment of Microplastic Waste in the Offshore Environment: An Analysis of the value chain based on the SGI perspective**

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### **ABSTRACT**

Marine microplastic pollution is a major environmental issue worldwide. Marine debris can be found floating on the sea surface, in the water column, stranded on shores, and/or deposited on the seabed. Another important issue is the logistics chain that supports offshore activities. The structure of the article follows the methodology of the Journal Clean Production. The article seeks to analyze the control of solid waste, especially microplastics from offshore companies in marine and coastal environments. The problem that the article intends to investigate lies in the occurrence of microplastics in the ocean waters, as well as its extensive 'offshore' communication network. In this context, this paper, intends to generally assess the microplastic solid waste, in offshore areas for marine and coastal environments. It seeks to specifically present the influence of offshore processes on waste generation; to demonstrate risk management in reverse logistics; the effects of the green whip in the supply chain; perspectives of polymer pollution and debris in the offshore environment; and the importance of integrated management systems in supporting sustainability. The results were analyzed for relevance to the supply chain, reverse logistics, green and risk management, the distribution of floating marine debris in waters under the domain of the offshore environment; offshore processes in waste generation, ocean trash and floating marine debris; the constant worldwide growth of plastic and the implementation of an IMS for compliance with the required NBR ISO 9001:15, ISO 14001:15 and ISO 45 000 standards, as a basis in an organic, fluid and transparent Management system.

**Keywords:** microplastics, logistics chain, offshore environment, integrated management system.

### **1 INTRODUCTION**

Currently, the total annual generation of solid waste worldwide is approximately 17 billion tons and is expected to reach 27 billion by 2050 (Karak et al, 2012).

Nowadays, waste generated from marine activities has been a source of much attention and concern due to its potential to pollute. Pollution by plastic materials in the oceans, called microplastics, is a ubiquitous marine environmental problem.

Solid waste management is known to be a major contributor to many different environmental problems, such as ecosystem damage and resource depletion due to inefficient recycling systems. The staggering increase in solid waste generation therefore calls for management systems (Lazarevic et al, 2012).

In Brazil, the Solid Waste Law (Law 12.305/2010) is too important in this process, where the principles, objectives, and instruments focus on the integrated management of solid waste, including hazardous waste, the responsibilities of generators and public authorities, and the applicable economic instruments.

Concomitant to this, the NBR 10 004 (ABNT, 2004) says that, solid wastes are all solid or semi-solid wastes that result from industrial activities, from water treatment systems, those generated in pollution control equipment and facilities, as well as certain liquids whose characteristics make it unfeasible to discharge them into bodies of water, or require for this technical and economically unfeasible solutions, given the best available technology (Rigas, 2019).

To increase their chances of survival in the market and meet the sustainable demands, organizations have sought opportunities for operational, technological and managerial improvements that allow them, equitably, evolve from the point of view, productive, environmental and social (SIMON et al, 2012).

The Integrated Management System presents the function of unifying the processes of quality, safety, environmental management, occupational health and social responsibility, the proposition of the alliance between sustainable management practices and competency models adopted by organizations, so as to result in procedures beneficial to society, economy and the environment. This is because a greater awareness of the relationship between social interests, business strategies and personal desires allows a greater participation of stakeholders in circumstances involved by conditions considered as sustainable (MUNCK, 2012).

The interaction of the IMS in waste management has become an important tool in monitoring indicators in the flow of materials, from the generator to the final destination. Offshore waste management contributes not only to the mitigation of negative

environmental impacts, but also to a better distribution of waste to their respective destinations, thereby generating economic benefits.

The problem that the article intends to investigate is the occurrence of microplastics in the ocean waters, as well as its extensive offshore communication network, which favors the trawling of these residues. The monitoring of microplastics in the ocean waters in the vicinity of platforms and their interfaces in an integrated management system have indicators that reinforce the human interactions with the environment, as well as its valorization for the balance defended in the sustainability?

In this context, it generally seeks to evaluate solid waste from microplastics in offshore areas for marine and coastal environments.

The article seeks to demonstrate risk management in reverse logistics; the importance of understanding the supply chain relationships in the offshore universe and make a relationship with waste generation in this marine environment, to assist perspectives in understanding the sources of polymer pollution and debris in the offshore environment.

The justification in its potentialization may pass in the existing relations between the IMS and environmental conservation strategies for the marine environment, to the extent that critical analyses are evaluated, in order to identify the aspects that can establish measurable indicators in the monitoring of microplastic waste and the mitigation of sustainable preventive measures. This evidence reinforces the scientific gap, which seeks to answer what are the practices that can contribute to the correct alignment with the strategy in the implementation of the IMS and environmental conservation. In this sense, it highlights the need to study the contributions of the IMS for the success of the organizations' strategies, identifying how and which elements of IMS can act in the creation of competitive advantages (SAVINO; BATBAATAR, 2015; SILVA et al, 2016; WITJES; VERMEULEN; CRAMER, 2017).

In general, the oil industry can be divided into two segments: the first known as upstream, where oil and gas exploration and production activities are included; and the other called downstream, intended for refining, distribution, and marketing activities. E&P activities, in turn, are divided into: Exploration, Drilling and Production.

Another important point refers to the stages that correspond to the logistics chain that provides support to the activities in the offshore oil industry. Several types of vessels act alongside the platforms and support facilities of the oil industry as an intrinsic part of

these activities and contributing to waste generation, in support of drilling operations, production platforms or emergency response. The vessels and maritime units include both the facilities aimed at the industry's core business (oil exploration and production), as well as housing and facilities for the workers who work on board (KOEHLER, 2012).

In a study done by IBAMA, about 54.3% of solid waste produced on offshore offshore platforms is considered hazardous. In the chronological order of petroleum activities, we have seismic research, well drilling, production and oil and gas flow, all being responsible for the generation of approximately 44,437 tons of solid waste (BRASIL, 2011).

Thus, marine debris can be found floating on the sea surface, in the water column, stranded on shores and/or deposited on the seafloor ( Goldstein et al, 2013 , Galgani et al, 2015 ). Plastics are prevalent among marine litter worldwide (Depledge et al, 2013 ) being currently considered a hazard to the environment ( Hammeret al, 2012 ).

Microplastics are plastic waste in the environment (Moore, 2008). Currently, marine microplastic pollution is a major environmental issue worldwide (UNEP, 2011). Jambeck et al. (2015) assesses that the annual input of MPs into marine environments ranges between 5 and 13 million tons. The main concern is attributed to their persistence, ubiquity, and potential risk to marine organisms (Kanhai et al., 2018).

Removing microplastics from the environment represents a new urgent challenge in the last decade, considering the disastrous impact to all species. These contaminants have been detected in various environments, such as lakes, rivers, oceans, and urban wastewater effluents.

Based on particle size, microplastics are defined as synthetic polymers smaller than 5 mm in diameter that resist biodegradation (Thompson et al, 2004).

Soon, considering the new evidence on the multiple risks plastics pose to the environment, in 2015, the G7 Science Ministers meeting recognized the global risks posed by plastics to marine and coastal life, ecosystems, and potentially human health, committing a priority Action Plan to combat Marine Litter through innovation, education, research, and outreach programs.

## **2 THEORETICAL FRAMEWORK**

### **2.1 REVERSE LOGISTICS**

Among so many concepts about logistics Coelho (2011) defines logistics as "an art and a science, dedicated to doing whatever it takes to deliver the right products, at the right place, at the right time"

In the oil chain, logistics is essential in all stages, both in exploration, development and production as well as in the refining and distribution stages. But each stage has its own particularities and faces its own logistical challenges.

The oil industry is known as upstream, for its oil and gas exploration and production activities; and downstream, for its refining, distribution, and marketing activities.

In upstream, the network project is determined from the location of the deposit. In onshore deposits, storage facilities (terminals) are close to the exploration area. Offshore, the oil extracted from the seabed is stored on fixed or floating platforms, and then stored on offshore platforms.

or floating platforms, then transferred to lighter vessels and finally transported for storage at onshore terminals.

The term downstream is used to define, essentially, the activities of transporting, marketing and refining oil, and transporting and marketing oil products.

Inventories are strategic at this stage. The crude oil inventory has a volatile demand, difficult to predict, traded in large lots and high added value (Jacoby, 2012). Finally, pipelines, tankers, trucks or trains are used to transport the crude oil. The choice of transport mode depends on the distance, type of oil, cost and available resources (Chu et al., 2012).

Reverse logistics can be defined as the part of logistics that aims to relate topics such as: reduction; source conservation; recycling; replacement; and disposal to traditional logistics activities of purchases, such as supplies, traffic, transport, storage, warehousing and packaging. (. . . ) there is the direct and reverse flow of products. Through it, we realize that the reverse cycle starts from waste from the production process or from customer consumption, and can go to disposal or return to the product cycle (OLIVEIRA et al, 2020 ).

Reverse logistics is an area related to business logistics, aiming at the return of goods used by consumers to the business cycle, both in post-sale and post-consumption,



in order to add value to the product, economically, ecologically, legally, logistically, or even with respect to corporate image (LINHARES, 2008).

Reverse logistics manages, equates and operationalizes the physical flow and the corresponding information of post-sale or post-consumption products discarded by society and that somehow should return to the production cycle adding value to the materials (LEITE, 2000)

Offshore operations represent an important part of exploration today. These operations basically consist of drilling wells on the seabed. They are performed by platforms or offshore drilling rigs of different types, depending on geographical characteristics such as the water depth of the location where the well will be drilled. The rigs for these services are generally contracted by the operating companies.

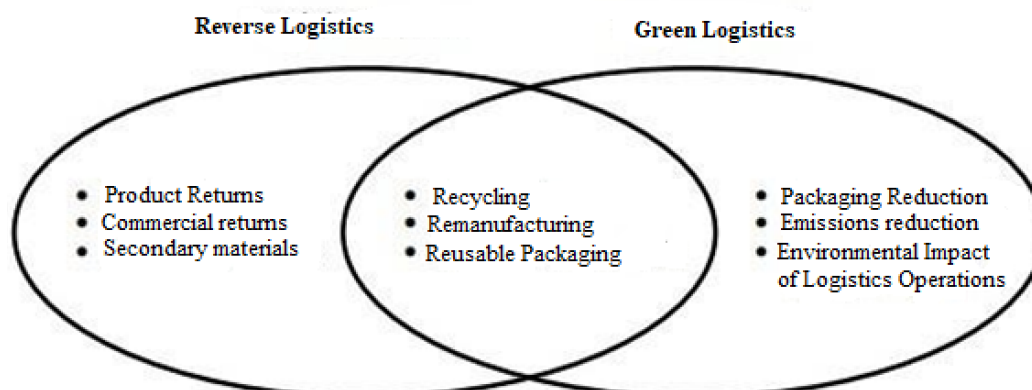
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Figure 1 - Comparison between Green Logistics and Reverse Logistics



Source: adapted from ROGERS and TIBBEN-LEMBKE, 2001

Green supply chain management explores both strategic and tactical considerations. At a minimum, two critical aspects include greener design defined over an entire product life cycle (i.e., pre-manufacturing, manufacturing, distribution, use, and end-of-life destination), and an extended view of a supply chain, encompassing the potential for remanufacturing and recycling (Srivastava, 2007, Klassen and Vachon, 2012).

In this case, the bullwhip effect is, in its definition, a phenomenon of inaccuracy in the estimation of demand by each member of the supply chain when there are fluctuations in order volumes, therefore the origin of the bullwhip effect in logistics lies in the problems that each member of the supply chain has to determine the real demand for their products. This lack of visibility causes companies to allocate resources to acquire inventory based on distorted or poorly contextualized data.

## 2.2 SUSTAINABLE INTEGRATED MANAGEMENT SYSTEMS

The Integrated Management System presents the function of unifying the processes of quality, safety, environmental management, occupational health and social responsibility, making efficient the implementation of processes, procedures and practices than through individual management systems for each process of an organization (BECKMERHAGEN et al. 2003).

Organizations generally operate in turbulent environments characterized by intense competitiveness, constant technological progress, new market demands and scarce natural resources. This scenario imposes the constant need for changes in the operation and management of companies. Oliveira (2013).

The implementation and maintenance of integrated management systems is a bet to develop the principles of Organizational Sustainability and ensure the quality of their products and services, ensure the preservation of the environment and risk-based thinking (SGS, 2019).

Sustainability is a widely discussed topic in today's society. In addition to the scarcity of natural resources, there is also the intensity of environmental impacts and the growth of the world population, believing the paradigm of sustainability related to economic and natural systems, making the environment a strategically very important and urgent issue (FERREIRA, 2016).

The main objective of sustainability indexes is to measure the financial performance of organizations through the creation of a benchmark, as there is a search for the application of resources in companies that increasingly seek to apply ethics and social responsibility in their processes. The Lean-Integrated Management System for Sustainability Improvement (LIMSSI) was developed taking into account the difficulties faced by organizations in carrying out sustainability improvement activities. This model seeks to avoid the loss of organizational efficiency that results from waste, duplication, and increased bureaucratic processes (Souza & Alves, 2018).

### 2.3 MICROPLASTICS

The word polymer originates from the Greek poly (many) and mero (repeating unit), thus a polymer is a macromolecule composed of many repeating units called meros, linked by covalent bonding. After World War II, the materials field was virtually revolutionized by the advent of synthetic polymers, because they could be produced at low cost. In 1900 was the first occurrence of polymers with Polystyrene (PS), and the initial industrial production, for commercial purposes, was Polyvinyl chloride (PVC) in 1933 (CALLISTER; RETHWISCH, 2009).

In 1950 began the global production of plastics, with 1.5 million tons, and since then had continuous growth over the years. In 2015, 322 million tons of plastic materials were produced globally, representing an average increase of 9% per year, using around 5% of the world oil production (PLASTICS EUROPE,2015).

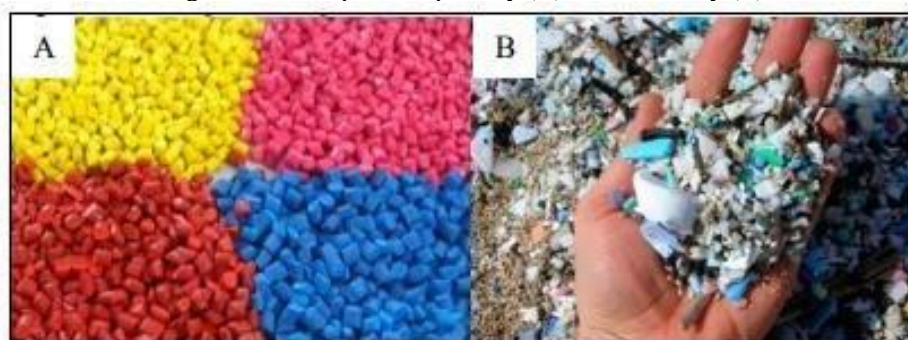
Latin America represents 4.4% of the global total, and Brazil has almost half of this production concentrated in PE, PP, PVC, PET and engineering thermoplastics (ABIPLAST, 2015).

With regard to the demand for plastics for consumption, as published by Plastics Europe (2015) in Europe the estimated figure is 49 million tons in 2015, with 70% concentrated in 6 countries (Germany, Italy, France, Spain, UK and Poland).

Macroplastics are the waste above 5 mm that are accumulating in marine habitats around the world and can persist for centuries. As for the source of these materials, about 80%, is terrestrial, mainly from densely populated or industrialized coastal areas, the other 20% comes from marine activities (LI; TSE; FOK, 2016). Marine plastics can cause impacts on tourism in the coastal zone, cause damage to marine species including birds, fish and cetaceans, by suffocation, entanglement, and ingestion, as well as carry chemical contaminants, and perform biological dispersion (BAPTISTA NETO; DERRAIK, 2002; LI; TSE; FOK, 2016).

Microplastics are fragments smaller than 5 mm in diameter and very damaging because of their size, these are the most numerically abundant plastic debris in the ocean (CÓZAR et al., 2014; JAMBECK et al., 2015a; LAW; THOMPSON, 2014; SEBILLE et al, 2015). Eriksen and colleagues (2014) estimated that out of 269 million tons, 92.4 percent, are micro-plastics and most of them sink into marine sediments. Predictions show that the amount will inevitably increase, mainly by large plastic objects that degrade into millions of pieces by the contribution of oceanic bacteria action, UV radiation, chemical degradation, wave mechanics and by marine life (LAW; THOMPSON, 2014; LI; TSE; FOK, 2016). Microplastics can be classified according to their sources: primary or secondary, whose distinction is based on particles that were manufactured so as to be originally in this size (primary) or that resulted from the disaggregation of larger items, or secondary (GESAMP, 2015). The image illustrates these two types of plastic, Figure 2.

Figure 2 - Microplastics: primary (A) and secondary (B)



Source: Casagrande, 2018

Plastic pollution has been a problem for decades, largely due to a society of consumption and incorrect disposal of waste. Despite the reduction in the fragmentation of plastic waste, the material still continues to interact with elements of the environment, which causes the impacts to become greater. Some of the consequences of plastic pollution are a decrease in the aesthetic value of the aquatic environment, loss of biodiversity, and a threat to public health. Fresh water environments can accumulate numerous plastic particles and fibers, serving as a source, transfer medium, and sink to sea waters. Other characteristics related to plastics and microplastics is the abundance of these substances near areas with high population (LI et al, 2018).

Among the industrial activities, the exploration, drilling and production of oil in offshore fields, present as the first negative cause, the environmental impact, either by the volume of waste generated, or by their toxicity and the very specificity of the activity that occurs offshore, where any lack of control could cause catastrophic impacts to the environment.

The production units generate around 38 (thirty-eight) tons of waste per week. The sector that takes care that all this waste generated has its destination duly corrected in the unit is waste management, always taking into account the environmental laws in force. Among the industrial residues, we can highlight the oily sludge, which comes from the bottom of the storage tanks and the water separators, oil and materials contaminated with oil (materials resulting from some cleaning and maintenance activity).

The waste generated in this activity is many and varied. They are classified and divided into classes I and II according to NBR 10 004 (ABNT, 2004).

Considering that offshore operations generate a great impact on the marine environment, mitigation measures are adopted for the environmental licensing to be deliberated. In this case, the enterprise must correspond with the PCP (Pollution Control Project), which brings the environmental agency's guidelines for sanitary effluents, atmospheric emissions, and solid waste (BRASIL, 2011). By definition, marine litter is any type of solid waste produced by man, generated on land or at sea, which, intentionally or unintentionally, has been introduced into the marine environment, including the transport of these materials by rivers, drains, sewage systems or wind, excluding organic materials (such as food and plant remains) (CHELSHIER et al, 2009; MMA, 2013b).

Understanding the flow of marine plastics aids in understanding the pathways taken by these materials and in the future development of future characterization models.

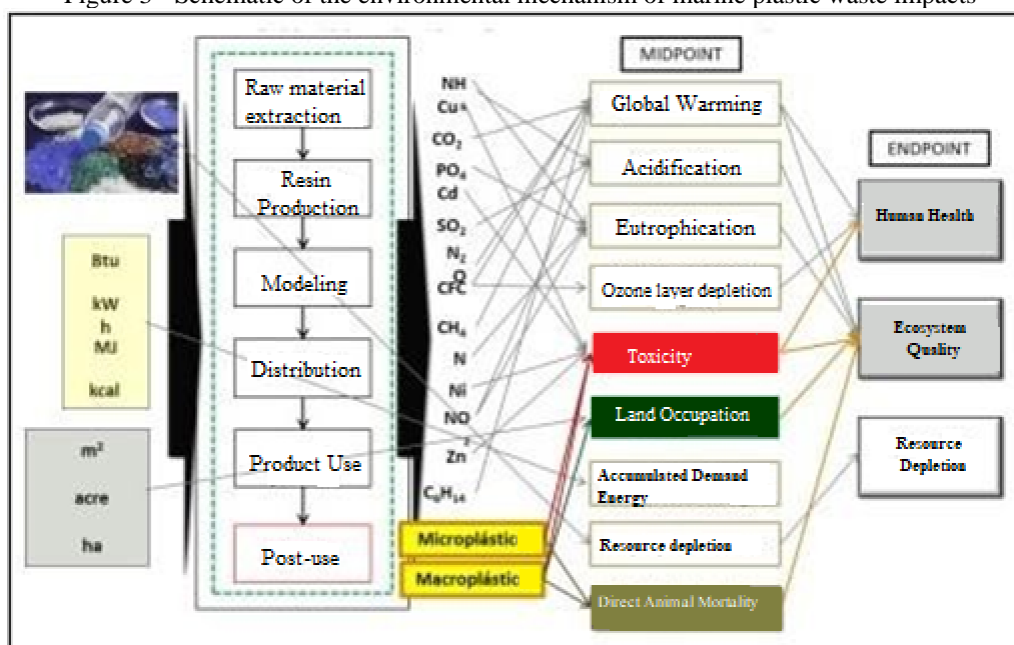
For this reason, after an analysis of the data found in the literature, it was possible to define the environmental mechanism of macroplastics and microplastics that reach the ocean and their pathway until the generation of final damage. The summary of this process has been schematized in Figure 3.

Given that plastic waste is not managed properly, there is a high probability of these materials reaching the oceans, so macroplastics and microplastics make up the majority of the debris found in the marine environment worldwide. Thus, this development is believed to contribute to improvements in impact assessment, and also to the advancement of Life Cycle Assessment of microplastics.

Despite decades of efforts to prevent and reduce marine debris in many countries, there is evidence that the problem is persistent and continues to grow - while populations and consumption patterns continue to increase (ANDRADY, 2010).

During Rio+20, marine litter was the most voted topic on the Oceans Theme Virtual Platform of the Dialogues for Sustainable Development, with 60,000 votes (MMA, 2013b).

Figure 3 - Schematic of the environmental mechanism of marine plastic waste impacts



### 3 METODOLOGY

The article is based on material found in published scientific articles. Thus, the research was based mainly on the studies of scientific articles, magazines and reliable electronic media, being also performed a literature review.

The most relevant articles were published between the years 2014 to 2021. They were found by keyword presented (Logistic, Microplastic, Marine Debris, Solid Waste, Offshore and integrated management system), using as a research base the Scopus platforms.

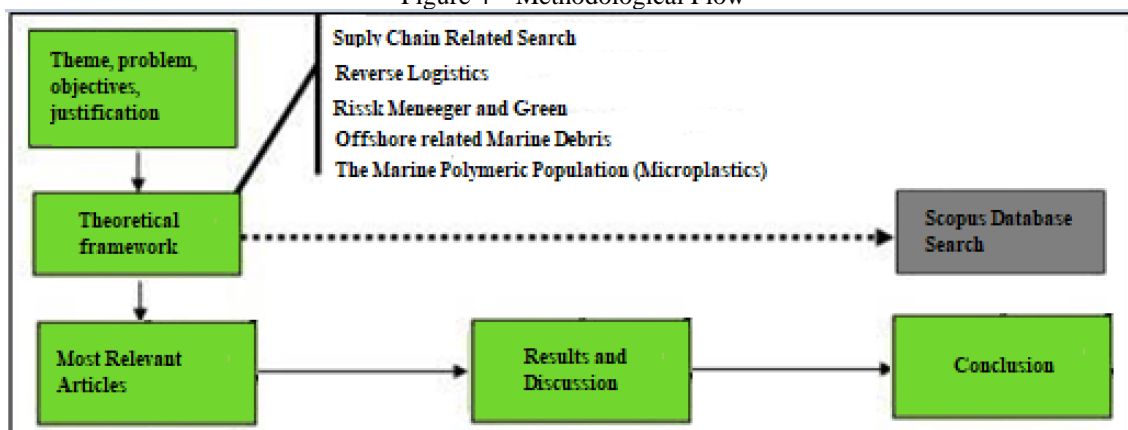
The methodology aimed at an exploratory research in order to obtain insights and ideas. For Lakatos and Marconi (2011), the bibliographical research refers to that which is carried out from available material, arising from previous research in printed documents, such as periodical books, articles and others. Objectively, the research is qualitative and considered applied, whose main objective is the generation of knowledge, directed to the solution of specific problems. Therefore, it presents the analysis of multiple cases is the possibility of demonstrating the model's action in different contexts. A Systematic Review with the definition of the objectives of the article, identification, selection of papers, periods, authors and search strategies, sources, period, keywords, and finally, analysis of the literature surveyed.

### 3.1 RESEARCH CLASSIFICATION

The research base presents its classification as to its nature in an applied search of qualitative approach, as to its objective a bibliographical and descriptive search of exploratory nature, and in relation to its technical procedure a documental survey.

### 3.2 METHODOLOGICAL FLOW

Figure 4 – Methodological Flow



## 3.3 ANALYSIS FORM

Table 1 - Supply Chain related research

<b>Título do Documento</b>	<b>Ano</b>	<b>Autores</b>	<b>Fonte</b>	<b>Citação</b>
Um sistema de triagem offshore revelado a partir da classificação global de lixo oceânico	2021	Morales-Caselles, C., Viejo, J., Martí, E., (...), Isobe, A	Gerenciamento incerto da cadeia de suprimentos 9(1), pp. 179-1	22
Gestão de riscos da logística reversa Identificação, agrupamento e estratégias de mitigação de riscos	2020	Panjehfouladgar an, H., Lim, S.F.W.T	Management Decision, Vol. 58 No. 7, pp. 1449-1474on	13
Perspectiva da cadeia de suprimentos sobre estratégias competitivas e estratégias verdes de gestão da cadeia de suprimentos	2017	Laari, S., Töyli, J., Ojala, L.	Revista de Produção Mais LimpaV141, pp. 1303-1315	62
Uma revisão da logística reversa e cadeias de suprimentos em circuito fechado: um foco do Journal of Cleaner Production	2017	Govindan, K., Soleimani	Revista de Produção Mais Limpa142, pp. 371-384	326
O efeito chicote verde: mudando os requisitos ambientais ao longo de uma cadeia de suprimentos	2014	Lee, S.-Y., Klassen, R.D., Furlan, A., Vinelli, A.	Revista Internacional de Economia da Produção156, pp. 39-51	68

Table 2 - Offshore Perspectives on Marine Debris

<b>Título do Documento</b>	<b>Ano</b>	<b>Autores</b>	<b>Fonte</b>	<b>Citação</b>
Um sistema de triagem offshore revelado a partir da classificação global de lixo oceânico	2021	Morales-Caselles, C., Viejo, J., Martí, E., (...), Isobe, A., Cózar, A.	Sustentabilidade da Natureza 4(6), pp. 484-493	22
Distribuição espacial de detritos marinhos flutuantes em águas continentais portuguesas offshore	2016	Sá, S., Bastos-Santos, J., Araújo, H., (...), Eira, C., Vingada, J), Isobe, A	Boletim de Poluição Marinha104(1-2), pp. 269-278	21



Table 3 - Research related to Marine Polymer Pollution

<b>Título do Documento</b>	<b>Ano</b>	<b>Autores</b>	<b>Fonte</b>	<b>Citação</b>
Soluções e estratégias integradas para o controle e mitigação da poluição plástica e microplástica	2019	Prata, J.C., Patrício Silva, da Costa, (...), Duarte, A.C., Rocha-Santos, T.	Revista Internacional de Pesquisa Ambiental e Saúde Pública 16(13),2411	113
Plásticos e microplásticos nos oceanos: De poluentes emergentes à ameaça emergente	2017	Avio, C.G., Gorbi, S., Regoli, F	Pesquisa Ambiental Marinha 128, pp. 2-11	487
Métodos de extração, enumeração e identificação para monitoramento de microplásticos no ambiente	2016	Qiu, Q., Bronzeado, Z., Wang, J., (...), Li, M., Zhan, Z. L.	Estuarina, Ciência Costeira e de Prateleira 176, pp. 102- 10915	126

Table 4 - Research related to SGI

<b>Título do Documento</b>	<b>Ano</b>	<b>Autores</b>	<b>Fonte</b>	<b>Citação</b>
Sistema de Gestão Verde Sustentável (SGMS) – Uma abordagem integrada para a sustentabilidade organizacional	2017	Mustapha, M.A., Manan, Z.A., Wan Alwi, S.R.A	Rebello, M.F., Santos, G., Silva, R.	43
Proposition for the alignment of the integrated management system (quality, environmental and safety) with the business strategy Proposition for the alignment of the integrated management system (quality, environmental and safety) with the business strategy	2018	Barbosa, L.C.F.M., de Oliveira, O.J., Santos, G.	International Journal for Quality Research 12(4), pp. 925-940	34
Evolução da pesquisa de sistemas de gestão integrada no Journal of Cleaner Production: Identificação de contribuições e lacunas na literatura	2016	Nunhes, T.V., Ferreira Motta, L.C., de Oliveira	Rebello, M.F., Santos, G., Silva, R.	60
Integração de sistemas de gestão: rumo a um sucesso sustentado e desenvolvimento de organizações	2016	Laari, S., Töyli, J., Ojala, L.	Revista de Produção Mais Limpa 127, pp. 96-111	81

#### 4 RESULTS AND DISCUSSION

The critical review of the articles selected for their relevance among the supply chain, presents references to the supply chain, reverse logistics, green and risk management, where five publications were selected, between the years 2014 to 2021.

The analysis of the scientific publications used an environmental context as the essence of the theme. The dimension involving the supply chain, risk management, reverse logistics reverse logistics, green logistics, and offshore perspectives related to

marine debris, microplastic pollution, and the implementation of environmental indicators, integrated into a sustainable management system.

Because of the environmental aspects, the wastes and tailings produced from offshore rigs and platforms need proper disposal. The return process normally begins with the waste being brought to the port by ship.

According to Morales-Caselles, 2021 marine litter is generating impacts for a range of plastic food and travel drink items that largely dominate global litter, but data on the nature and origin of the litter remain patchy.

Thus, the environmental dimensions and their combination with other areas is aimed at a multidisciplinary aspect. The production chain and logistics of the offshore industry is key to enabling a better understanding of the processes in their entirety. An overview of the production chain allows one to understand the complexity of the entire system.

The results show SCRM as a collaboration between supply chain members to reduce risk and increase profitability. SCRM being an ongoing process that requires a long-term commitment from members. It focuses on waste management and product recovery. It aims to fill the knowledge gap by first identifying RL risk factors and then classifying the risks into homogeneous groups. Risk identification provides the opportunity for decision makers (Panjehfouladgaran, 2020).

The role of business in society and its responsibility in minimizing environmental impacts. Green supply chain management to identify companies that consider small environmental impacts an important or very important source of competitive advantage as environmentally proactive. This led to a subsample of 39 manufacturers and 34 trading companies (Laari, 2017).

According to Govindan, 2017 the results shed light on the key trends in reverse logistics and closed-loop supply chain for the Journal of Cleaner Production as evaluations reveal some suggested opportunities for new research directions for the journal. The classical supply chain approach, now called advanced supply chain, does not take responsibility for end-of-life products.

The development of sustainable supply chains is focused on improving economic, environmental and social benefits. Waste reduction is one of the primary goals of the sustainability concept, and when the implications are even broader. In the area of logistics in the offshore oil chain, it seeks to identify new avenues for operational development to

support the solution of specific problems in logistics and/or environmental processes. A green whip effect created to meet specifications. Four different managerial responses, i.e. replace, accommodate, negotiate and collaborate, were observed to amplify or attenuate a green whip effect based on the nature of firm relationships and the balance of environmental capabilities at each level. Of particular interest, the green whip effect can force positive change by triggering the development of new environmental capabilities at various levels in a supply chain (Lee, 2014).

The implementation of an IMS will collaborate towards compliance with the required NBR ISO 9001:15, ISO 14001:15 and ISO 45000 Standards, based on an organic, fluid and transparent Management system.

In the context of the SGI the current sustainability related management systems, proposes the development of an integrated green management structure called Sustainable Green Management System (SGMS). A systematic, integrated and efficient approach to collect, monitor, analyze and manage information and resources to organizational sustainability and promote cleaner production, increase profitability and efficiency of an organization. The strategies and development framework of the SGMS are aligned with the goals of sustainability and cleaner production, in addition to the ISO standard requirements to identify the similarities and redundancies between three ISO standards (ISO9001, ISO14001, and ISO5001) (Mustapha, 2017).

According to Barbosa, (2018) the IMS allows identifying the existence of a two-way interaction, i.e., the integrated management system influences the business strategy in the organizational culture of the critical factors for the proper development of management systems. The development of IMS Integration (Integrated Management Systems) with business integration proposes a greater understanding and comprehension with the objective of formulating propositions that assist in the alignment of IMS with business strategy.

On the other hand, the drawbacks associated with the integration process include the following: increasing management costs, incurring cultural incompatibility, and causing complexity in internal management. Levels of integration can be achieved according to the level of integration of objectives, resources, and procedures. Certifiable management systems, such as ISO 9001 Quality Management System, ISO 14001 Environmental Management System, and Occupational Health and Safety Management

System, operate separately and are a way to improve the overall efficiency of the management system (Nunhes, 2016).

The integration of sustainable management system helps companies to seek integration in order to reduce costs and flexibility within the organizations processes due to a more demanding bureaucracy. The ability to satisfy all stakeholders for excellence to all stakeholders, that is, not only to your customer, but to the community, the state, investors and a myriad of other Stakeholders (Laari, 2016).

The relevant review on the distribution of floating marine debris in waters under the domain of the offshore environment. It presents references to offshore processes in waste generation, ocean trash and floating marine debris. Marine litter is any type of man-made solid waste, whether generated on land or at sea, that has been intentionally or unintentionally introduced into the marine environment, including the transport of such materials. Pollution by marine litter is now recognized as a worldwide problem and a major threat to marine ecosystems.

Marine debris pollution is now recognized as a worldwide problem and a major threat to marine ecosystems. Floating debris is surveyed by ship-based observations of the sea surface, and sunken/deposited debris on the seafloor by trawls, ROVs, and divers. Microplastic surveys require sampling the top of the intertidal and subtidal sediment (Sá, 2016).

Plastic accumulation in the environment is increasing due to low degradation rates coupled with unsustainable use and disposal. Cleanup activities have been proposed as mitigation strategies as well as awareness-raising tools. However, removing plastics from the environment seems impossible due to widespread environmental pollution with plastic particles of all sizes. Proper solid waste management will reduce plastics in the environment, therefore, decrease fragmentation into microplastics (Prata, 2019).

Considering the new evidence on the multiple risks that plastics pose to the environment, marine protection projects, such as the U.S. National Oceanic and Atmospheric Administration (NOAA) Marine Debris Program, have included plastic waste as an emerging form of contamination. Despite these technicalities, the distribution of plastics has been documented in several seas, with highly variable concentrations normalized to units of surface area or volume. The impact of large plastic debris in the marine environment has long been a topic of environmental debates and its well-

recognized effects include loss of aesthetic perception and environmental value, economic repercussions for tourism and numerous sea-related industries (Avio, 2017).

On the occurrence, pollution characteristics, and impacts of microplastics within the environment, it omits factors that play important roles within microplastics analysis. Sediment samples are usually taken from beaches, estuaries, and the seabed. Beach sampling varies greatly from the sampling location, parking route, and sampling depth. The sampling site may be far from the center of human activities and is located between the shoreline and the tide line, especially in parallel to the high tide line.(Qiu, 2016).

The realization that the natural resources of our planet are finite is nothing new. Finally, we can see that the social dimension is low.

## **5 CONCLUSION**

The environmental impacts are not restricted to the offshore plant. The transport of waste offshore and onshore have incompatible dimensions. The development of eco-indicators is an important tool for the establishment of guide values of the best environmental practices of the activity, for a greater transparency of offshore activities.

Thus, the implementation of environmental indicators, integrated into a sustainable management system, will allow a comparison with offshore processes, control of plastic waste in particular evaluation for microplastics, improving the transit of data.

There is still a long way to go and statistical data aligned between the generating sources, in which, the environmental awareness is increasingly clear in the transfer of waste between the origin and the final destination.

In this context, the objective of the article to evaluate the solid waste from microplastics in offshore areas for marine and coastal environments was demonstrated, in addition to demonstrating the importance of a management system integrated to sustainability.

The paper seeks to demonstrate risk management in reverse logistics; the importance of understanding the supply chain relationships in the offshore universe and making a relationship with waste generation in this marine environment, to aid perspectives in understanding the sources of polymer pollution and debris in the offshore environment.

When plastic material is exposed to different environmental conditions, its interaction and fragmentation gives rise to debris, which is called microplastics.

Therefore, it can be concluded that the main academic contribution of this study is to identify the state of the art for reverse logistics, IMS, the presence of debris in the oceans and microplastic pollution in the marine environment.

With the results of the studies presented in this paper, it is concluded that waste management in the marine environment presents specific contributions for authors to base their research on the evaluation of microplastic waste in the offshore environment, based on the IMS perspective.

In addition, this work raised the possibilities of future research in the scope of IMS and sustainability in marine environmental conservation in the offshore environment.

From the gaps identified by the articles analyzed, there was a lack of studies addressing social responsibility for the control of environmental microplastic pollution.

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## **Prevalence and incidence of clinical and subclinical bovine mastitis in a dairy herd in the southeast of Goiás, Brazil**

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### **ABSTRACT**

Bovine mastitis is a disease of extreme importance to the dairy production chain, since it causes economic losses in production. Mastitis is an inflammatory disease that affects the mammary glands. There are two forms of presentation of the disease, the clinical and

subclinical, requiring diagnostic tests to differentiate them. This article aimed to verify the prevalence and incidence of mastitis in a dairy farm located in the southeast of the state of Goiás. To carry out this research, the Somatic Cell Count (SCC) test was used. The results showed 54% mastitis prevalence, a lower value if compared to other studies. The incidence of clinical mastitis was also low, and it was possible to observe periods of more than 30 days without any identification of new cases, due to the care taken on the property, such as the correct management of the herd and milking, hygiene and the use of qualified labor. According to the SCC findings, it can be inferred that the low values of the epidemiological indicators analyzed may be associated with good management and hygiene practices practiced on the property, reducing the prevalence and incidence of mastitis.

**Keywords:** somatic cells, scc, milk, bovinocultura.

## **1 INTRODUCTION**

Brazil has been standing out worldwide through livestock farming. One of the most important production chains is dairy farming. The country produced about 33.8 million liters of milk in the year 2018, with about 17 million dairy cows, having a relatively low average of 2,069 liters/cow/year (Carvalho et al., 2020). What may impact this low average productivity is mastitis. It is estimated that this disease has caused a 15% drop in milk production in the country.

Mastitis is an inflammatory disease that affects the mammary glands, considered the main disease in dairy cattle worldwide, specifically in high production animals. Its presentation occurs by pathological means in animals and by several physicochemical changes in the milk (Silva, 2019).

Studies point out that there are two types of mastitis, clinical and subclinical. The subclinical type mastitis is of greater harm and needs specific diagnosis. It is characterized by not presenting noticeable changes in the milk or in the animal. However, there may be changes in the composition of the milk, with high levels of chloride, sodium, protein and casein, making it a poor milk with increased somatic cells (Peres Neto & Zappa, 2011).

The diagnosis of subclinical mastitis is given through the Somatic Cell Count (SCC) analysis, which is performed by laboratories accredited by the Ministry Agriculture, Livestock and Supply (MAPA). This laboratorial exam is based on the count of epithelial cells, and for the exam to take place, cows that present clinical mastitis, cows under treatment and recently calved cows must be excluded, as these specificities can alter the diagnostic results (Matioli, 2000).

The SSC results are presented through the analysis of the exam performed. A value lower than 200,000 cells/mil is considered healthy. With values above this, a result presented as sick is obtained. Another way to diagnose the disease is through the California Mastitis Test (CMT), presented as an indirect way to diagnose mastitis. This test is done based on the SCC, in which the reagent is added to the milk, forming a gel. The greater the coagulation of this gel, the greater the SCC (Busanello et al., 2017).

Clinical mastitis is detected by alterations in the milk, such as changes in color, presence of lumps, consistency and even smell of the milk. The cow affected by the disease can be restless during milking, with a reddish udder, edema, increased temperature and hardening of the teats (Peres Neto & Zappa, 2011).

This form of presentation is the most severe, being necessary to perform the diagnosis and treatment protocol in order to promote the recovery of the animal and ensure productivity. The diagnosis is made through the mug test or the black background test, which identifies the changes in the milk. Besides the disease being present in the animals, it is also present in the environment through the milking line or the milker's hands. In the epidemiological chain of bovine mastitis, bacteria of the genus *Streptococcus* and *Enterococcus* can cause environmental and contagious mastitis. These bacteria cause an infection in the mammary gland of cattle. The bacterium *Streptococcus aureus* is the most present species in the issue of transmissibility of the disease, causing serious damage to the health of the population (Busanello et al., 2017).

One of the places where there is a higher risk of contamination and occurrence of mastitis is in the milking parlor itself. Using milking machines can cause lesions on the cows' teats due to the pressure and number of pulsations of the machine, among other factors. With this the udder health is compromised, more susceptible to contract the disease environmentally or contagiously. Therefore, the handling of milking should be controlled in relation to its speed, also considering the reduction of activity with the cow, because, according to the etiology of mastitis, the infection by environmental pathogens outweighs the contagious agents, reducing the effectiveness of traditional strategies of disease control (Barbosa et al., 2009).

The disease has risk factors for the animal population and for public health. Many microorganisms found in the milk of affected animals, such as bacteria of the genus *Staphylococcus* spp, can cause food-borne infections. The methicillin-resistant *Staphylococcus aureus* strain is the cause of hospital infections due to the transfer of genes that

generate resistance to antimicrobials. It also produces toxins in humans that are not inactivated by pasteurization and boiling processes (Oliveira et al., 2016).

In relation to animals, this pathogen causes economic losses due to triggered factors, such as a drop in milk production and quality, besides generating an increase in the culling of animals, as well as sanitary losses because it is a contagious pathogen (Carvalho et al., 2018). There is, therefore, the risk of great economic and public health losses.

The prevalence of a pathology is the proportion of existing cases in a certain population and at a certain time, allowing an analysis of all the patients in a certain period or place. Incidence, on the other hand, refers to the new cases of a certain disease that appeared in a population at the time of the analysis (Almeida Filho & Rouquayrol, 1992). That said, prevalence and incidence are measures of diseases that can help in the knowledge of the distribution of a disease, as well as in the establishment of control and prevention.

Therefore, the objective of this study was to investigate the incidence and prevalence of clinical and subclinical mastitis in a dairy farm located in Cachoeira Alta, in the state of Goiás. The specific objectives were to point out the morbidity, lethality and mortality rates for mastitis, and to correlate the health indicators with the risk factors for getting sick and with the epidemiological chain of the pathology.

## **2 METODOLOGY**

A study focused on the area of prevalence and incidence of clinical and subclinical mastitis was conducted in May 2020 at Fazenda Reserva, located in the southeast of the state of Goiás, in the municipality of Cachoeira Alta. There were 55 dairy cows of the Holstein breed, producing an average of 19 kg of milk/cow/day, totaling a production of 1,045 liters of milk/cow/day with an interval between calving of 13.5 months. Among all lactating animals, the SCC laboratory test was performed in 47 of them. Among the remaining 8 cows, 5 were recently calved and 3 were being treated for clinical mastitis, thus making it impossible to perform the SCC test.

The material for analysis was collected on the property by a veterinarian and sent to a laboratory in the city of Goiânia, state of Goiás. The collection was performed during the morning milking. It started at 05:45 am and ended at 07:00 am. Milking is done by a couple of employees twice a day. This couple performs the milking and the cleaning of the whole structure. Milking is mechanized and follows a hygiene protocol.

Before starting the handling with the animals, the equipment is sanitized and rested for a period of 30 minutes before the beginning of milking. As soon as the animals arrive to be milked, the mug test, pre-dipping, individual drying of the teats are performed and, after everything is hygienic, milking begins. After these procedures are finished, the post-dipping is performed and the animals are released to the pasture. At the end of each milking, the animals are rinsed with warm water, without chemicals, to remove any milk residues. After that, alkaline water is circulated in the liners at (75°C). After that, another rinse with running water is performed. At the end of the process, natural water with acid is circulated, for a period of 10 minutes for each type of product, guaranteeing that all the material is totally clean and free of bacteria.

The removed milk is sent, via a pipeline, to the cooling tank, where it is kept at a temperature of about 3°C until it is collected, which is done four times a week by a milker from the company where the milk will be processed. In the trough in the milking parlour, cows have access to concentrate with 24% protein and mineral salt. The cows also have access to the picketed Mombasa grass pasture area. In times of drought, the animals are supplemented with silage, produced on the property itself.

### 3 RESULTS AND DISCUSSION

According to the study by Busanello et al. (2017), which evaluated large herd population from different regions, there was an average prevalence of 46.4% of subclinical mastitis in the country. The result of the SCC test performed on 47 animals from the Reserve farm found that 23 animals had values below

200,000 cells/mL. Therefore, 48.9% of the animals were considered healthy, and 18 animals had SCC between 200,001 and 500,000 cells/mL, 38.29% were considered sick. Six animals showed SCC above 500,000 cells/mL. That said, 12.74% were considered sick, given the result of high concentrations in SCC, as presented in table 1.

Table 1 SCC values obtained in machine milking above and below 500,000 cells/mL

CCS (cells/mL)	Number of animals examined	Percentage
< 200.000	23	48,9%
200.001 a 500.000	18	38,29%
> 500.001	6	12,74%

In the work developed by Barbosa et al. (2009), a research was carried out in 21 farms with different types of milking. A total of 629 milk samples from mestizo cows were analyzed. The farm number 6, where the results were closer to the Reserve Farm,

used mechanical milking with a closed circuit, with 40 animals being analyzed. From the results, it was found that 45% (18 samples) of the sample had values higher than 500,000 cells/mL, and 55% (22 samples) had results lower than 500,000 cells/mL which were higher when compared to the Reserve Farm, as shown in table 2. Thus, the results reported by Barbosa et al. (2009), corroborate the results in the present study, in which the milk samples had a higher mastitis rate with machine milking than with hand milking.

Table 2 SCC values obtained in machine milking, above and below 500,000 cells/mL

<b>CCS (cells/mL)</b>	<b>Number of animals examined</b>	<b>Percentage</b>
< 500.000	18	45%
> 500.000	22	55%

Due to the results found in the present study the farmer was advised to perform a milking line management in order to avoid contamination of other animals. He was asked to first milk the primiparous cows and the cows that had never had mastitis. Then the cows that had SCC less than 200,000 cells/mL were milked, then the cows that had results between 200,001 and 500,000 cells/mL, followed by cows that had results above 500,001 cells/mL. Finally, the cows with clinical mastitis were milked. It was also advised to use a milking machine for newly calved cows and cows on antibiotics only, to avoid spreading the disease. This way, the incidence of mastitis in the property was reduced, reducing costs with medication and increasing productivity.

The animal with subclinical mastitis has up to 70% of its production reduced, bringing losses to the owner. From the animals affected by the disease, 8% of them need treatment, also causing the discard of 8% of the milk produced. Unfortunately, 14% of the animals die or are prematurely discarded for not being treated in time. The milk to be rejected must be correctly discarded in a pit so that there is no contact with healthy animals, avoiding contamination. It is of utmost importance not to use this contaminated milk when nursing the heifers, because they will be the future producers. If there is contact with contaminated milk, these calves may develop resistance to treatment against the bacteria present (Barbosa et al., 2009).

According to the study by Guilloux et al. (2008), what influenced the results of their research was the identification of small events that added negatively to the results during data collection, such as the entry of 70 new animals without proper health checks, inefficiency in the pre-dipping, which was performed quickly (time less than 30 seconds) and even before the test of the mug, and a problem in the vacuum level, in which the



correct to work would be 50 kpa, compared to 45 kpa that was found.

In addition, the producing property was composed of 405 lactating animals. The increase in cases of clinical mastitis was relatively high, and the treatment used was being ineffective. After epidemiological analysis and performing SCC on lactating animals, it was observed that the highest results were caused by the contagious form of the disease (mainly *S. aureus* and *S. agalactiae*) (Guilloux et al., 2008).

Several agents may be involved in the occurrence of mastitis in a dairy herd (Empresa Brasileira de Pesquisa Agropecuária, 2007 cited in Melo, 2020). These microorganisms have two classifications. The first is called environmental agents, that is, agents that cause environmental mastitis. The second classification is called contagious agents, which lead to contagious mastitis.

Environmental agents are microorganisms found surviving in the environment where cows circulate, such as recreation areas, tractor tracks, milking parlors, bedding, water, and in their own feces. According to Melo (2020), these agents cause clinical mastitis and are considered opportunistic. Their occurrence is greater during the period when there is more humidity and high temperatures. The most common agents are *Streptococcus dysgalactiae*, *Streptococcus uberis*, *Streptococcus bovis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Enterobacter aerogenes*, algae such as *Prototheca zopfii*, yeasts and fungi (Kulkarni & Kaliwal, 2013 cited in Melo, 2020).

To avoid this type of agent, it is necessary to perform a good sanitary management, making the proper cleaning of the places, such as milking parlors and stables, preventing bacteria to proliferate with the accumulation of feces or standing water, for example. Moreover, it is important to keep away animals with any infection (metritis, chronic mastitis or open wounds) that may contaminate the environment or the herd, thus highlighting the importance of the correct management with the animals, especially with those that are sick. It is also important to have a suitable place where the animals can be kept (Campos & Lizieire, 1993 cited in Melo, 2020).

In contrast, contagious agents are beings that survive little in the environment, since they need the animals to survive. Melo (2020) and Kulkarni and Kaliwal (2013) mention that contagious pathogens have a high survival rate in the udder and mammary gland of animals, and the most common pathogens in these cases are *Staphylococcus aureus*, *Streptococcus agalactiae* and *Mycoplasma spp.* To control this type of agent it is evident how essential it is the effective care of the animals' teats in relation to exposure

to the main means of contamination.

According to Fonseca and Santos (2001), it is necessary to pay special attention to milking management, suggesting the following procedures: correct disinfection during milking, especially of the liners; use of pre-dipping and post-dipping as teat disinfection (always preferably using disposable paper (towel) for drying the teat and never reuse the same paper in more than one teat); offer adequate training for the milker; offer a balanced diet to increase the immunological resistance of the animals; and always milk the cows being treated after a healthy herd.

Besides these measures, it is essential to emphasize that prevention is always the best way for any herd to remain healthy and with good zootechnical and productivity rates. In short, Bressam (2000) cited in Melo (2020), points out that it is necessary to institute, on the farm, preventive treatment in drying cows and treatment of animals in lactation. In addition, it is essential to pay attention to the SCC of the storage tank of milked milk, being ideal that it does not exceed 200,000 cells/ml, thus indicating that the contagious mastitis is well controlled.

High SCC levels in the milk tank indicates high levels of subclinical infection. Hiring new personnel, not used to the milking routine, can cause stress to the animals and failures in milking management. High levels of stress can increase the SCC, especially in cases of clinical mastitis. Therefore, it is necessary to perform the milking line correctly in order not to spread the disease to other animals (Dohoo & Meek, 1992).

The cases of mastitis bring significant losses to the dairy chain, generating a decrease in production, discarding of milk, and the early disposal of producers (Costa, 1998). With the purpose of stimulating the producer to prevent this problem, Normative Ruling No. 62 is in force, with the objective of guiding that producers produce type A milk with an average SCC of less than 600,000 cells/mL, with a Total Bacteria Count (TBC) of less than 500,000 cells/mL. Following such normative, the final product has a higher quality (Ministério da Agricultura, Pecuária e Abastecimento, 2011).

#### **4 CONCLUSION**

The SCC results in the animals of the Reserva farm were due to good management and hygiene practices, reducing the incidence of clinical and subclinical mastitis. From what was analyzed, it can be concluded that the incidence of clinical mastitis is low, and it is possible to observe periods longer than 30 days without any identification of new cases due to the care taken in the property, such as the correct handling of the herd and

milking, hygiene, and the use of qualified labor.

Bovine mastitis is considered a disease that causes great losses to dairy production, reducing the quantity and quality of milked milk. To have a good performance in herd productivity, it is necessary to adhere to good management practices and, especially, to a biosecurity protocol. Moreover, it is essential to take preventive actions, such as cleaning and disinfection of facilities and equipment. An early diagnosis is of utmost importance to prevent new incidences of mastitis in the dairy herd.

As a consequence of the inflammatory alterations in the mammary gland, several damages can occur to the industry and, mainly, to consumers who use milk, since contaminated milk can cause health problems, either by the presence of transmissible pathogens or by residues of drugs administered in order to treat the present mastitis. The bovine mastitis must be a reason for attention and concern of the cattle breeders and specialists, who need to master the knowledge related to the disease to avoid economic losses and preserve the quality of the milk.

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## **Study of the teaching-learning process and the influence of intrinsic and extrinsic factors on volleyball blocking movement**

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### **ABSTRACT**

O voleibol é uma modalidade coletiva que pode ser praticada com melhor qualidade quando seus gestos são estudados sob os conceitos do Processo Ensino- Aprendizagem, relacionando-os aos Fatores Intrínsecos e Extrínsecos, pois, compreendendo tais fatores, obteremos maior eficiência dos movimentos e sua potencialização, por consequência, haverá diminuição na incidência de lesões, uma vez que a modalidade exige altos níveis de impactos. Volleyball is a collective sport that can be practiced with better quality when its gestures are studied under the concepts of the Teaching-Learning Process, relating them to intrinsic and extrinsic factors, understanding such factors, we will obtain greater efficiency of movements and their potentiation, consequently, there will be a decrease in the incidence of injuries, since the sport requires high levels of impacts.

**Keywords:** teaching-learning process, blocking in volleyball, intrinsic and extrinsic factors.

### **1 INTRODUCTION**

Volleyball is one of the most played sports in the world and constantly, in order to be more attractive and reach more spectators and players, presents several evolutions, both in the way of playing (tactically and technically), and in its rules.

One motor skill that stands out in volleyball is blocking, blocking is a combination of Fundamental Motor Skills (Locomotion, Stabilization and Manipulation) and Volleyball-specific (Motor Gesture).

And even though it is not the highest scoring form for a team, it has extreme importance in the tactical system of a team, because without it, the efficiency of the defensive system would be very compromised due to the enormous power with which the ball is attacked, it would be extremely difficult for the players to execute the defense, due to the large area to be covered by them. As funções do bloqueio no vôlei:

- 1 - Transform the opponent's offensive action into a point, from the moment the ball is directed to the ground in the opponent's court;
- 2 - The reduction of the spatial (or angular) area of the opponent's attacker, as a result of the penetration of hands and arms, over the net (opponent's airspace), an action allowed by the rule of the game and much emphasized by the coaches;
- 3 - Reduce the power of the opponent's attack, facilitating the work of the defensive system and the preparation of the counter-attack.

By reviewing the literature, we found scientific articles and digital magazines that analyze the improvement in the performance of the block, using Intrinsic and Extrinsic Factors involved in the movement, as well as Biomechanics and Kinesiology (correct use of muscles and joints), to justify not only the better result in its execution (reach of the jump and the penetration of the hands in the opponent's field), but also the reduction of injuries originating from the landing.

## **2 OBJETCTIVE**

To analyze the literature on the analysis of the intrinsic and extrinsic factors involved in blocking in volleyball, in order to gather information about the landing of this gesture.

## **3 METHOD**

The study consisted of a literature review. The basis consulted was GOOGLE ACADEMIC and the following descriptors were used: Biomechanical and Volleyball. The inclusion criteria for the articles and digital journals used were only those with analyses about the factors that can help in the teaching-learning process of volleyball blocking.

## **4 RESULTS**

After reading and understanding the information provided in the analyzed papers, we noticed that there is a need to deepen the discussions about the teaching-learning process of the volleyball landing movement, because, if we fail to improve this process, we may drive several athletes away from the sport practice, simply because we do not apply the proper and adequate learning processes, not only to beginners in the sport, but also to athletes who are in a more advanced stage of sport performance.

This study also showed us the need for such care, because:

- 1- Because it is a very dynamic sport, involving fast and explosive movements of different parts of the body and in the most different axes in space, it certainly shows that there are countless forces involved in the movements performed and, inevitably, there will be injuries ( Watkins & Green, 1992);
- 2- Jumps and landings are constantly performed in volleyball, for being basic movements of the game and, statistically, they are the greatest risk factors for athletes and cause traumatic injuries, mainly associated to cutting and blocking actions (Bahr and Bahr 1997; Marques Junior, 2003; Silvestre and Lima, 2003; Zampieri and Almeida, 2003);
- 3- Modalities that require, or demand, fundamentals with impact are those that are more susceptible to injuries (Antonio, Ruschel, Back and De Souza, 2013);
- 4- The constant impact of musculoskeletal structures during landing and in cutting and blocking actions (Bahr, Bahr, 1997; Marques Junior, 2003);
- 5- The ground reaction force during landing which is equivalent to 3.7 to 5.2 times the body weight ( Fantini, Menzel, 2001; Suda, Pereira, Sacco, 2007);
- 6- The repetition of the movement may generate fatigue and, consequently, modifications in the impact cushioning strategies (Madigan, Pidcoe, 2002; Moran, Marshall, 2006);
- 7- The unconcern about prevention programs and the lack of adherence by athletes to this type of training.

#### 4.1 FACTORS THAT INTERFERE WITH THE BLOCK LANDING: - INTERNAL (INTRINSIC) AND EXTERNAL (EXTRINSIC)

- 1- Intrinsic Factors, we highlight:
  - a. Age, gender, body composition (anthropometry, body fat, weight, among others);
  - b. Physical history of injuries;
  - c. Physical training conditions (strength, speed, flexibility, etc.);
  - d. Anatomy (postural alignment);
  - e. Skill level in the sport;
  - f. Psychological factors (anxiety, competitiveness, motivation, etc.).
- 2 - Extrinsic Factors: these are the ones determined by conditions that may accentuate the chance of injury, for they interfere directly or indirectly in the execution of the technical movement. Among them we highlight:
  - a. Regarding the sport (type of conduct of the coach, the rules, the referees, etc.);
  - b. Protective equipment (the use, or not, of knee pads, ankle pads, etc.);
  - c. Game equipment (ball, tennis shoes, etc.)

d. Environmental factors (weather, playing field conditions, etc.).

Analyzing all the cited authors (articles and magazines), we noticed that there is almost unanimity about the factors that can positively or negatively influence the learning of the landing movement of the volleyball block. Therefore, we believe that it is the responsibility of those responsible for learning this technical gesture, in this case, the coaches and teachers, to obtain more and more technical and scientific information about the best conditions to develop the teaching-learning process of the landing movement of the volleyball block.

## **5 DISCUSSION**

We observed a huge amount of information available in the several media (videos, tutorials, etc.), directed to the increase of vertical impulsion, to the largest point of reach of the attack and block, but little concern with the landing.

In the literature review performed, we noticed that almost all injuries resulting from landing could be better managed, or avoided, through a better preparation of the muscular and articular structures of the athletes.

This work should be carried out by integrated multidisciplinary teams: medical and physical therapy departments, physical trainers, coaches, athletes, and managers.

We also notice that few sports institutions have this structure; however, we believe that such structures would prevent the occurrence of injuries, or their recurrence, which often leads the athlete to play with pain, to use medications, and, in several cases, to abandon his sports career.

When we talk about prevention in physical preparation, we direct our attention to the control of the muscles involved in landing and responsible for absorbing the impact of the jump block, the care with balance and strengthening of agonist and antagonist muscles, in addition to increasing the flexibility of the hip joints, knees, and ankles, because they are the most requested at the time of landing the block.

### **5.1 THE LANDING TECHNIQUE:**

The landing technique, as reported by several authors, shows that the proper use of biomechanics, kinesiology, and kinematics can reduce impact and, consequently, injuries during this movement.

Many authors mention that ankle extension is extremely important as it allows



the ankles to achieve greater movement and, therefore, more time to distribute the impact forces.

With the use of appropriate techniques during landing, such as knee angle at the moment of first contact (Stacoff et al., 1988) and plantar flexion of the feet (Valiant & Cavanagh, 1985), we can significantly reduce impact and injury risk.

Misuta et al., 1999, states that greater knee flexion at the moment of landing means a lowering of the center of mass. This fact contributes to the maintenance of balance, but, on the other hand, causes difficulty in returning to new actions of the game.

In the study by Zhang et al. the dissipation of energy during the execution of several drop heights was compared with the stiffness of the lower limbs, and the greatest eccentric work of the knees and hips was found in the softer jumps, compared to the stiffer jumps, and it was found that the plantar flexors are less able to absorb and dissipate energy, when compared to the knee and hip extensors.

In the study conducted by Santos, Coelho, and Dos Reis, it was found that the hip and knee joints differ for the impulsion and landing movement of the block and demonstrates that body mass influences the ankle angle at the moment of impulsion to the extent that the greater the mass, the greater the angle of this joint. On the other hand, the lower the body mass, the greater the value of the hip angle at the moment of landing.

In the paper "Landing techniques affect performance and mechanical stress during DROP JUMP", conducted by Marchetti et al, landing with different execution techniques was tested, thus determined:

- a. BDJ ( Bounce Drop Jump) - prioritizes ankle action, involving minimal knee flexion and contact time;
- b. DJ90 ( Drop Jump 90) - requests the landing with knee flexion up to 90°;
- c. DJ135 (Drop Jump 135) - requests a knee flexion up to 135°;
- d. DJ135A (Drop Jump 135 A) - performs the landing with knee flexion to 135° and with hand support on the ground.

The objective of this study was to evaluate the effects of changes in the landing technique on the performance and the reaction force of the vertical component of the ground after the "Drop Jump". In the specific case of our study, we analyzed the results with emphasis on the simple landing and not on the jump after this movement.

According to the results obtained, it was found that the lowest peak impact occurred in the DJ90 technique.

It has also been suggested that trunk movements, in the sagittal plane, also influence the forces acting on the knee joint during jump landing activities (Powers, 2010).

Landings involving greater trunk flexion result in lower ground reaction forces, greater hip flexion, and lower quadriceps activity (Blackburn & Padua, 2009; Shimokochi et al, 2012).

## 5.2 FACTORS THAT MAKE IT DIFFICULT, OR IMPOSSIBLE, TO PERFORM THE LANDING TECHNIQUE

- 1- The speed of the game interferes in the landing execution technique, because it decreases the time for the player to execute the safe landing and absorb the impact, as well as to balance "in the air" and at the moment of landing;
- 2- The distance from the net when the athlete jumps and "invades the airspace of the opponent's field" to perform the block, is another factor that interferes with the landing execution technique, due to the little space reserved for the flexion of the trunk during the fall;
- 3- The stride technique, or displacement, also interferes in the landing, due to the higher or lower horizontal energy;
- 4- The height of the blocker's jump, because the higher the jump, the greater the impact.

## 5.3 ACTIONS THAT CAN BE TAKEN IN THE LANDING TECHNIQUE THAT CAN BRING POSITIVE RESULTS IN IMPACT ABSORPTION

- 1- After the block, rotate the body perpendicular to the net, increasing the chance of trunk flexion, reducing the possibility of lateral imbalance;
- 2- In the aerial phase of the jump, perform a forward projection movement of the forefoot (like a "kick"), facilitating the counter movement of the trunk forward;
- 3- In the last step, touch the ground with the "tip of the foot" turned to the opposite side of the movement, minimizing the air displacement, leaving the body in a vertical position, bringing balance and body control.

## 6 CONCLUSION

We do not propose to completely eliminate injuries caused by all these impacts, but if the player has a correct execution of the technique, respecting the whole teaching

and learning process and the biomechanics of the gesture, in addition to a directed physical preparation, we believe that there is a great possibility of preventing injuries, as well as improving performance.

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## **Analysis of health indicators for Erlichiosis and Naplasmosis from Rapid ELISA serology at the veterinary clinic**

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### **ABSTRACT**

The climate of Brazil is predominantly tropical, which favors the high prevalence and incidence of hemoparasitosis such as Erlichiosis and Anaplasmosis. transmitted by ticks, especially the brown tick of the species *Rhipicephalus sanguineus*. Thus, considering the seasonality, the Uberlândia region favors the development of ectoparasites, especially the "brown" tick of the species *Rhipicephalus sanguineus*, the agent that transmits these diseases. The present article aimed to investigate the prevalence, incidence, morbidity,

lethality and mortality caused by Erliquiosis and Anaplasmosis of cases seen in a veterinary clinic in Uberlândia, in the period between May 09 and October 23, 2021. Hemoparasitosis was confirmed in 46.87% of the suspected animals, and Ehrlichia canis was identified in 12 animals (80%), with a prevalence of 2.29%. Anaplasma platys was identified as the pathogen responsible for the disease in 3 animals (20%), with a prevalence of 0.76%. There was no evidence of high mortality rate in positive animals, which may be related to the early diagnosis of the disease. It was possible to conclude that the hemoparasitoses Erliquiosis and Anaplasmosis are diseases that are becoming more prevalent in the clinical routine.

**Keywords:** prevalence, incidence, mortality, ehrlichia, anaplasma.

## 1 INTRODUCTION

Nowadays, having a pet animal is something that is becoming more and more common in Brazilian households. Dogs are usually the animal of preference when thinking about a pet. Even with all the domestication process and adequate health management, the animal is still susceptible to pathogens. In Uberlândia, Minas Gerais, the most common parasitoses diagnosed in veterinary clinics are hemoparasitoses, especially Erlichiosis and Anaplasmosis, diseases whose etiological agents have tropism for blood cells that, if left untreated, can lead the animal to death (Mota et al., 2019).

Among the most prevalent hemoparasitoses, the agents Ehrlichia canis and Anaplasma platys, which are Gram negative bacteria belonging to the order Rickettsiales and the family Anaplasmataceae, respectively, stand out (Garcia et al., 2018). The high incidence of these infections can be associated with a particular region which, in Brazil, is related to the tropical climate present in almost all the national territory. Seasonality favors the evolutionary cycle of the brown tick Rhipicephalus sanguineus. This ectoparasite, through the bite, can transmit to the host the pathogens that cause Erlichiosis and Anaplasmosis (Gomes & Marques, 2022).

The best way to prevent the transmission of these diseases is related to the management and care of animals and the environment. Thus, maintaining control of ectoparasites, especially the brown tick, is essential (Crivellenti & Crivellenti, 2015). In general, the clinical symptoms include anorexia, lethargy, weight loss, fever, nasal and ocular secretion, petechiae, ecchymoses, epistaxis, hematuria, edema of the limbs, vomiting, diarrhea, coughing, dyspnea, liver and kidney failure, lymphadenopathy, paleness of the mucous membranes, and anemia. In more chronic cases, uveitis, hyphema, hemorrhage, retinal displacement, and blindness are observed (Garcia et al., 2018).

Besides the high prevalence and incidence in Brazil, these hemoparasitoses still have a reserved prognosis, despite the fact that most of the clinical signs presented by the animal are common in other pathologies. Thus, it is essential to use laboratory and complementary tests that provide clarity and objectivity to close the diagnosis and start treatment that, in this case, has doxycycline as the antibiotic of choice, used for a period of 28 days with an interval of 12 (Nelson & Couto, 2015).

Since these are diseases caused by vectors, it is understood that the best treatment is in the control of ectoparasites, an essential factor for the reduction of cases. Thus, prophylaxis is of utmost importance, considering that the agents remain in the environment by the passage of ticks to dogs (Nelson & Couto, 2015).

Given the above, the general objective of the study was to investigate the prevalence and incidence of Erlichiosis and Anaplasmosis in a veterinary clinic located in the city of Uberlândia, in the state of Minas Gerais, in the period between May 2021 and October 2021. The specific objectives were to point out the morbidity, lethality and mortality rates, besides correlating the health indicators with the risk factors for getting sick and with the epidemiological chain of these diseases.

## **2 METHODOLOGY**

For the epidemiological investigation, we used a sample of animals seen at the Salvare Veterinary Clinic, located in the Jardim Karaíba neighborhood, southern sector of Uberlândia, state of Minas Gerais, Brazil. In the period between May 09, 2021 and October 23, 2021, information was collected through the registration forms of the animals seen. In the period, it was identified that of the 392 dogs seen, 32 patients of different ages, sex and breed were seen with symptoms of hemoparasitosis.

All suspect animals went through a screening appointment and after that underwent laboratory tests. A rapid laboratory test was performed that relies on ELISA technology, capable of identifying *Ehrlichia canis* and *Anaplasma platys* pathogens. The test uses enzymes to obtain antigen-antibody reactions, thus allowing the identification of whether the animal has antibody against a certain pathogen. The SNAP 4Dx Plus IDEXX Laboratories® was the rapid test used in the clinic for confirmation of cases of Erlichiosis and Anaplasmosis, being performed following the manufacturer's recommendations.

Because it is a test that uses blood to bring the results, it was necessary to collect blood from the animal to be tested intravenously. With the collected material, it was



prepared. Using a pipette, only 3 drops of blood were used and isolated in a new tube containing 4 drops of the reagent provided by the rapid test kit. The prepared material was then introduced into the structure called "sample orifice".

Then, the blood associated with the reagent went through the "results window" structure until it reached the region called "activation circle". After going through all the structures, the "activator" structure was pressed ventrally. With all the steps completed, it was necessary to wait 8 minutes for the result to be available.

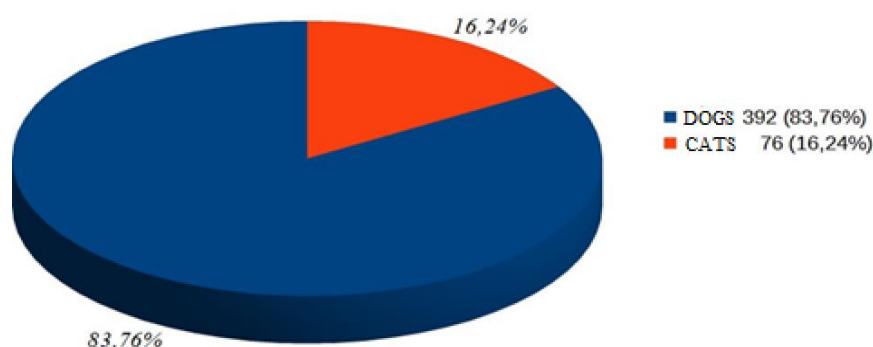
The interpretation of the test was made based on the circular markings in light blue coloration, arranged in the structure "results window". In animals with positive results for Erlichiosis, there was a marking called "positive control" in the upper left corner, and another marking located in the lower left corner. In the positive tests for Anaplasmosis, it was possible to see the positive control marking in the upper left corner and another marking in the central region of the "results window". As for the tests on the animals tested that were negative, only the positive control marking was visible in the upper left corner, with no other marking indicating Anaplasmosis or Erlichiosis.

### 3 RESULTS E DISCUSSION

In the period between May 2021 and October 2021, 468 animals were seen at the Salvare Veterinary Clinic. Of these animals, 76 (16.24%) were felines and 392 (83.76%) were canines, as seen in Graph 1.

Graph 1 Proportion of dogs and cats treated at the Salvare Clinic from May 2021 to October 2021

**ANIMALS TREATED AT THE SALVARE CLINIC FROM  
MAY 2021 TO OCTOBER 2021**



Of the 392 dogs seen in this period, 32 dogs came to the clinic with suspected hemoparasitosis. All animals with suspected diagnosis of hemoparasitosis were submitted to the rapid test capable of identifying pathogens that cause such disease. Among the

animals tested, the suspicion of the diagnosis was ruled out in 17 animals (53.13%) and confirmed in 15 animals (46.87%). *Ehrlichia canis* was identified as the pathogen in 12 animals (80%), with a prevalence of 2.29%. The *Anaplasma platys* was identified as the responsible pathogen in 3 animals (20%), presenting a prevalence of 0.76%.

By having the information on how many animals were seen each month, it was possible to calculate the incidence of each pathogen in a monthly frequency. In May, we observed 3 positive cases of *Ehrlichia canis* (incidence 0,76%); in June, 2 positive cases of *Ehrlichia canis* (incidence 0,51%); in July, 1 positive case of *Ehrlichia canis* (incidence 0,25%) and 1 positive case of *Anaplasma platys* (incidence 0,25%); In August, there were 4 positive cases of *Ehrlichia canis* (incidence 1.02%) and 2 positive cases of *Anaplasma platys* (incidence 0.51%); in September, there was 1 positive case of *Ehrlichia canis* (incidence 0.25%), and finally, in October, there was another positive case of *Ehrlichia canis* (incidence 0.25%).

All animals tested positive were submitted to treatment immediately. However, even after the beginning of the treatment, 3 animals did not resist and died. *Ehrlichia canis* was the pathogen present in all three cases, thus presenting a mortality rate of 0.76%, a lethality rate of 25% and a morbidity rate of 3.06%. The animals that presented the pathogens *Anaplasma platys* were submitted to treatment and recovered. Thus, Anaplasmosis presented a morbidity rate of 0.76%, but without mortality and lethality.

In the present study, a high death rate in animals positive for *Ehrlichia canis* and *Anaplasma platys* was not evidenced, which may be related to the early diagnosis of the disease through specific laboratory tests. Similar results were obtained in the research conducted at the Scientific Institute for Higher Education and Research (ICESP) in Brasilia, in which the use of specific tests proved essential for the identification of hemoparasitosis, allowing the effective start of treatment (Mota et al., 2019).

In contrast, Paiva (2021), through the use of the SNAP 4Dx Plus IDEXX Laboratories® rapid test, found that more than 70% of the animals tested were positive for the pathogen *Ehrlichia canis*. According to the results obtained in this study, it is possible to observe that the percentage of animals with the presence of *Ehrlichia canis* is also higher than the other hemoparasitoses. Therefore, it is possible to indicate that Erlichiosis is the hemoparasitosis that most affects dogs.

#### **4 CONCLUSION**

In view of the findings of this study, it is possible to conclude that the hemoparasitoses Erlichiosis and Anaplasmosis are diseases that are becoming more prevalent in clinical routine. Erlichiosis stood out for representing positivity in more than 35% of the dogs submitted to the test. In terms of symptoms, most of the symptoms are expressed by both pathogens, creating some difficulty in the specific diagnosis, requiring the use of tests that distinguish between the etiologic agents *Ehrlichia canis* and *Anaplasma platys*. Both agents have the ability to cause damage to the health of animals that, if untreated, may evolve to death. Thus, one can point out the importance of a good prophylaxis that, in the case of Erlichiosis and Anaplasmosis, is related to the control of ectoparasites, especially the well-known tick, popularly known as brown tick.

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## **Health indicators of Canine Visceral Leishmaniasis as tools for control and prevention in Brazil**

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### **ABSTRACT**

Canine Visceral Leishmaniasis (CVL) is a disease caused by the protozoan genus *Leishmania* and transmitted by the bite of the sand fly mosquito. It is considered a zoonosis and its control is based on the diversity of urban vector reservoir agents, where dogs are

the main reservoirs of the parasite. The present article aimed to investigate the prevalence and incidence of CVL in different regions of Brazil, from a literature review. An analysis of scientific articles focusing on the epidemiological, clinical, diagnostic, prophylaxis and control aspects of the disease was carried out. The prevalence of CVL in Brazilian regions is determined by means of clinical, epidemiological and laboratory diagnostic methods. Laboratory confirmation is necessary to avoid false positive results, whose consequences can be fatal, such as euthanasia in non-infected animals. The study is based on the survey of transmission areas with the evaluation of the effectiveness of actions to control and progress the disease, such as the reduction of prevalence and lethality, with measures of interventions and environmental sanitation that can reduce its incidence. It was found that the knowledge of the epidemiological indicators of CVL are essential to implement health actions to promote control and prevention in susceptible populations.

**Keywords:** zoonosis, prevalence, incidence, leishmania.

## **1 INTRODUCTION**

Canine Visceral Leishmaniasis (CVL), also known as Calazar, is an important zoonosis transmitted between animals and humans. In humans, Leishmaniasis presents itself in four clinical forms, such as visceral, cutaneous, mucocutaneous and diffuse cutaneous. Of the presentations of the disease, the visceral form is the most serious, as it can usually be fatal when left untreated. In animals, the visceral and cutaneous forms are mainly observed (Marcondes & Rossi, 2013).

The dog has been indicated as a reservoir of the disease and, as a domestic host, it is probably the most important natural reservoir related to human cases (Silva et al., 2003). CVL is a pathology caused by a protozoan of the genus *Leishmania*, which affects dogs. Dogs are considered, in the urban transmission cycle, the main reservoirs through which humans can become infected. However, wild animals such as wolves, coyotes and foxes can also function as reservoirs of this pathogen (Costa, 2011).

In Brazil, CVL is transmitted through the bite of a mosquito belonging to the sand fly family, the genus *Lutzomyia*, and the species *Lutzomyia longipalpis*. This vector is popularly known as the straw mosquito, birigui, or tatuquiras, and is the main vector in Brazil. The straw mosquito is a very small insect that usually breeds in places with a lot of decomposing organic matter (Costa, 2011).

The infected animal may be clinically healthy for a long period, but remains as a reservoir of the disease and with the ability to infect the vector and continue with the dissemination of the cycle (Gontijo & Melo, 2004). The most commonly observed clinical signs include skin lesions such as alopecia, scaling, nasal hyperkeratosis, ulcers and

hyperpigmentation, in addition to anorexia, onychogryphosis and ophthalmic changes (Koutinas & Koutinas, 2014). Studies of the prevalence of canine disease in several cities in Brazil have detected rates of 9.7% in Montes Claros, in the state of Minas Gerais, and 40.3% in Paulista, in the state of Pernambuco (Silva et al., 2003).

Given its magnitude, transcendence and low vulnerability to control measures, CVL is a serious public health problem in Brazil (World Health Organization, 1990). From 1984 to 2002, 48,455 cases of CVL were reported in Brazil, 66% of them in the states of Bahia, Ceará, Maranhão and Piauí. In the 1990s, about 90% of the notified cases occurred in the Northeast Region, for as the disease spread, it spread to other regions of the country. Another point to be highlighted about the disease is its correlation with predisposing factors. Still important to consider is the knowledge about the indicators of CVL in Brazil, formed from the notified cases, since a program of control and prevention is an appropriate measure for the eradication of this pathology.

The present study aimed to investigate the prevalence of Canine Visceral Leishmaniasis in different regions of Brazil from a literature review. Secondly, we sought to raise the incidence of CVL in certain periods and in different locations, to present the CVL epidemiological chain and to identify the risk factors for the animal population and for public health in the national territory and in the different regions of Brazil.

## **2 METHODOLOGY**

To obtain the results and answers regarding the objective of the article, a literature review on Canine Leishmaniasis in Brazil was performed. The methodology used is based on studies and analysis to identify, select and evaluate research considered relevant that contributes as theoretical support on the theme addressed in this review.

The search, analysis, study, and preparation of this article occurred in the period from February 26, 2021 to May 21, 2021. The keywords used were dogs, incidence, *Leishmania* spp, and zoonosis. Preference was given to articles published in the last ten years.

The search used the usual databases for reviews in veterinary medicine, such as SciELO, LILACS, MEDLINE, CAPES, and PubMed. The institutional repositories of the Universidade Federal de Pelotas, Universidade Federal de Lavras, and Universidade Federal do Rio Grande do Sul were also used, as well as the Google Scholar search tool.

Some mixed articles of qualitative and quantitative methodology were selected

for the analysis. The articles were selected by reading the titles, abstracts and relevance to the objective of this research, without any restriction as to study category and language. Thus, articles investigating CVL in Brazil between 2003 and 2014 were selected.

### **3 RESULTS**

According to Werneck et al. (2008), the environmental transformations associated with migratory movements and the urbanization process may explain, in part, why CVL was restricted to rural areas of the country until the 1970s. From then on, it began to occur in an endemic and epidemic form in large cities of the Brazilian Northeast and, subsequently, spread to other micro-regions of the country. From 1984 to 2002, 48,455 cases of CVL were reported in Brazil, 66% in the states of Bahia, Ceará, Maranhão and Piauí. In the 1990s, about 90% of the notified CVL cases occurred in the Northeast Region.

Since the expansion of the disease to other regions between 2000 and 2002, more than 25% of the cases in Brazil occurred outside the Northeast Region. Thus, one can observe the occurrence in the large cities of Bahia, such as in the Metropolitan Region of Salvador, where a large number of human and canine cases of CVL have been recorded (Frank et al., 2002; Julião et al., 2007).

These data can be related to another information from the Ministry of Health (2004). According to this reference, CVL is distributed in 21 Federated Units. In recent years, an annual average of 3,357 human cases and 236 deaths have been recorded. CVL is a disease that affects mainly low-income populations, being considered emerging due to its urbanization and coinfection with the Human Immunodeficiency Virus.

Due to the incidence of CVL in the country, an exposed population has high risks of becoming infected, implying the need for the implementation of control measures. In Brazil, besides the high incidence and wide distribution, what aggravates the risks of CVL is the possibility of this disease manifesting severe and lethal forms when the animal has immunosuppression or concomitant diseases (Santos et al., 2017).

According to Werneck et al. (2008), the rapid urbanization of the country brought with it a huge wave of precarious living conditions concomitant with environmental destruction. Such factors influence the emergence of the disease in the urban environment, since *Leishmania* spp easily adapts to the peridomestic conditions of depleted areas, exploiting the accumulation of organic matter generated by domestic animals and poor sanitary conditions.



In a study on the prevalence of CVL in selected dogs, carried out at the Animal Protective Association (APA) shelter in Uberlândia, state of Minas Gerais, 39 dogs were examined by the ALERE® Leishmania screening test. Two of these animals were diagnosed seropositive. However, the confirmatory ELISA test was performed, which confirmed the same reactors as positive, and they were therefore considered sick. The apparent prevalence observed was 5.12% (95% CI: 1.42 - 16.89). The identification of confirmed cases of CVL is essential to find risk areas and thus adopt prevention measures (Reis et al., 2020).

In the epidemiological survey of CVL cases in the municipality of Jaguaribe, state of Ceará, 194 dogs were examined. 31 of them were reagent and 163 were negative. In the study, it was shown that of the 31 animals positive for CVL, 12 animals lived in the urban area (38.70%) and 19 animals in the rural area (61.30%). The samples had been sent to the Central Laboratory for the enzyme-linked immunosorbent assay (ELISA) and, in case of a positive reaction, the Indirect Immunofluorescence Reaction (IFT) test was performed, which is the confirmatory test for the disease according to the Brazilian Ministry of Health. Thus, the disease has several diagnostic methods,

and it is important to evaluate the clinical, epidemiological and, mainly, laboratory diagnosis, interpreting the results so that a false positive result is avoided.

At the Hovet Unimes veterinary hospital in the city of Santos, state of São Paulo, eleven positive samples were obtained in the Dual Path-Plataform DPP®LVC test, and two positive diagnoses were confirmed through the ELISA immunoenzymatic test. Thus, it was observed that it is necessary to increase the use of serological methods in the Baixada Santista to increase the detection of the disease. From the studies selected in the literature review, it was evident that the place with the highest prevalence of CVL in Brazil is the Northeast region, and the state of Alagoas is the place with the highest prevalence and highest lethality of the disease (Reis et al., 2017). Therefore, CVL is highly prevalent and important due to its high incidence and public health consequences.

According to Baneth and Shaw (2002), the treatment of CVL in animals results in a temporary clinical improvement and a decrease in anti-Leishmania antibody titers. However, this treatment does not prevent a recurrence of the clinical manifestations and does not prevent the dog from remaining infective for the vector, that is, it still functions as a reservoir and can potentially transmit the disease. In August 2007, a discussion forum on the treatment of dogs with CVL was held. Researchers from several research

institutions participated in this Forum. Among them, representatives of the Ministry of Health (MH), the Federal Council of Veterinary Medicine and the National Association of Veterinary Practitioners of Small Animals.

According to the Ministry of Health, the treatment of animals with leishmaniasis may be carried out through controlled clinical trials after authorization from the Ministry of Agriculture, Livestock and Supply (MAPA) and approval of the clinical trial completion report through a joint technical note prepared by MAPA and MS.

The emergence and spread of resistant strains of the parasite have been warned in communities where the treatment of dogs is practiced, which may have an irreversible character and unpredictable consequences. According to Ribeiro et al. (2004), if the treatment is authorized and approved by MAPA and MS, it can be performed. It is extremely important that the animal examined is accompanied by the veterinarian. From this monitoring, it is essential to perform the clinical, serological and biochemical control of the animal every three months. Sirtoli (2009) adds that the cost of treatment will depend on the type of protocol, ranging from R\$ 600 to R\$ 2,000. The following are some of the existing drugs that can be used in the treatment of leishmaniasis if the treatment for CVL is authorized by MAPA and MS: antimonials, allopurinol, Aminosidine, Pentamidine, Amphotericin B, Marbofloxacin, Miltefosine and Nimodipine (Ribeiro et al., 2004).

According to Amaral (2009), Leishmaniasis control actions in Brazil include diagnosis and adequate treatment of human cases; chemical controls of the vector; improvement of hygienic-sanitary conditions; and control of the canine reservoir through serological sample or census surveys followed by euthanasia of seropositive dogs. These are efficient measures to control this disease. It is also recommended the use of natural and/or chemical repellents on animals, the spraying of domestic and peridomestic environments with insecticides and, in the future, the vaccination of non-infected animals.

Pour-on products and the use of a 4% Deltamethrin-based collar - Scalibor® are effective ways to repel the phlebotomus in dogs. The use of screens on windows and kennels is also recommended. For humans, it is recommended to use repellent and avoid exposure at times of vector activity, as well as avoid environments where the vector can be usually found. In addition, a serological survey of animals in endemic areas is recommended, as well as the encouragement of health education among the population and the cleaning of vacant land (Fortes, 2004).

The theoretical basis that supports the use of vector control and reservoir control

as intervention strategies for CVL is the conjecture that the incidence of infection in humans is directly related to the number of infected dogs and the ability of the sand fly population to transmit infection from dogs to humans. Both vector control and elimination of dogs, in theory, can be considered as effective measures (Werneck et al., 2004).

According to Amaral (2009), the mosquito vector proliferates in shaded areas and with decomposing organic matter, especially in areas under trees and places that accumulate leaves. The cleaning of the environment, environmental management, and the awareness of the population are also control measures. The fact that the vector insect does not need water to reproduce, but decomposing organic matter, coupled with the fact that its behavior is not fully known, makes it difficult to control. Because of this, the euthanasia of dogs carrying Leishmaniasis is a complementary measure in the control of this disease.

Euthanasia of dogs sero-reactive for CVL has been recommended as a control measure by the World Health Organization (WHO) and the Pan American Health Organization (PAHO) (Jericó et al., 2015). However, studies have stated that this methodology is ineffective because transmission occurs through phlebotomine vectors, and there are several species of wild animals that can act as reservoirs (Greene, 2015).

The WHO recommends sacrifice as the ideal control measure. However, it recognizes the limitations of this practice when dogs of high emotional and economic value are infected. In Brazil, the embarrassment caused by this measure is reported by professionals linked to the public sector and responsible for CVL control when searching for the positive dog for elimination. According to Feijão et al. (2001), this moment, crossed by a strong emotional component, means, given the importance of the dog in the family environment, the determination of the "death sentence" for a "family member". There are increasing occurrences of refusal to surrender the animal, which, consequently, maintains the chain of transmission.

According to Tesh (1995), the inexistence of an effective treatment for the total cure of the canine disease and the polemic about eliminating infected dogs has led to a new strategy focused on the production of a vaccine. Mendes et al. (2003) complement that the published results of experiments conducted in Brazil affirm that the vaccine blocks the transmission of the agent to other animals and humans, as long as the vaccination protocol is followed: 3 doses are performed at intervals of 21 days, and the revaccination should be performed one year after the first dose, and should be repeated annually.

For dogs, collars impregnated with 4% Deltamethrin under experimental conditions have shown good efficacy as a sand fly repellent (Alves et al., 2018). Natural repellents based on citronella and neem extract can also be used, as well as topical insecticides in spray form based on permethrin (Jericó et al., 2015). In Brazil, there is the Leish-Tec® vaccine, which is the only one licensed by public health authorities in the country for sale and administration by veterinarians (Matias et al., 2020). According to studies by Fernandes et al. (2008), this vaccine was able to induce immunity against infection caused by high intravenous dose of *L. chagasi* in beagle dogs. In addition, it was also tested in heterogeneous populations of dogs, proving to be safe and well tolerated by the animals (Testasica et al., 2014).

No studies were found in Brazil that evaluated the knowledge that veterinarians have about the disease and their conduct in relation to it, but only studies that evaluate the knowledge and conduct of health professionals in general, such as that of Luz et al. (2005). In this study, the efficacy of informative materials aimed at veterinarians was evaluated, and low effectiveness was observed regarding the knowledge aggregated to these professionals.

The diagnosis of CVL represents a problem given the variety of clinical signs and the similarity of symptoms with other diseases. The choice of diagnostic technique is based on the probable area of transmission. It is investigated whether this is an area endemic only for CVL and free for its main differential diagnoses, such as Tegumentary Leishmaniasis and American Trypanosomiasis. Moreover, the diagnosis also involves the sensitivity and specificity of the method used, its limitations, and clinical interpretation. Currently, the Ministry of Health recommends the use of the immunochromatographic test as screening and the ELISA test as a confirmatory procedure (Ministério da Saúde, 2011).

The guidelines passed on to owners regarding household prevention were routine cleaning of the backyard and caution in breeding other domestic or wild animals, in addition to the use of citronella in surrounding flowerpots. According to the Ministry of Health (2011), the control of disease transmission requires permanent measures, such as environmental management, by cleaning backyards, not keeping domestic animals near homes, disposing of solid and organic waste, and disposing of it properly.

The reservoirs of CVL are infected through the bite of the female sand fly. Initially, the parasites are at the site of the bite, after which infection of viscera occurs with

eventual distribution through the dermis (Salzo, 2008). The amastigote form of CVL is present within leukocytes and Mononuclear Phagocytic System (MPS) cells in definitive hosts. Inside these cells, the parasite divides by simple cispairity, destroying them. The intermediate host, the female sand fly, becomes infected by ingesting the amastigotes present in the vertebrate's blood. In the mosquito gut, the amastigotes transform into promastigotes and, by simple cispairity, multiply rapidly. The protozoa are then inoculated into vertebrates through the bite of the sand fly (Fortes, 2004).

After inoculation of the promastigotes into dogs, they are phagocytized by the cells of the SFM, which are represented mainly by macrophages. Inside the leukocytes, the promastigotes transform into amastigotes, which multiply rapidly through successive binary divisions. According to Cimerman and Cimerman Neves (2005), when macrophages are densely parasitized, they rupture, releasing several amastigotes that are phagocytosed again by other macrophages. CVL is a chronic disease. Clinical signs appear between three months and seven years after infection. There is proliferation of B lymphocytes, plasma cells, histiocytes and macrophages, resulting in lymphadenomegaly, splenomegaly and hyperglobulinemia (Salzo, 2008).

Clinical symptoms include locomotor difficulty, weight loss, polydipsia, apathy, anorexia, vomiting, diarrhea, polyphagia, epistaxis and melena. On physical examination, lymphadenomegaly, cachexia, dermatological changes, pale mucous membranes, hyperthermia, splenomegaly, uveitis and conjunctivitis can be observed (Salzo, 2008). Cutaneous manifestations may be present in 50 to 90% of infected dogs (Salzo, 2008).

Clinical diagnosis is difficult due to the variety of symptoms of the disease or lack thereof. In addition, laboratory changes in the blood count, or in renal or liver function tests, may be nonspecific. Confirmation of the diagnosis can be by parasitological, serological, and molecular methods. Parasitological diagnosis is considered by some authors to be the main test. Another form of diagnosis is through aspiration cytology, a method of easy execution (Ikeda- Garcia & Marcondes, 2007).

The observation of parasites in cytological impressions or through aspiration of skin nodules is also a way used. It is also possible to perform skin biopsies collected from macroscopically normal areas. Serological diagnosis occurs through the detection of circulating anti-Leishmania antibodies. The serological tests recommended by the Ministry of Health for investigation of the disease are indirect immunofluorescence (RIFI) and ELISA (Ministério da Saúde, 2003).

## **4 DISCUSSION**

Among the main hypotheses to justify the change in the pattern of CVL transmission is the migration of people from rural areas to cities, with deforestation and the construction of works with great environmental impact. In our study, we observed that the increase in the prevalence of the disease in dogs is consistent with the growth in the incidence of the disease in humans. The presence of the vector is necessary for the dissemination of the parasite, since transmission does not occur from vertebrate host to vertebrate host. After the multiplication cycle, hematogenous and lymphatic dissemination occurs to tissues rich in cells of the mononuclear phagocytic system. Infection spreads to the spleen, lymph nodes, and bone marrow within the first few hours.

Freitas et al. (2012) state that protozoa of the genus *Leishmania* spp. are considered hemoparasites because they can be transmitted through blood transfusion from infected donor animals. In a study done with 215 dogs sick with CVL in the municipality of Araçatuba, São Paulo, it was observed that there was no sexual or age predisposition for the occurrence of the disease, as observed in our research (Feitosa et al., 2000).

Peters et al. (2008) conducted an experiment with females of the insect *Phlebotomus duboscqi* carrying *Leishmania major* to infect laboratory animals through the ears of mice. Using a microscope, the authors observed the parasites fighting back, and that the rodents' immune systems identified their invasion, with neutrophils targeting the bite site. After half an hour, the neutrophils had engulfed most of the parasites and were trying to destroy them with their digestive enzymes. It was verified by the research that after the neutrophils had died, the parasites approached the macrophages to lodge and reproduce. These authors believe that this disguise allows *Leishmania chagasi* to penetrate the macrophages, causing damage to the spleen, liver and bone marrow, weakening the defense system of the infected mouse, data that corroborate with the results of this research.

The classification according to the clinical signs in infected animals may be as follows: asymptomatic dogs that do not present suggestive clinical signs; oligosymptomatic dogs that present lymphoid adenopathy and reduced weight loss and opaque fur; and symptomatic dogs that present cutaneous alterations (alopecia, furfuraceous eczema, ulcers, hyperkeratosis), onychogryphosis, weight loss, keratoconjunctivitis and paresis of the hind limbs. The disease occurs slowly, being systemic and severe, affecting the spleen according to the immune response of the host (Luvizotto, 2006).

For the diagnosis of the disease, it is necessary to evaluate if the animal comes from an endemic area or if it has visited such areas. For the confirmation of the serological diagnosis, it is necessary to perform a second examination. The parasitological examination is the test of choice, being the gold standard. However, some of the procedures, despite their simplicity, are invasive methods, offering risks to the animal. However, the parasitological examination is a safe method of diagnosis, since the positive result is given through direct observation of amastigotes. As observed in the research in Jaguaribe, state of Ceará, present in our study, the authors performed two tests to confirm the infection, since the diagnostic test must be reliable to avoid false positives.

The specificity of the parasitological method is approximately 100%, and its sensitivity depends on the degree of parasitemia, the type of biological material collected, and the time taken to read the slide. As observed in our research studies, in areas with low socioeconomic standards, difficulties in confirming the clinical diagnosis may occur, especially in dermatitis and malnutrition, which mask the clinical picture of CVL. The owner of the animal may demand a counterevidence, which should be a serological test performed by an accredited laboratory. In 2012, the diagnostic protocol was changed to use the newly validated DPP test as screening and ELISA for confirmation (Ministry of Health, 2011; Grimaldi, 2012). Canine leishmaniasis is more resistant to treatment than human leishmaniasis. Only some animals are considered fully cured.

According to Spina (2009), the choice of treatment protocols is based on the general condition of the patient, always taking into account that, for the determination of the general condition, laboratory tests that can assess kidney function, liver function, serum proteins, and specific serology for Visceral Leishmaniasis confirmed by parasitological diagnosis are necessary, in addition to clinical evaluation. Although there are many drugs for this disease, the combination of Glucantime® and Zyloric® are the most common.

To avoid the spread of CVL, it is necessary to prevent contact between the infected vector and the dog. Prevention measures in large urban centers are directed to dogs. The lack of effective treatment for the total cure of the disease makes it urgent to practice new strategies, such as the Leishmune® vaccine against CVL, already approved by MAPA. Even vaccinated, the dogs, because they become seroreagent, may be indicated for euthanasia when canine surveys are being carried out in the areas of transmission. Furthermore, the Ministry of Health does not recognize the vaccination of dogs as an effective measure for reservoir control (Ministério da Saúde, 2006). At the 13th Symposium of the

Companion Vector-Borne Diseases World Forum, held in 2018 in the UK, the concept that euthanasia is not an effective control measure was established.

Information from the Ministry of Health reports that, historically, chemical control is one of the measures that has been proven to guarantee the reduction of vector-borne diseases, especially in times of epidemics.

## **5 CONCLUSION**

From the study, it was concluded that CVL is a public health problem because it is a zoonosis that leads to a considerable number of deaths in Brazil, being considered one of the parasitic diseases that kills the most in the world. These alarming data are closely related to the advance of urbanization in an uncontrolled way, which brings as a consequence, among other factors, inadequate sanitary conditions. It is necessary the sum of efforts of the public authorities to try to reverse the epidemiological picture of CVL so critical to society. CVL is most prevalent in the Northeast region. However, this serious disease has spread throughout Brazil in places with no previous notifications, becoming a worrisome factor that requires appropriate public policies for its control.



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## **Evaluation of energy properties in wooden briquettes produced without the use of binding and temperature and enriched with carbonaceous solids**

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### **ABSTRACT**

The main objective of this work is to propose an alternative method for the production of wood briquettes with high energy potential. In the present work, these materials from the angico wood species *Anadenanthera Macrocarpa* were produced without the use of binders and temperature. Powder residues obtained from turning this wood with particle size  $\leq 0.85$  mm were compacted at pressures of up to 300 MPa. Then the compacts or briquettes obtained were immersed in a solution of water enriched with 50% of carbonaceous solids until saturation of their porous microstructures with said solution. In order

to ensure that the pores were filled only with carbonaceous solids, all briquettes were subjected to heat treatment in the oven until the total removal of water from their microstructures. The briquettes obtained were characterized via starting granulometry, bulk density measurements and determination of calorific value and energy density. The results showed that the compaction pressures used in this work produced, from the residues of angico wood (*Anadenanthera Macrocarpa*), intact briquettes without the use of binders and temperature for their compaction and with energy density values of up to 5379 MJ/m<sup>3</sup>. Furthermore, it was noted that the presence of carbonaceous solids in the pores of the briquettes microstructure increased the energy density of these materials to values up to 6439 MJ/m<sup>3</sup>.

**Keywords:** energy density, production of intact briquettes, addition of carbonaceous solids.

## 1 INTRODUCTION

Although Brazil leads the world production of forest biomass, it does not yet have the conditions to meet the implementation of new forest plantations in all regions of the country. This is one of the challenges to overcome. According to agronomist and researcher at Embrapa Florestas, Antônio Francisco Jurado Bellote, the standardization of forest plantations is one of the bottlenecks for energy generation because environmental conditions are not the same in all regions. An example of this reality can be seen in the state of Mato Grosso. According to recent information [1] this is one of the states that currently has the highest deforestation in Brazil. Its forests are being cut down and the environmental conditions of this state so far, a major obstacle for them to be replaced. Another interesting challenge cited by Antônio Francisco Jurado Bellote is the need to develop technologies for converting forest plantations, or biomass, into energy. He reports that "it is necessary to make more efficient and sustainable technologies available, while developing and adapting other technologies not yet used or in an embryonic state in Brazil". According to previous studies [2], the carbon balance in the plant is something that is currently being studied a lot. The objective is to obtain efficient crowns for fixing them and efficient plants for their use in wood production. For this, it is important to know the mechanisms of tree growth and how they respond to the use of natural resources. From an energy point of view, this generates a significant increase in the energy density of this biomass, because for the same number of trees felled, there is a greater mass of wood to be used. However, as the gross production of biomass is higher, and as the proportion of useful removable biomass (wood) is also higher, the total removal of nutrient elements per hectare is also higher and more impactful. Within this, science and

technology need to find ways to properly balance productivity gains with environmental gains or losses. On the one hand, new fertilizer formulations and even irrigation as an alternative will emerge, seeking to make the ecosystem more balanced, less vulnerable and more sustainable. But on the other hand, the search for other energy sources from solid biomasses that meet the aforementioned balance described in the previous sentence. In this sense, studies to increase energy density in solid biomasses such as wood and its residues have been developed.

The wood used as a source of energy has carbon contents of approximately 50% in its structure due to its loss during the period in which it was standing as a tree, after its felling as wood or in the operations of its processing, storage and transport [2]. An alternative for increasing energy density with technology dominated and in the process of diffusion is the one developed for the production of briquettes. In the case of wood, due to the high compaction of its residues, the briquettes obtained from it present energy density values of two to three times the value obtained for wood and up to five times that of the residue itself [3,4]. The increase in energy properties of wood and briquettes can be significantly increased if these materials are subjected to processing techniques such as carbonization and roasting. They are widely used to increase the energy yield of these biomasses [5,6,7]. In the case of briquettes, the energy density of this biomass will be significantly increased. While these techniques are effective, the starting wood they use is approximately 50% carbon deficient. Increasing the content of this element in wood before being subjected to one of these processing techniques could significantly increase the energy properties of this biomass, if the carbon content of this material at its origin were increased. In this sense, increasing the presence of this element in wood through its microstructural saturation with a liquid solution enriched with carbonaceous solids can be a very interesting alternative. The possibility of increasing the carbon content in the starting wood before its use for energy purposes via techniques such as roasting, is an interesting option to increase the energy density of this material.

The objective of this work was to develop new materials from the increase of carbon content in different wood biomasses and to investigate their effect on the behavior of its energetic properties. The increase in carbon content in the microstructure of this biomass occurred via its immersion in a liquid solution enriched with carbonaceous solids. The simplicity of the procedure for the production of this solution to be adopted without significant safety risks and generation of environmental contamination are interesting

attractions that enable its application on an industrial scale. The biomasses used in this study were residues of different woods of unknown origin in the form of branches harvested at the campus of the Federal University of Rondonópolis (UFR). Several cylindrical samples with equal dimensions of this material were fabricated via machining and compaction. In the latter case, the dust generated during the turning of the machined samples was used for the production of the compacted ones. The results obtained showed that, regardless of whether the manufactured sample was machined or compacted (briquette), the carbon content in the form of carbonaceous solids present in the microstructure of these materials, contributed in particular to the increase in energy density to values of up to 8196 MJ/m<sup>3</sup>. In percentage terms in the present study this means an increase of up to 49.5%. Furthermore, from an energy point of view, the possibility of enriching the microstructure of any type of wood with carbon opens a path where not only wood, but any other type of solid biomass can also be enriched. The perspective that one has from this fact is: a) a significant addition of value to solid biomass residues; b) a great reduction in the disposal of these materials as garbage in the regions where they are generated and, consequently, a contribution to the sustainability of these regions; c) an important contribution to the reduction of deforestation in several regions of the country, such as the Midwest, in particular, the state of Mato Grosso, where the implementation of new forest plantations is very difficult.

## **2 MATERIALS AND METHODS**

### **2.1 MATERIALS**

The biomasses used were any wood, regardless of its origin and specific characteristics, randomly collected from the soil of the Campus of the Federal University of Rondonópolis. Samples of these materials were machined and the granulometry of the powder produced from the machining of these materials was measured via the Electromagnetic Agitator for Sieve shown in Figure 1. The granulometry greater than or equal to 0.85 mm was used for the production of the compacts.

Figure 1- Electromagnetic Shaker for Sieve.



## 2.2 METHODOLOGY

Cylindrical samples of these materials with dimensions, height = 24.80 mm and diameter = 23.65 mm, were manufactured through turning and compaction. All specimens were manufactured using unknown wood, but always from the same batch. Five different pressures, ie 100 MPa, 150 MPa, 200 MPa, 250 MPa and 300 MPa were used for compacting the powders. Eighty were machined and the same amount compacted at each press, making a total of four hundred and eighty samples manufactured. After each eighty samples produced, forty remained as fabricated and forty were immersed in a liquid solution enriched with carbon in the form of carbonaceous solids until saturation. To saturate the sample with the solution of carbonaceous solids, it was first necessary to remove all the initial moisture contained within the briquettes (compacts) and the machined samples. For this, they were placed in an oven at  $105^{\circ}\text{C} \pm 5^{\circ}\text{C}$ . At each time period, the samples were weighed until, according to the ABNT NBR 14929:2009 technical standard, the difference between the current and previous measurements did not exceed 0.5%. This same procedure was used in the drying analysis of the samples after they were saturated with the liquid solution (65% of carbonaceous solids) produced in the Laboratories of the Mechanical Engineering Course at UFR.

Figure 2 shows the typical appearance of the compacts produced. Unlike light briquettes, those with a dark color are those saturated with carbonaceous solids. Next, all the specimens manufactured were characterized by immediate analysis, calorific value, apparent density and energy density. The immediate analysis was performed based on



ABNT NBR 8112/1986 [8], the calorific value estimated according to the equation of PARIKH *et al.*, 2005 [9] and the apparent density measured according to the ABNT NBR 6922/1981 [10] standard in a container with volume equivalent to a box with internal dimensions of (22.90 x 22.90 x 22.90) mm. In the latter case, the mass (g) under combustion corresponded to the mass of ten briquettes produced at each pressure.

Figure 2 - Typical briquettes produced at different compaction pressures with or without the addition of carbonaceous solids.



### 3 RESULTS AND DISCUSSIONS

Table 1 shows the density values of totally dry compacted briquettes at different pressures before saturation with carbonaceous solids. As expected, the compaction mass used to produce the briquettes increased as the pressure increased. The mass of any of the briquettes was always greater than that measured for the machined sample. This indicates that while the pores of the latter remain empty, those present in the briquettes were either reduced or completely filled with the powders. Soon AM of these increased and it is to be expected that all briquettes present energy density values higher than those obtained for the machined sample.

Table 1. Density values of dry compacted briquettes at different pressures before saturation with carbonaceous solids.

SAMPLES	DIMENSIONS [mm]		COMPACTION DENSITY [g/cm <sup>3</sup> ]	
	DIAMETER	HEIGHT	MASS [g]	
AB100SC	25,05 ± 0,03	24,65 ± 0,08	11,5054 ± 0,0015	0,9471
AB150SC	24,95 ± 0,03	24,60 ± 0,05	12,1661 ± 0,0025	1,0115
AB200SC	24,90 ± 0,04	24,70 ± 0,08	12,7571 ± 0,0060	1,0606
AB250SC	24,90 ± 0,05	24,65 ± 0,05	13,0187 ± 0,0050	1,0846
AB300SC	24,95 ± 0,04	24,70 ± 0,05	13,4849 ± 0,0070	1,1167
AUSC***	<b>24,79 ± 0,07</b>	<b>23,64 ± 0,06</b>	<b>6,72 ± 1,6105</b>	<b>0,5899</b>

Obs: \*\*\* Average estimate of dimension, mass and density values of the machined sample in the dry condition.

In Tables 2 and 3 it is possible to verify the values of bulk density of the briquettes without and with the addition of carbonaceous, and it is also possible to notice that the density of the briquettes is higher than that presented by the machined samples. This is already expected, as it was previously seen that the mass required to fill the pores present in the microstructure of the briquettes causes their mass to be greater than that measured in the machined samples. It is also noted that the bulk density increases considerably when carbonaceous solids are added to the microstructure of the samples.

Table 2. Bulk density values without addition of carbonaceous solids.

Sample	Bulk density [kgm <sup>3</sup> ]
AB100SC	316,6258
AB150SC	347,1562
AB200SC	374,1636
AB250SC	344,8075
AB300SC	289,4323
AUSSC	189,0861

Table 3. Bulk density values without addition of carbonaceous solids.

Sample	Bulk density [kg/m <sup>3</sup> ]
AB100CC	442,1912
AB150CC	446,2682
AB200CC	464,4949
AB250CC	416,8608
AB300CC	414,5699
AUSCC	209,1523

Tables 4 and 5 present values of the energetic properties obtained for both machined and compacted samples, without and with the addition of carbonaceous solids.

Table 4. Values of calorific power and Energy Density for samples without addition of carbonaceous solids.

Sample	Calorific Value [Kcal/Kg]		Energy Density [MJ/m <sup>3</sup> ]	
	PCI	PCS	PCI	PCS
AB100SC	4083,0546	4086,2892	5409,0768	5413,3618
AB150SC	4011,9620	4015,1966	5827,3806	5832,0789
AB200SC	4206,8976	4210,1322	6585,8999	6590,9636
AB250SC	4196,9050	4200,1396	6054,7684	6059,4349
AB300SC	3768,8058	3772,0404	4563,9660	4567,8831
AUSSC	3936,0932	3939,3278	3113,9853	3116,5444

Table 5. Value of power lower calorific and higher for samples with added carbonaceous solids.

Sample	Poder Calorífico [Kcal/Kg]		Energy Density [MJ/m <sup>3</sup> ]	
	PCI	PCS	PCI	PCS
AB100SC	4366,1255	4369,3601	8077,8907	8083,8751
AB150SC	4385,9969	4389,2315	8189,4722	8195,5118
AB200SC	4033,7036	4036,9382	7839,2871	7845,5734
AB250SC	4143,1820	4146,4166	7226,3122	7231,9538
AB300SC	3856,7370	3859,9716	6689,7432	6695,3538
AUSSC	3958,4883	3961,7229	3464,0465	3466,8771

Comparing the maximum energy density values obtained in the present study with those presented in the literature by SALVALAGGIO, 2017 [11], JUNIOR, 2018 [12] and BIERHALS, 2019 [13], it is noted that regardless of the biomass under study, the proposal to saturate these materials with a solution rich in carbonaceous solids was effective and, once its experimental procedure was perfected in the present work, it provided a clearer identification of the increase in carbon content in these samples and, consequently, its effect on the behavior of energy density. The values for this property found

by SALVALAGGIO, 2017 [11], JUNIOR, 2018 [12] and BIERHALS, 2019 [13] reached just over a third of the maximum found in the present work from the PCS (19,000 Kcal/m<sup>3</sup>) and, unlike what was identified here, depended on basically from the addition of particulate mass to the samples.

One aspect to consider from these results is how the pressures between 100 MPa and 150 MPa, used in the present work, are a pressure range in which industrialbriquette machines produce briquettes, this from a commercial point of view becomes quite interesting.

#### **4 CONCLUSIONS**

In the present work, the addition of carbonaceous solids to wood residues of different unknown species, mixed or not, was effective in increasing the carbon content in the microstructure of these materials, and offers a destination for this type of residues to be reused for energy purposes by increasing their energy properties, such as calorific value and energy density. In addition, the reuse of said solid waste tends to contribute significantly to the reduction of deforestation in several regions of the country, since it for energy purposes can be largely replaced by the reuse of wood waste, as a considerable energy source.

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## **Physicochemical parameters of different types of fats used as raw material in biodiesel production**

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### **ABSTRACT**

Biodiesel has been pointed out as a potential substitute for fossil fuels and can be obtained from several lipidic raw materials. The present study aimed to evaluate the quality of lipidic by-products such as pork lard, beef tallow, mixed fat, and fish and poultry oils, used in the production of biodiesel. The samples of the lipidic by-products were collected in meat packing plants located in the southwest region of Paraná and west region of Santa Catarina. The collection was done weekly, during three months. The results showed that all samples presented acidity and saponification index values lower than the reference value indicated by the Brazilian Compendium of Animal Feeding. The pork lard (collected in May), all the bovine tallow, fish oil and poultry oil samples presented iodine index in accordance to that established by the compendium, while those collected in April and June (pork lard) presented values lower than the reference. The mixed fat, however, presented iodine index values higher than the reference values. The highest percentages of impurities were presented by pork lard (May) and poultry oils (May, June) with values higher than 2%.

**Keywords:** biodiesel, animal fat, industrial by-product.

## **1 INTRODUCTION**

Fats can also be called lipids, and can be of vegetable or animal origin. Several lipids are used in food, including lard, tallow, butter, margarine, bacon among others (Fennema et al., 2010; Montebelo et al., 2014). Besides being considered an energy source for food, lipids can also be used for other purposes, including the production of biodiesel.

According to the RDC 270 of 2005 (Brazil, 2005), fatty lipids are classified into oils and fats based on their melting point. Oils are those lipids that at 25 °C are in liquid state, while fats at this temperature are solid or pasty (Brazil, 2005; Ramalho & Suarez, 2012).

Pork lard is a byproduct of pork slaughtering, with quality for use in human food, which is treated to add value and acceptability (Pardi et al., 2007; Dos Santos, 2019).

Tallow can be defined as a by-product from bovine tissues, being processed in greenhouses by continuous batch digesters, fat extraction by presses, centrifuges or by the organic solvent extraction method (Moura, 2008; Levy, 2011; Varão et al., 2017).

Fish oil has been widely used in the production of biodiesel. It is extracted from fish guts and is characterized by being an oil with a long carbon chain, with variable fatty acid profile, which reflect the levels of fatty acids accumulated in the trophic chain of a given habitat (Averina & Kutyrev, 2011). The reuse of waste (fish guts) for energy generation is of great value, since they are usually discarded and can cause damage to the environment (Bery et al., 2012; Rocha, 2021).

Poultry oil, on the other hand, is a byproduct extracted from fatty tissue and inedible parts after the animal is slaughtered. Its extraction occurs by pressing or solvent after cooking, whether filtered or not, and should contain at least 90% of total fatty acids and a maximum of 3% of impurities and unsaponifiables (Bellaver, 2002).

Mixed animal fat is considered a by-product obtained from the adipose tissues of mammals or birds, so that the extraction occurs by pressing and digesters, and may be filtered or not with 90% of total fatty acids and a maximum of 2% of unsaponifiable impurities (Bellaver, 2002).

To certify the quality of oil and fat is necessary characterization by means of physical-chemical analysis, which aims to express the properties of the product. When the destination of these raw materials is the diesel oil industry, the main parameters evaluated are acidity, iodine and saponification indexes, identification of impurities, and color

evaluation.

The acidity shows the conservation status of the oil/fat, since the decomposition of triglycerides is accelerated by heating and also by exposure to light (Gomes et al., 2008).

The saponification index indicates the relative amount of high and low molecular weight fatty acids, it can be obtained by measuring the amount of base needed to saponify a certain amount of oil and/or fat (Tofanini, 2004; Carvalho, 2017).

Iodine Index of an oil or fat indicates the measure of unsaturation, so that it can be expressed in centigrams of iodine absorbed per gram of sample (% iodine) (Almeida, 2015).

The analysis of the impurity index can be applicable to all oils and fats, so that the method determines dirt and other foreign substances, insoluble in petroleum ether (Brazil, 2010).

Among biofuels, biodiesel, due to the characteristics of low toxicity, abundance of raw material, easy biodegradability, not requiring adaptations in engines, among others, has been considered a promising substitute for fossil fuels (Chen et al., 2014; Varão et al., 2017).

Biodiesel production is carried out from various feedstocks, such as vegetable oils, animal and residual fats, obtained by various processes. In liquid form (ethanols and biodiesel), gaseous (natural gas) or solid (bagasse, biomass waste, briquettes, piquets) (Guimarães et al., 2019). Among animal fats, tallow is the most representative nationally. Other residues can also be used, such as, fish and mocotó oils, lard, and chicken fat (Barros & Jardine, 2016).

Moreover, the use of lipidic raw materials of industrial origin (frigorific and animal slaughter) for biodiesel production contributes to reduce the disposal of these residues in the environment. Thus, the quality control of this raw material becomes essential, since it directly impacts the quality of biodiesel.

Based on the above, the objective of this study was to evaluate the quality of the raw materials: pork lard, beef tallow, fish oils, poultry oil and mixed fat intended for biodiesel production.



## **2 MATERIALS AND METHODS**

### **2.1 SAMPLING**

The raw material samples (pork lard, bovine tallow, fish oil, poultry oil, and mixed fat) were collected in the processing industry, originating from the processing lines of meatpacking plants located in the southwest of Paraná and west of Santa Catarina.

Two to three samples were collected weekly, coming from the reception of the raw material, during a period of three months. The samples were collected with the help of a specific sample collector, taken first from the upper part of the tank truck and then an aliquot sample was taken from the lower part. The amount of sample could be variable depending on commercial seasonalities. The analysis period included the months of April, May, and June 2021. The raw material samples (pork lard, bovine tallow, fish oil, poultry oil, and mixed fat) were collected in the processing industry, originating from the processing lines of meatpacking plants located in the southwest of Paraná and west of Santa Catarina.

Two to three samples were collected weekly, coming from the reception of the raw material, during a period of three months. The samples were collected with the help of a specific sample collector, taken first from the upper part of the tank truck and then an aliquot sample was taken from the lower part. The amount of sample could be variable depending on commercial seasonalities. The analysis period included the months of April, May, and June 2021.

### **2.2 ANALYTICAL PROCEDURES**

Physicochemical analyses of acidity (oleic acid), saponification index, iodine index and impurity index were performed.

To determine the acidity index and impurities, the methodology suggested by the Brazilian Compendium of animal feed (2017) was used. For the analysis of the iodine index (measure of the unsaturation of fats and oils), the method of the American Oil Chemists' Society Official Method Cd 1-25 Iodine Value of Fats and Oils Wijs Method was used and to determine the saponification index the Standard Methodology DGF (German) Section-Fats (C-III15(91)) was employed (Aocs 2004).

### 2.3 DATA ANALYSIS

Analysis of variance (ANOVA) and Tukey's test were used to compare the results of the parameters evaluated in the different types of fat. For all tests, a 95% confidence interval was applied. ACTION® software, version 2014, was used to perform the analyses.

### 3 RESULTS AND DISCUSSION

The main parameters used to evaluate the quality of the raw material for biodiesel production are acidity (oleic acid), saponification index, iodine index, impurity index and these have reference standards established by ANP Resolution No. 14/2012 of the National Agency of Petroleum, Natural Gas and Biofuels (Anp, 2012), which is the agency in Brazil that establishes the standards for marketing, distribution, quality and inspection of fuels (Melo, 2014). The established standards have the function of fixing the limits of contaminants, and are also fundamental to ensure the quality of biodiesel, so as not to impair the quality of emissions from the burning of biodiesel. In addition, it aims to ensure good performance and integrity of the engine, as well as safety in transport and handling (Lôbo & Ferreira, 2009). Another factor that must be considered in this process are the possible degradations of the product during the storage process (Mazzonetto, 2017). The results of the physicochemical parameters: acidity (in oleic acid), iodine,

soaps and impurities of the raw materials (pork lard, beef tallow, fish oil, poultry oil, mixed fat) used in the biodiesel manufacturing process are presented in Table 1. Of the oil and animal fat samples evaluated, all presented acidity values lower than those indicated by the Brazilian Compendium of Animal Feed (2017), which indicates a maximum value of 6.0% for acidity.

Table 1- Physical-chemical parameters of raw materials used in biodiesel production.

Product	Month	Oleic acidity (% FFA)	Saponification value (ppm)	Impurities (%)	Iodine value (g)
<i>Lard</i>	April	1,40±0,53bcd	106.67±28.87cdef	1,17±0,76abc	56.67±16.07ef
<i>Lard</i>	May	3,75±1,79a	127.78±46.04def	2,33±1,66ab	69,78±9,19de
<i>Lard</i>	June	1,60±0,62bcd	76.67±15.28ef	1.67±0.58abc	53.00±7.55ef
<i>Ref. value</i>	Compendium in 2017	Maximum 6.0	190-194		57-70
<i>Bovine tallow</i>	April	0,95±0,10e	128.00±14.24bcdef	0.70±0.14abc	48,50±3,00f
<i>Bovine tallow</i>	May	1,67±1,02cd	125.28±16.80cdef	0.71±0.13ac	43,14±5,01f
<i>Bovine tallow</i>	June	1,00±0,16e	130.00±8.23bcdef	0,50±0,22abc	45,25±3,40f
<i>Ref. value</i>	Compendium in 2017	Maximum 6.0	190-202		35-50
<i>Fish oil</i>	April	2,48±0,38abcd	82,14±14,96f	0.90±0.34abc	160,00±18,93b
<i>Fish oil</i>	May	2.10±0.85abcd	85.00±7.07cdef	0.65±0.21abc	187,50±3,54a
<i>Fish oil</i>	June	2.80±0.71abcd	67.50±10.61ef	0,75±0,35abc	150,00±70,7b
<i>Ref. value</i>	Compendium in 2017	Maximum 6.0	189-193		140-200
<i>Poultry oil</i>	April	2,02±0,85bcd	234,38±50,40a	1,54±1,01abc	76,92±7,63cd
<i>Poultry oil</i>	May	1,85±0,97d	211.27±44.82ab	2,20±1,53b	78.73±4.62bcd
<i>Poultry oil</i>	June	1,63±0,57d	193.46±15.42abc	2,18±1,65b	74,37±7,56d
<i>Ref. value</i>	Compendium in 2017	Maximum 6.0	190-196		70-90
<i>Mixed Fat</i>	April	2.89±0.20ab	158.60±42.40bcde	0,97±0,13c	87,07±2,81b
<i>Mixed Fat</i>	May	2.90±0.55ab	188.60±79.03abcd	0,76±0,23c	85.70±8.66bc
<i>Mixed Fat</i>	June	2.77±0.23abc	130.00±38.53ef	0,76±0,26c	86,85±4,80b
<i>Ref. value</i>	Compendium in 2017	Maximum 6.0	190-202		57-70

Os resultados são representados na forma de média±desvio padrão de 10 replicatas. Letras iguais na mesma coluna, não diferem entre si pelo teste de Tukey ( $P>0,05$ ).

The pork lard collected in May was the one that numerically presented the highest value and acidity, not statistically different ( $P>0.05$ ) from samples of mixed fat and fish

oil. The lowest acidity index, however, was for the tallow samples collected in April and June, which differed statistically ( $P < 0.05$ ) from the other samples, this is explained by the fact that bovine tallow is formed basically by saturated chain fatty acids (Krause, 2008; Tapanes, 2013); and the acidity index is a variable related to the nature, quality and purity of the fat, with the processing and, especially, with the conservation conditions of the fat (Moreto & Fet, 1998; Rios et al. , 2013).

The saponification index of an oil or fat indicates the relative amount of high and low molecular weight fatty acids, defined as the number of milligrams of potassium hydroxide required to neutralize the fatty acids resulting from the complete hydrolysis of 1 gram of sample (Tofanini, 2004; Almeida, 2015). All the samples of oils and fats evaluated presented saponification index lower than that established by the Compendio Brasileiro de Alimentação animal (2017) which presents an ideal range for each fat matter (Table 1), except poultry oil. For this grease, only the sample collected in the month of June falls within the established range (190-196), the others exceed this value. According to Almeida (2015) low molecular weight esters require more alkali for saponification, therefore, the saponification index is inversely proportional to the molecular weight of the fatty acids present in the triacylglycerols.

The iodine index is a direct measure of the amount of double bonds present in an oil sample (Segura-Campos, et al., 2014). Of the fatty materials evaluated, the pork lard collected in May showed an iodine index according to that established by the Compendio Brasileiro de Alimentação animal (2017), while those collected in April and June showed lower values than the reference (57-70). However, statistically the samples did not differ ( $P > 0.05$ ).

The samples of bovine tallow, in turn, are in accordance with the established (35-50) and did not differ statistically ( $P > 0.05$ ). According to Cunha (2008), the low iodine content in this type of raw material is due to the fact that this type of fat is composed of a higher amount of saturated fatty acids. This low index is important, since raw materials with high iodine content can transfer this to biodiesel, making it unsuitable for direct use in diesel cycle engines (Ramos et al., 2003).

The fish oil samples also presented iodine indices according to the reference values, however, the May samples differed ( $P < 0.05$ ) from the April and June samples. Values lower than those found in the present study were observed by Cardoso (2017), who recorded iodine indices of 100 g of I<sub>2</sub>/100g of oil when characterizing fish oil for

biodiesel production. The iodine index can determine the degree of unsaturation of an oil (Lôbo et al., 2009; Cardoso, 2017).

All samples of the poultry oils presented iodine index according to values set by the Compendio Brasileiro de Alimentação animal (2017), which comprises the range of 70 to 90 g of I<sub>2</sub>/100 g. The iodine value observed in poultry oil samples is higher than that observed in beef tallow, because they have a higher concentration of unsaturated fatty acids in their composition. Values of iodine value lower (60.27g of I<sub>2</sub>/100g) than those found in this study were presented by Cunha (2008) in chicken fat.

The mixed fat was, among the samples evaluated, the only one that exceeded the reference values for the iodine index in the three months evaluated, not differing from each other ( $P > 0.05$ ). The high iodine index is related to a higher concentration of unsaturated fatty acids and, consequently, a higher capacity of iodine absorption by the sample (Almeida, 2015).

The presence of impurities may influence the density of biodiesel, such as alcohol or adulterants (LÔBO et al., 2009). Thus, it is recommended that before the biodiesel production process, the oil or fat is submitted to a pre-treatment called degumming, in order to remove most of the phospholipids. This procedure also removes other impurities such as waxes, colloidal substances and metal ions (Gonçalves & Bortoleto, 2021).

For the percentage of impurities, there is no reference in the legislation, however, it is known that the lower the degree of impurities, the higher the quality of the raw material and consequently the better the quality of biodiesel obtained. The highest percentages of impurities were presented by the pork lard (May) and poultry oils (May, June) with values above 2%.

#### **4 CONCLUSION**

The results showed that 100% of the samples evaluated presented acidity and saponification index values lower than the reference value indicated by the Brazilian Compendium of Animal Nutrition. The pork lard (collected in May) and 100% of the bovine tallow, fish oil and poultry oil samples presented iodine index values according to the Compendium, while those collected in April and June (pork lard) presented values lower than the reference values. The mixed fat, however, presented iodine index values higher than the reference values. The highest percentages of impurities were presented by pork lard (May) and poultry oils (May, June) with values higher than 2%.

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## **Foreign direct investment and external vulnerability: an analysis of the Brazilian economy with VEC methodology**

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### **ABSTRACT**

Research on foreign direct investment became one of the main areas of study in the Brazilian economy after the economic stabilization of 1994, a period in which the country began to register an unprecedented flow of investments in its history. In summary, the main research seeks to analyze the importance of FDI for the country's long-term development or to measure its attractiveness factors, and there is still a small literature that focuses on analyzing how external vulnerability affects the flow of foreign capital. In this sense, this research sought to measure how the main external vulnerability indicators affected the FDI flow in the Brazilian economy during the years 1995 - 2020 using the methodology of Error Correction Vectors (VEC). The explanatory variables selected were the Gross Domestic Product (GDP), Current Transactions and International Reserves, the explained variable corresponds to the inflow of Foreign Direct Investments. The data suggest that the external vulnerability indicators and their lags are the main factors of attraction of foreign capital.

**Keywords:** international economics, foreign direct investment, error correction vector, external vulnerability.

### **1 INTRODUCTION**

The literature on foreign direct investment (FDI) gained great prominence during the 1990s with the commercial and financial opening, guided by the neoliberal policies of the "Washington consensus". In summary, the diagnosis of the Latin American crisis, according to the "consensus", was that there was an excess of inefficient state-owned enterprises originating from the import substitution model, which, together with fiscal indiscipline, were incapable of promoting economic growth. From this diagnosis emerged the recommendation of "ten major measures" that Latin American countries should adopt to overcome the crisis of the 1980s according to Williamson's article (1990).

With a context of liberalization and stability from 1994 on, the Brazilian economy began to receive a large FDI flow, unprecedented in its history. According to data from The World Bank, in 1993 the net inflow of investments accounted for US\$ 1,292 billion and in 1996 for US\$ 12,552 billion, resulting in a variation of 871.52% in three years,

showing how the internal dynamics was an important factor in attracting new investments.

The boom in foreign investments continued until 2000, registering US\$ 32,995 billion, a level that Brazil only exceeded again in 2007 with US\$ 44,579 billion.

Not even the global financial crisis of September 2008 reduced the inflow of investments, a period in which the Brazilian economy reached its record in the last 61 years until then, registering US\$ 50,716 billion. The effects of the crisis hurt in 2009, when the country registered US\$ 31,481 billion, a reduction of 62.07%.

The impact of the global crisis on the inflow of investments was temporary, surprising most analysts when they saw Brazil in 2011 become the fifth country in the world that received the most foreign direct investment according to the World Investment Report (WIR, 2012), besides consolidating its position as the Latin American country that receives the most FDI. From 2011 the behavior of investments has varied steadily, internal factors have proved relevant to explain, given that the performance of the Brazilian economy tends to fluctuate with the inflow of investments.

In addition to internal factors, the global dynamics must be taken into account in any analysis of the determinants of FDI. According to Castro (1979) foreign investment has a double determination: i) capital exports from developed countries, and ii) attractiveness of the Brazilian economy in its diversification and growth. For Possas (1983) the bilateral relationship between the two countries is also an important factor, in which this approach differs from the others by introducing the participation of institutions as a conditioning factor of foreign capital inflow.

To meet the research objectives, the paper is divided into four parts: i) Introduction, ii) Literature review, iii) Methodology, and iv) Conclusion. The structure of the paper was organized to meet the research objectives, so that the empirical analysis is transparent by enabling other researchers to verify the authenticity of the analyses.

The literature review added to the research by identifying the main determinants of foreign direct investment in the Brazilian economy, in addition to deepening the study based on unconventional trade and investment theories, especially the Product Cycle and the Eclectic Paradigm of International Production.

The methodology of the work was developed through the Error Correction Vector model (VEC), which is commonly used in empirical studies on FDI. The main steps of the VEC were demonstrated from the theoretical model, database, model used, unit root

test and cointegration test. At the end it is commented on the main results obtained and the limitations of the study.

The last chapter is dedicated to the conclusion of the theoretical and empirical results, so that despite the vast literature on FDI the researches do not tend to be homogeneous, there are spaces for the most varied interpretations.

## **2 LITERATURE REVIEW**

Between 1980 and 1994 the Brazilian economy was marked by the phenomenon of stagflation, resorting to numerous stabilization plans and monetary reforms that failed to achieve their main objective, monetary stability. Besides the economic difficulties, there was also enormous political instability, marked by the end of the military regime in 1985, the elaboration of a new Constitution in 1988, and the opening of the impeachment process of the first directly elected president, Fernando Collor de Mello in 1992. In summary, the economic and political instability that marked the period between 1980 and 1994 made the Brazilian economy unattractive to foreign direct investment (CURADO & CRUZ, 2012, p.282).

The political and economic instabilities during the 1980s kept the countries of the Latin periphery away from the large FDI flows of the period, of which, according to World Bank data, high-income countries and later middle-income countries were the main destinations of new investments. According to Curado and Cruz (2012), in 1978 and 1979, net FDI flows to the Brazilian economy were US\$ 2.18 billion and US\$ 2.40 billion, respectively.

Although the debate on foreign investment already existed during the lost decade, specialists focused on external imbalances. Contractionist policies and maximal exchange rate devaluation were adopted to minimize current account deficits, which according to Carneiro and Modiano (1990) resulted in a retraction in economic growth and a change in the inflation level.

With the advance of globalization and neoliberal focus policies, studies on foreign direct investment became one of the main areas of research in the Brazilian economy in the 1990s, in which the change in internal dynamism in 1994 was one of the key factors for the large flow of new investments. According to Laplane and Sarti (1997) the stabilization generated two important factors: elimination of nominal and effective tariffs through the opening of trade and elimination of nontariff barriers through exchange rate

appreciation. The two factors together contributed with less protection to the domestic market, thus attracting foreign capital.

The authors Medeiros et al (1997), Cardoso and Goldfanj (1998) and Sá and Almeida (2006) emphasize the importance of stabilization and privatization for the entry of foreign resources; the great dilemma consists in analyzing whether these are still key factors for the Brazilian economy and whether they differ according to the sector.

Theories of international trade have also become important for understanding the strategies of multinationals, the "eclectic paradigm of international production" and the "product cycle theory" are frequently found in the literature. By emphasizing market failures, uncertainty, resource constraints, and technologies, the theories have identified the movements of multinational firms.

Product cycle theory was first introduced by economist Raymond Vernon with the publication of "International investment and international trade in the product cycle" in 1966, by suggesting that a given product type has three phases: i) introduction, ii) maturation, and iii) standardization. The first stage is marked by uncertainty, since it is not yet known how and which consumers will accept the product, and its production is directed to the domestic market where the transnational company operates and for export. The second stage refers to maturation, where the number of producers expands in search of product homogenization, in which production starts to take place in foreign countries. Finally, after the introduction and maturation of the product, the scaling of production is optimized and the company transfers its production to the country where costs are minimized.

According to Alencar (2011) the model shows how subsidiaries evolve towards activities with greater added value via technology transfer from headquarters. According to Gomes (2003) the product cycle model is of great use in understanding the initial stages of the subsidiary's evolution, by establishing the dependence of the subsidiary with the corporate level, given that when innovation advantages become scarce, the company transfers part of production to subsidiaries in countries where there are low costs.

Another important theory present in the literature refers to "The Eclectic Paradigm" or simply "OLI (Ownership, Location, Internalization) Model", elaborated Dunning (1980). The model consists in analyzing the factors of attractiveness in the realization of Foreign Direct Investments (FDI), following three levels: i) ownership, ii) location, and iii) internationalization. The first level refers to the firm's specific ownership

advantage in relation to the local companies where it is setting up, so that there will be advantages if these exceed the production costs of the foreign company. According to Dunning (1988), it is important to emphasize the difference in the possible market structures, considering that sectors with ascending failures, the foreign company may have incentives to establish itself locally.

Another important level of the eclectic paradigm and commonly used in international trade theory refers to location, with factors such as product flow, size of the domestic market, infrastructure development, degree of competition and subsidy policies being essential. In addition, according to Dunning himself (1988) the flow of foreign direct investment (ied) arising from transnational companies (TNCs) can be strongly influenced by economic alliances, reductions in transport and entry costs. Alencar (2011) complements the location factor by arguing that NTTs will prefer to produce intermediate products in other countries due to the variables mentioned above, thus the eclectic paradigm theory provides ex- plications on how, why and where NTTs will allocate their resources.

The last level refers to productive internationalization, involving three other factors according to Dunning (1988): i) uncertainty when setting up in a new country, given that its production is fractioned among the subsidiaries, ii) scale gains, and iii) externality in the market where the firm is setting up.

In relation to empirical studies that analyze the factors that stimulate or inhibit the entry of new investments, the methodological approach is still not very homogeneous. In summary, we can group the attractiveness factors between internal and external, where for Cardoso and Goldfanj (1997) the internal factors include solid monetary and fiscal reforms that are market-oriented via privatization, in addition to the key role of economic stabilization, reducing the risks for the entry of foreign capital.

Regarding the external side, the literature indicates that shocks to world interest rates have been one of the main factors inhibiting the inflow of investments into developing economies, as is the case of Brazil.

Gravitational models have proven to be an important tool for predicting bilateral FDI flows between countries, based on the distance and size between them. The study by Catela (2016) estimates a model with 21 FDI-emitting and 31 FDI-receiving countries, where a binary variable was inserted to measure whether the 2008 crisis generated greater uncertainty about FDI flow among investors.

The studies by Ignácio (2021), Bittencourt et al (2006), Araújo (2021), and

Klagges and O'Shee (2020), analyze the FDI flow received by Latin America. Most studies highlight the importance of bilateral treaties for capturing FDI, although the study by Araújo (2021) does not identify that bilateral investment treaties (BITs) have a statistically significant effect on FDI. The study carried out by Bittencourt (2006) allows us to identify the "winning" and "losing" countries with the regional integration agreements (RIA) between MERCOSUR-EU.

The use of Vector Autoregressive (VAR) model and one of its variations, the Vector Error Correction (VEC) model, has been used frequently in the literature to measure the strategies of multinational companies. Silveira et al (2017) draw on the eclectic paradigm theory in determining that the strategies of multinationals are linked to the size of the market where firms are setting up and efficiency from a VEC model.

Using VAR methodology, Sampaio (2018) in his study concludes that the greatest FDI variance is due to its own lag, highlighting the importance of incorporating structural and institutional factors when modeling. Such empirical identification becomes important as it meets the theories and understanding of Castro (1979) and Possas (1983) on FDI dynamics, privileging the historical process and the role of institutions.

The texts selected in the present literature review, allow us to identify the importance of internal dynamics as a conditioning factor of foreign direct investment. Although most studies emphasize both internal and external factors, few authors suggest the need to analyze the impact of external vulnerability on FDI, where the literature on this relationship is basically non-existent.

### **3 METHODOLOGY**

#### **3.1 ERROR CORRECTION VECTOR (VEC)**

The measurement of the determinants of foreign direct investment has gained great prominence through the combination of autoregressive vectors (VAR) and error correction vectors (VEC). According to Sampaio (2018, apud CANOVA and CICARELLI, 2013) rank the following advantages of the Var method: i) capture dynamic and static interdependence relationships; ii) treat these relationships between variables without imposing restrictions; iii) incorporate variations for the time coefficients and for the variance of shocks; and iv) reflect dynamic heterogeneities in panel data.

According to Johnston and DiNardo (2001), all the equations of a VAR are present in a VEC, so that both become similar except that the latter corrects for cointegration

relationships. So that if  $y_t$  e  $z_t$  are  $I(1)$  and not cointegrated, in this case we must estimate the first difference dynamic model:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{\rho-1} \alpha_1(i) \Delta y_{t-i} + \sum_{i=1}^{\rho-1} \alpha_2(i) \Delta z_{t-i} + \epsilon_{it} \quad (1)$$

As is apparent in time series,  $y_t$  e  $z_t$  often cointegrate, so that equation (1) needs to be modified. In this case, we simply insert  $I(0)$  into the model, so that we continue to estimate a dynamic model, but include the error term.

$$\Delta y_t = \alpha_0 + \alpha_y \hat{\epsilon}_{t-i} + \sum_{i=1}^{\rho-1} \alpha_1(i) \Delta y_{t-i} + \sum_{i=1}^{\rho-1} \alpha_2(i) \Delta z_{t-i} + \epsilon_{it} \quad (2)$$

Through the VEC model it is also possible to predict the "Trace Test", whose objective according to Moro (2020) is to verify the null hypothesis that the number of cointegration vectors is less than or equal to  $r$ :

$$\lambda_{\text{traço}}(r) = -T \sum_{i=r+1}^n \ln(1 - \lambda_i) \quad (3)$$

It is important to stress that it is not the goal of this paper to perform in-depth theoretical demonstrations of the model, but when using a VEC the researcher needs to observe two crucial factors: i) check if the residuals are white noise, ii) if the variables are cointegrated, if so  $\alpha_y$  will be statistically different from zero.

### 3.2 ESTIMATED MODEL AND DATABASE

The contribution of the literature review and the theories of foreign direct investment were extremely important to understand the pattern of investments made in Brazil since economic stabilization. The estimated model considered GDP, international reserves and the current account deficit as a percentage of GDP to explain the FDI flow, and can be represented as follows:

$$\log(FDI) = \log(GDP) + \log(TC) + \log(RESERV) + u_t \quad (4)$$



The double-log functional form, says that the inflow of foreign direct investment (FDI) is a function of current GDP (GDP), Current Transactions (TS) and International Reserves (RESERV). The FDI and RESERV variables were calculated from the Time Series Management System database linked to the Central Bank of Brazil. FDI is an annual series with data on foreign direct investment inflows into the country measured in millions of dollars, while RESERV indicates the stock of international reserves in the Brazilian economy measured in millions of dollars, also calculated on an annual basis.

The GDP variable was extracted from the World Bank Open Data, being the sum of the gross value added by all resident producers in the economy plus the difference between taxes and subsidies without including the value of depreciation. The data were collected on an annual basis, calculated in US dollars.

The TS variable was collected from the IpeaData, linked to the Institute for Applied Economic Research (IPEA). The current transactions account shows the flows of goods, services, primary income, and secondary income between residents and non-residents of a country, and is measured as a percentage of GDP.

The theoretical explanation for the use of the GDP variable is due to the fact that the country's growth opens spaces for the internal market, thus attracting new investments. The literature seems to indicate a convergence on the use of this variable, but it is necessary to adopt caution in its interpretation, given that the simultaneity between FDI and GDP usually appears frequently in empirical studies.

The use of the variables TS and RESERV indicate the external vulnerability of the country, and their presence is not common in most empirical works, but it is possible to find several works such as Moro (2020) that conclude the need to insert variables that capture external vulnerability, as is the case of international reserves (RESERV) and Current Transactions (TS). For a large open economy, the use of these variables makes no sense, but for developing countries their importance becomes crucial, since external problems are often present in the Latin periphery.

Several variables can contribute to explain foreign direct investment, but for reasons of time limitation only the three explanatory variables mentioned above were prioritized, so that the introduction of more variables is encouraged for future work.

### 3.3 UNIT ROOT TEST

Time series studies often present stationarity, so that their properties such as mean, variance and autocorrelation do not change over time, in addition to the covariance of the lagged values depending only on the lag between them. The studies of Granger and Newbold (1974) were pioneers in the area, where they observed that series with trend despite presenting statistically significant results had no economic logic, so the estimators are biased. In this sense, according to Gujarati and Porter (2011) the unit root test allows detecting situations of non-stationarity of a time series.

There are numerous ways to identify whether a series contains a unit root, among which the Dickey Fuller, Augmented Dickey Fuller - ADF, Phillips Perron, KPSS, DF-GLS, Structural Break - Zivot and Andrew, Dickey and Pantula tests stand out. In addition to the tests, a priori, the researcher must observe the autocorrelation, in view of the fact that non-stationary series have high autocorrelation.

To identify the presence of unit root, the research opted for the Augmented Dickey Fuller (ADF) test, whose objective is to test for the presence of unit root in  $Y_t$  in three steps: i) model with constant and deterministic trend, ii) model with constant, iii) model without deterministic terms.

$$Y_t = \alpha + \beta_t + \rho Y_{t-1} + \epsilon_t \rightarrow \Delta Y_t = \alpha + \beta_t + \gamma Y_{t-1} + \epsilon_t \quad (5)$$

$$Y_t = \alpha + \rho Y_{t-1} + \epsilon_t \rightarrow \Delta Y_t = \alpha + \gamma Y_{t-1} + \epsilon_t \quad (5.1)$$

$$Y_t = \rho Y_{t-1} + \epsilon_t \rightarrow \Delta Y_t = \gamma Y_{t-1} + \epsilon_t \quad (5.2)$$

Where  $\alpha, \beta_t$  are deterministic components and  $\epsilon_t$  is white noise. If one of the steps is not satisfied we cannot claim there is the presence of a unit root, so the hypothesis test is set up in such a way:

$$H_0: \rho = 0 \leftrightarrow \gamma = 0$$

$$H_1: \rho = 1 \leftrightarrow \gamma = 1$$

The null hypothesis, if  $\rho = 0$  says that there is presence of unit root and the alternative hypothesis,  $\rho = 1$  says that there is no unit root, this being a one-tailed left-handed test.

Table I demonstrates the result of the Augmented Dickey Fuller test for the time series considered in the model, so the number of lags was determined using the Bayesian selection criterion (BIC), which is more conservative than the Akaike (AIC).

Table I – Augmented Dickey-Fuller Unit Root Test (ADF)

Series	Expressions	Lags	t calculated	tc (1%)	tc (5%)	p-value
FDI	Constant and Trend	2	-2.53	-4.15	-3.50	0.0216
GDP	Constant and Trend	2	-0.550	-4.15	-3.50	0.589
TS	Constant and Trend	2	-2.534	-4.15	-3.50	0.0214
RESERV	Constant and Trend	2	-1.366	-4.15	-3.50	0.1898
FDI	Constant	2	-0.980	-3.58	-2.93	0.340
GDP	Constant	2	-1.506	-3.58	-2.93	0.150
TS	Constant	2	-2.491	-3.58	-2.93	0.0227
RESERV	Constant	2	-1.140	-3.58	-2.93	0.2694
FDI	Open-ended Deterministic	2	0.268	-2.62	-1.95	0.792
GDP	Open-ended Deterministic	2	-0.194	-2.62	-1.95	0.848
TS	Open-ended Deterministic	2	-1.983	-2.62	-1.95	0.062
RESERV	Open-ended Deterministic	2	0.394	-2.62	-1.95	0.6979

Source: Prepared by the author using the RStudio statistical software and the IpeaData, Brazilian Central Bank, and World Bank databases.

The ADF test demonstrated the presence of a unit root for all the analyzed series at the 5% confidence level, confirming that they are non-stationary variables. In this case, we should proceed to the next step and perform the cointegration test.

### 3.4 COINTEGRATION TEST

Among the cointegration tests, the Engle-Granger, Johansen, and Phillips-Ouliaris

tests stand out. The test selected for the research was the Engle-Granger test, constructed from the following steps:

- 1 Test for non-stationarity of the series
  - 1.1 Perform the unit root test
  - 1.2 If both are stationary use traditional methods
  - 1.3 Variables are not integrated if they are of different orders
- 2 Estimate the long-run relationship if  $yt = \beta_0 + \beta_1 Zt + \epsilon t$ 
  - 2.1 If the variances are stationary,  $yt$  and  $Zt$  are cointegrated of order (1,1)

Table II – Engle-Granger cointegration test

t Calculated	t Reviewer (1%)	t Reviewer (5%)
-3.9835	-4.592	-3.915

Source: Prepared by the author using the statistical software RStudio.

The Engle-Granger test suggests that we cannot reject the null hypothesis at the 1% confidence level, so the series cointegrate, and there is a long-term relationship between them.

#### 4 MAIN RESULTS

Throughout the methodology, three different models were tested. The first model in linear form presented clear signs of spurious regression as expected in time series. Table III shows the main results obtained through the estimation performed.

Table III – Linear Model Analysis

Coefficients	Estimate	Std. Error	t Value	Pr(> t )
Intercept	1.210e+04	7.853e+03	1.540	0.138
GDP	-9.632e-09	1.090e-08	-0.884	0.386
RESERV	3.580e-01	5.145e-02	6.958	5.51e-07***
TS	-1.860e+03	1.639e+03	-1.135	0.269

Signif. Codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 14620 on 22 degrees of freedom

Multiple R-squared: 0.9235, Adjusted R-squared: 0.913

F-statistic: 88.51 on 3 and 22 DF, p-value: 1.963e-12

Source: Prepared by the author using the statistical software RStudio.

The model suggests that only the international reserves variable (RESERV) is statistically significant, while the explanation coefficient presents a value of 0.923 5, this

being a clear sign of spurious regression according to Granger and Newbold (1974).

As shown in table II, the Engle-Granger cointegration test was applied, so that we cannot reject the null hypothesis at the 1% confidence level, so the series cointegrate, and there is a long-term relationship between them. From the test result a vector of residuals was created to analyze the error correction model.

Table IV – Vector of Corrected Errors (VEC)

<b>Coefficientes</b>	<b>Estimate</b>	<b>Std. Error</b>	<b>t Value</b>	<b>Pr(&gt; t )</b>
Intercept	2.722e+03	2.349e+03	1.159	0.2602
L(Erro)	-4.940e-01	1.648e-01	-2.998	0.0071**
d(GDP)	2.995e-08	1.118e-08	2.678	0.0145*
d(RESERV)	1.074e-01	1.004e-01	1.069	0.29770
d(TS)	-3.459e+03	1.807e+03	-1.914	0.07006.

Signif. Codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 10440 on 20 degrees of freedom

Multiple R-squared: 0.7077, Adjusted R-squared: 0.6493

F-statistic: 12.11 on 4 and 20 DF, p-value: 3.673e-05

Source: Prepared by the author using the statistical software RStudio.

The VEC estimates suggest that the speed of adjustment is -0.4940, being highly significant, with a probability of committing the type I error of less than 0.01. It is important to emphasize that the negative sign agrees with the literature, since it is this that makes the adjustment.

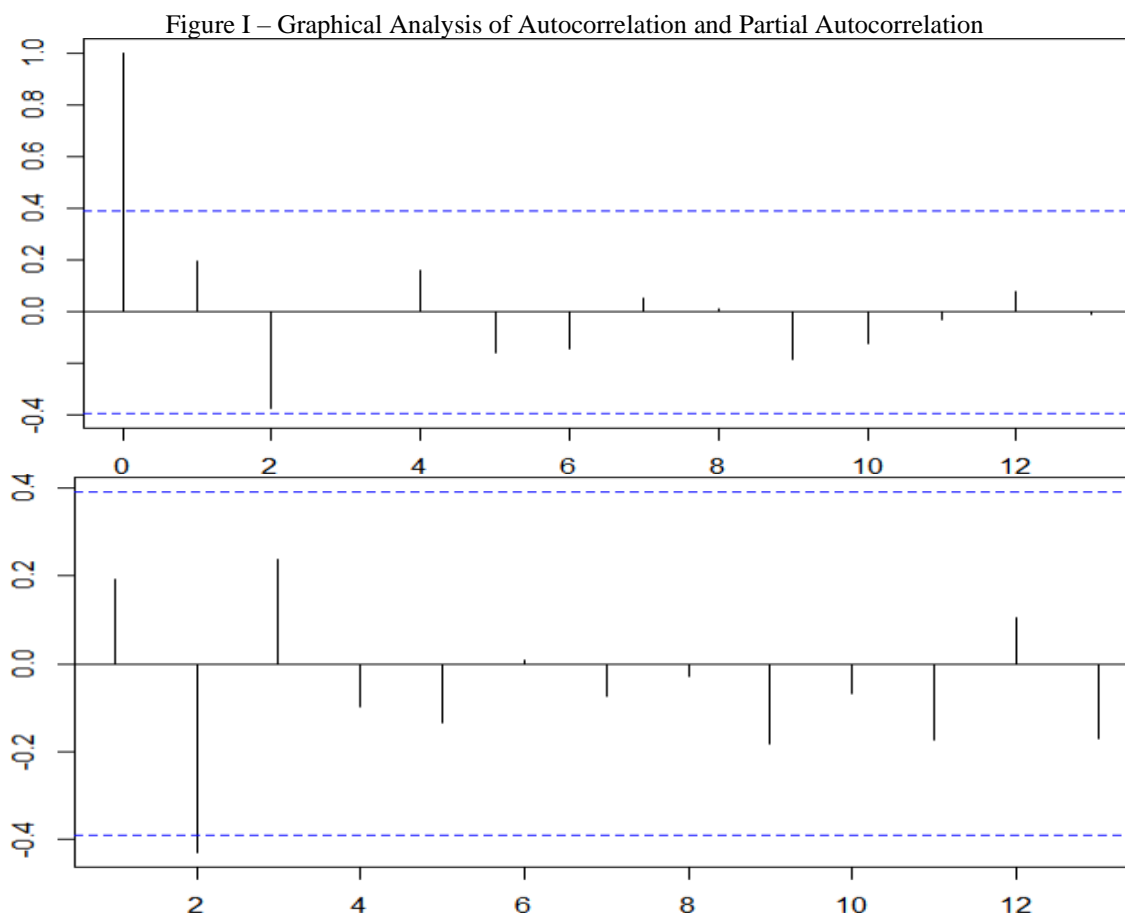
The variable with the greatest explanatory power is the current transaction, so that a positive variation of one US dollar in Brazilian reserves results in a reduction of -3.459 percentage points in FDI, keeping GDP and RESERV constant. Thus, discrepancies between GDP and current transactions (trade balance, balance of services, plus unilateral transfers) tend to reduce the attractiveness of investments. The statistics proved significant at the 10% confidence level, and a priori we can affirm that there is a linear relationship between FDI inflows and current transactions.

GDP has also been shown to be statistically significant at the 5% confidence level, so that a one dollar increase in Brazilian GDP results in a 0.00000002995 percentage point increase in FDI, holding everything else constant. The RESERV variable which helps measure the role of external vulnerability, says that a change in international reserves, results in an increase in FDI by 0.074 percentage points, holding everything else constant.

Although the sign of the result is in agreement with the literature, it was not statistically significant, and it cannot be said that there is a relationship between reserves and

FDI.

Despite the substantial improvement of the model, we must still test for autocorrelation and partial autocorrelation. Through the figures below it is possible to identify that the lag period two are outside the interval (statistically different from zero), with the need to correct it.



Source: Prepared by the author using the statistical software RStudio.

To perform the correction we included terms in the regression, so as to make the residuals random. The table below shows the new test performed, where it was possible to correct the lagged series, thus obtaining residuals within the confidence interval (uncorrelated residuals).

Table V – Error Correction Vector (ECV) Final

Coefficients	Estimate	Std. Error	t Value	Pr(> t )
Intercept	6.364e+03	1.699e+03	3.746	0.002169**
L(Erro)	-7.859e-01	1.346e-01	-5.838	4.31e-05***
d(GDP)	2.990e-08	7.592e-09	3.938	0.001485**
d(RESERV)	1.245e-01	7.125e-02	1.747	0.10248
d(TS)	-3.871e+03	1.232e+03	-3.142	0.00721**
L(d(FDI))	2.782e-01	1.057e-01	2.633	0.0197*
L(d(GDP), 2)	-3.502e-09	7.475e-09	-0.469	0.6467
L(d(RESERV),2)	-2.822e-01	6.761e-02	-4.173	0.00094***
L(d(TS), 2)	-1.965e+02	1.282e+03	-0.153	0.8803

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 6418 on 14 degrees of freedom

Multiple R-squared: 0.9224, Adjusted R-squared: 0.878

F-statistic: 20.79 on 8 and 14 DF, p-value: 1.652e-06

Source: Prepared by the author using the statistical software RStudio.

The lagged model suggests that the short-run variation in current transactions is negative and highly significant with  $t = -3.142$  and  $p$ -value less than 0.01, so the probability of making the type I error is practically zero, so that a one percentage unit increase in the TS results in a reduction of -3.871 percentage points on FDI inflows, holding everything else constant. For the two-period lag of the TS, the statistic proved not to be statistically significant, with  $t$ -statistic = -0.15 and a strictly high  $p$ -value of 0.8803.

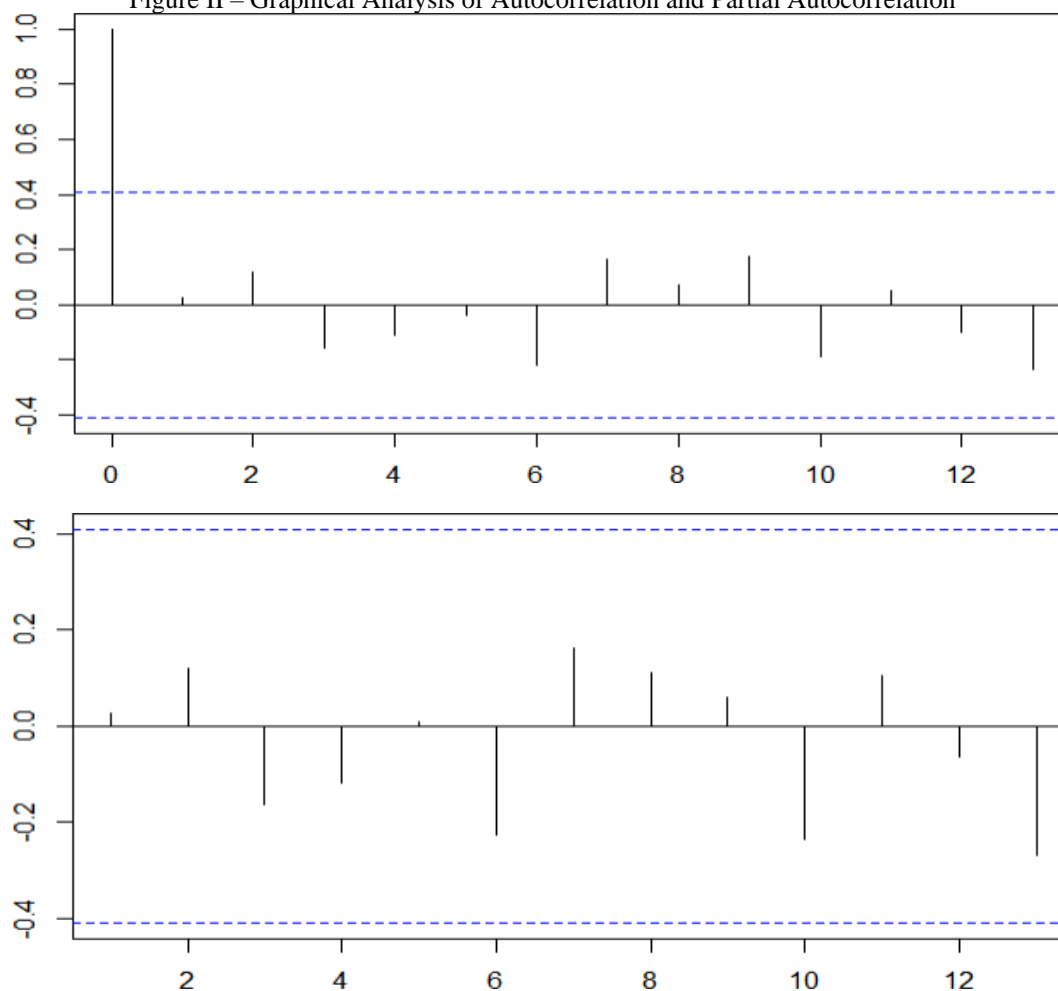
For the second variable that sought to measure the role of external vulnerability, international reserves, we obtained a surprising result in view of the fact that only its lag in period two proved to be statistically significant, so that an increase in reserves tends to reduce the inflow of FDI starting in the second year.

The result of the statistic is highly significant, with the error probability being strictly low.

Another interesting result of the test was the high impact that the lag of FDI itself has on its present moment, explaining about 0.2782 percentage points of the inflow of foreign direct investment at the 5% confidence level. Therefore, we can expect that a high level of FDI in the present will influence at least the next two years of investments in the Brazilian economy.

It is worth mentioning that the procedure used to estimate the error correction model was through the inclusion of a residual variable, so the correction consisted of an estimated variable, making the standard error inefficient.

Figure II – Graphical Analysis of Autocorrelation and Partial Autocorrelation



Source: Prepared by the author using the statistical software RStudio.

Through partial autocorrelation we can state that the inclusion of new lagged terms in the regression resulted in random residuals, where the lag in the second year is now in the confidence interval as is illustrated by the Figure above.

## 5 CONCLUSION

The countries of the Latin periphery experienced a long external debt crisis in the 1980s, and this was a period of low external capital flow. During the mid-1990s there was a substantial improvement for most countries, this event was combined with the rise of neoliberalism in Latin America pushing for less protection of domestic markets and facilitating the inflow of foreign resources.

The FDI expansion in the Brazilian economy began after the economic stabilization of 1994, and in 1996 the country began to receive an unprecedented volume of foreign investment. Since then, several researchers have worked to understand the main factors that attract FDI and its impact on the domestic economy. The literature review sought



to understand how researchers from different areas and schools of thought have analyzed and analyze the role of foreign direct investment to date, so that the diversity of research lines allowed us to investigate the relationship between vulnerability and FDI, there being few works with this focus in the literature.

Based on the estimation of the VEC model, which is frequently used in the literature on FDI determinants, we can measure important results to understand how international reserves and current transactions influence its flow. The main results obtained are due to the high explanatory power of current transactions as a percentage of GDP to explain FDI, whether in its present moment or lag. The lag of international reserves, suggesting that only in the second period can they explain the FDI flow, also proved to be an important result, so that few models other than the VEC could capture this relationship.

Despite the good quality obtained with the model adjustment, it is important to highlight its limitations, such as, for example, the small number of observations and the method for correcting the lags, developed through the inclusion of an error term preventing the standard error from being efficient.

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## **Creating a business laboratory and the pedagogical challenges of academic practice in an institution of higher education**

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**ABSTRACT**

This article seeks to contribute to the discussions about the creation of entrepreneurial laboratories in Higher Education Institutions, deepening practical and theoretical-conceptual aspects that give this dimension to the process in academies and organizations. The benefits of the use of academic practices in HEIs are still timid, but it shows a differential in the student learning model. Understanding the characteristics of each student and how they behave in the theoretical learning process is difficult and often only verified in the evaluations of models based on the classic theory of questions and answers, everything indicates that the use of this model alone is not efficient and guarantees the responsibility of the institution to teach. Based on this context, the practical and pedagogical teaching laboratories are presented as another approach method in the teaching-learning process, making the student leave the theoretical environment and experience the business practice, even if in a simulated way. Thus, this article intends to present how the Management Laboratories at Fatec Senai Mato Grosso College was idealized, designed, and created. A structured and academic environment to develop pedagogical practices of theoretical concepts in the management areas.

**Keywords:** management laboratory, academic practice, higher education.

**1 INTRODUCTION**

Learning through practical experience is an important methodology in the pedagogical process of teaching, especially in higher education courses, since this method is essential to apply and validate what is learned in theory. According to Senge (2010), in a complex system such as a company, there are consequences to be considered that are neither immediate nor precise, and are distant in time and space, and even if these consequences can be experienced, the results are almost always undesirable.

Higher education in management courses face difficulties when they perceive the need for pedagogical practices that aim to facilitate theoretical learning. Thus, learning involving practical experiences is a characteristic must be a constant process of continuous learning. The increasingly complex environment of organizations demands from professionals immediate and precise actions that minimize negative consequences for both the organization and its employees and partners.

The learning process that involves the development of the ability to make decisions in students sometimes gets distant from books and classroom theory. As an

alternative for corporate learning, in order to help in the process of understanding the theory learned in the classroom, there is the possibility of presenting virtual environments, business games, models and simulators that develop in the participants a critical thinking and logical reasoning aligned with social and emotional skills, in the face of real situations that may arise in the corporate world.

In this context, this article aims to present how the Management Laboratory at Fatec Senai Mato Grosso was idealized, designed and created. A structured and academic environment that acts as a business laboratory to develop pedagogical practices of theoretical concepts in management areas. Thus, contributing to the advancement of academic research with applied development studies and experiments that simulate business reality.

## 2 THEORETICAL FRAMEWORK

According to Sauaia (2010), what characterizes a business or management laboratory are the business games that are mostly formed by a conceptual tripod that unites simulators, business games and applied research. The author himself also points out that Management Labs are environments of conceptual practices of management theories applied in the classroom and taken from theoretical books, which seek to promote experiential learning in a pedagogical way. This corroborates Kolb's (1984) view that learning by doing is a fundamental part of the development of learning.

Table 1. Components of the Management Laboratory

Components	Concepts	Components	Concepts
Organizational Simulator	Initial situation of the organization described by means of	Organizational Simulator	Initial situation of the organization described by means of
rules.	Economic.	rules.	Economic.
Business Game	Organizational experience in a decision making process.	Business Game	Organizational experience in a decision making process.

Source: Sauaia (2010)

One of the main advantages in creating a business or management laboratory is to seek a balance between theory and academic practice in the professional training of business managers. Thus, the use of laboratories becomes a practice in higher management courses, activating the practical nature of the application of business theories. The advances in the area of social psychology made by scholars over time strengthen the need for the creation of other research laboratories in several areas, gaining space in education

(MINICUCCI, 1997).

The learning process is seen as a cognitive process by which a person acquires knowledge and becomes able to interact with the world. In it, there are three central elements that must be articulated for the development to occur successfully: the student, the teacher, and the learning situation, (SILVA E SANTOS, 2006).

Learning is a phenomenon or method related to the act, or condition, of learning to do or perform. The learning method establishes important links between stimuli and expected responses. This process increases the individual's chances of adapting to his or her environment. When the phenomenon is presented as part of the pedagogical process, learning is a tool for modifying the individual's behavior as a function of his or her experience (KOLB, 2005).

An important characteristic of the teaching-learning process is that the student gains greater protagonism as an agent, no longer being passive, which is the classic method of traditional teaching. In management courses in higher education this becomes relevant, because the student is inserted in the world of scientific initiation, where the laboratories for practical classes represent a fundamental support for the development of theories and ideas.

Besides management education, the focus of laboratory learning is also research through the analysis of problems similar to those existing in organizations. Since research results lack applications that confirm their effectiveness, the simulation process facilitates the analysis of the results. Another advantage is the approximation with practical activities, since management, in the day-to-day of organizations, operates with a practical language where theory has a modest presence (SAUAIA, 2010).

With the advancement of technology intrinsically makes the competitiveness increase in all sectors, especially in industries, directly proportional to the increase in competitiveness, quality and efficiency go together. However, there are still difficulties to be faced by managers and improvements that could be made, bringing benefits directly or indirectly to all departments.

Aiming at the search for excellence, organizations want solutions to their problems, difficulties, in order to improve their productivity, quality, and efficiency, making them more competitive in the national and international market. Problems and difficulties are identified by the organizations, being perceptible to their employees, requiring improvements in the steps, processes and particularities.

### **3 METHODOLOGY**

The present article, as to its nature, is considered a case study, in order to allow its ample and detailed knowledge, a task almost impossible with the other types of designs considered. According to Yin (2005), the case study is an empirical study that investigates a current phenomenon within its context of reality, when the boundaries between the phenomenon and the context are not clear and defined and in which several sources of evidence are used (GIL, 2010).

Regarding the objectives, this research is considered exploratory-descriptive. According to Gil (2010) considers that the exploratory research has as main objective to develop, clarify and modify concepts and ideas, this type of research also involves the bibliographic survey. As for the approach to the problem, the research is characterized as qualitative. According to Oliveira (2002) and to Vieira (2007), qualitative research offers substantiated descriptions and explanations concerning processes in organizational contexts.

### **4 RESULTS AND DISCUSSIONS**

The creation of a business or management laboratory arose from the academic and pedagogical needs of the teachers of the Higher Education Institution Fatec Senai Mato Grosso during a pedagogical meeting, since the IES presents itself in the market as an institution that prioritizes academic practice as a form of learning. Participating in the alignment meetings for the construction of the laboratory project were, besides the HEI's education team, teachers and students from the higher education courses in Logistics, Human Resources, Quality Management, and the Management Processes course.

During the construction of the project to create the Management Laboratory, the teachers were able to raise and present their needs for materials, software and games, so that the classes could acquire a practical and didactic character. To build the project it was proposed to acquire games, models, software, modern computers with a specific configuration to run simulation programs, and a specific physical environment for the classes. It was also established by the Núcleo Docente estruturante (NDE) the lines of research for each undergraduate course at the IES.

#### **4.1 RESEARCH LINES**

For each degree course in the Management and Business axis offered by the IES,



after a meeting of the structuring teaching group (NDE), lines of research were established that aim to use the management laboratory as a didactic tool for academic learning practices.

#### **4.1.1 Management and business axis**

For the Technological Axis of Management and Business there will be four lines of work (Human Resources, Quality, Logistics, and Managerial Processes) with pre-defined areas for the development of the research projects, they are: Human Resources, Industrial Operations and Logistics, Management of Material and Property Resources, Services, Quality Management, and Project Development.

#### **4.1.2 Higher course in human resource management technology**

This line has as main objective to develop projects that help in the transition from the traditional Human Resources to a HR 4.0. The research of new tools allows the automation of HR operational processes and the extraction of data using Big Data for decision making about people. With this it is possible to improve the experience and engagement of employees, making the Human Resources area a driver of productivity in companies. These are the thematic areas for the development of projects and research:

- Artificial intelligence in people management;
- Applications that assist in the generation of information;
- Big Data for Human Resources;
- Process automation;
- Integration of data and information;
- Lean Office;
- Analytics Peoples.

#### **4.1.3 Higher course in logistics technology**

This line intends to approach the Supply Chain concepts; the forecast as a source of information for production and stock scheduling, negotiation with suppliers, the consequences of their failures; the internal and external logistics process; the flow of movement, stock management and its necessity as well as waste and delivery strategies. These are the thematic areas for the development of projects and research:

- *Cloud computing;*
- *Big data for logistics;*
- *Internet of things;*
- *Artificial intelligence;*
- *Machine learning;*
- *3D printing;*
- *Business games;*
- *Simulation mockups;*
- *Sensing;*
- *Visual management;*
- *Mapping and process improvement;*
- *Augmented reality.*

#### **4.1.4 Technology course in quality management**

This line has as objective the approach of the concepts of Quality Management; Auditing, Certifications and Awards, Excellence and Standardization, Strategic Management and Marketing; Process Management and Mapping, Quantitative Methods and Business Costs. New technologies emerge all the time to make processes more agile and cheaper. Thus, increasing product quality and reliability in deliveries. These are the subject areas for the development of projects and research:

- *Cloud computing;*
- *Big data for Quality;*
- *Internet of things;*
- *3D printing;*
- *Improved data collection and analysis;*
- *Augmented reality;*
- *Visual management;*
- *Sensing;*
- *Digital models and simulations of the manufacturing process;*
- *Increased quality control and diagnostics*
- *Increased quality and process parameters through simulations and models*
- *Individualized traceability of products;*

- *Process mapping and improvement.*

#### **4.1.5 Technology course in management processes**

This line has as its objective the approach of the concepts of Business Strategy, Financial and Capital Markets, People Management, Project and Process Management. The thematic areas for the development of projects and research:

- *Business and Project Analytics;*
- *Practice the fundamentals of Artificial Intelligence and Big Data;*
- *Develop problem situations that guide innovation and marketing;*
- *Broadening knowledge of leadership, business management, and sustainability;*
- *- Mapping and process improvement.*

During the project's construction process, industries and companies from the private and public sectors, mainly from the State of Mato Grosso, that could benefit from the ideas and projects coming from the Management Laboratory were identified. The output products can be scientific articles, innovation projects (aligned to the scientific articles), prototypes or concept parts, new products, equipment, improvement of production processes. The following are suggestions for acquisitions for the implementation of the Management Laboratory:

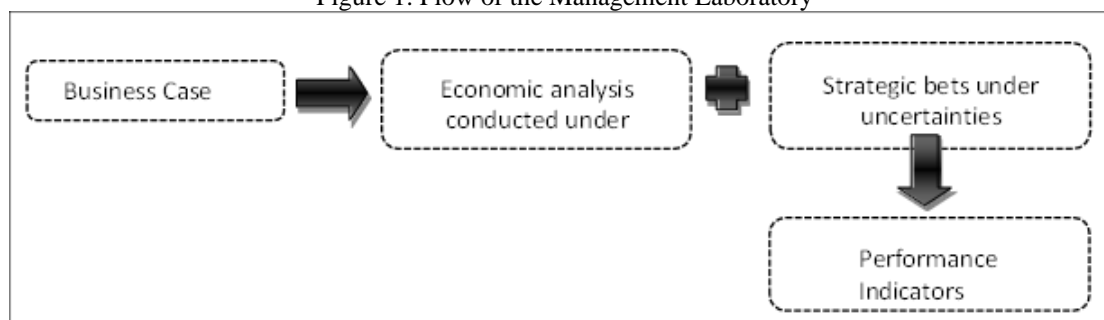
As for the physical structuring of the space, an environment that already exists in Block C of the Operational Unit of Senai Cuiabá was taken advantage of and has 120 m<sup>2</sup> (Attachment 1). The complete structuring of the Training Center foresees:

- Partitions for the training rooms, lighting and air conditioning system;
- 20 computers with tables and chairs;
- Mock-ups of the multimodal logistics platform;
- Multimedia projector;
- 3D printers;
- Storage and movement microstructures (mockups);
- WMS Proton - Warehouse process simulation software;
- Models of tables for management at a glance;
- Models of frameworks for applying management tools;
- Lean management templates;
- Anylogic - Software for logistics simulation;

- Bizagi - Software for process modeling.

Figure 1 demonstrates by a flowchart the operation of the Management Laboratory, where the business case is initially presented according to the economic rules of the organizational simulator, and the economic analyses conducted under certainty, and the strategic bets under uncertainty are made by the managers of the companies in the decision-making process, with the results evaluated in the form of performance indicators at each round of the business game (Suaia, 2010).

Figure 1. Flow of the Management Laboratory



Source: adapted from Suaia (2010)

This flow provided by the simulator in conjunction with the business game generates primary data for applied research that addresses research problems that refer to issues experienced during the course of the business game.

#### 4.2 PROJECT PHASES

The project must follow three phases for its full implementation, basic, intermediate, and advanced phases.

**1st The Basic Phase** includes the following activities: Installation of the physical structure, acquisition of computers, 03 3D printers, logical infrastructure, furniture, supports for logistics mock-ups, boards for the application of management tools, installation of free and/or already acquired programs.

**2nd Intermediate Phase** includes the following activities: Acquisition, installation of simulation software, business games, Lean Board Game, Lean Logistics, training of teachers, acquisition of 40 3D glasses, acquisition of materials for sensorization, acquisition of logistics models.

**3° The Advanced Phase** contemplates the following activities: Integration with the already existing laboratories of Food, Automation, Information Technology and with

the Senai Institute of Technology - IST.

Once the project was structured, its total budget was R\$ 192,789.62 (one hundred and ninety-two thousand reais, seven hundred and eighty-nine reais and sixty-two cents) (Attachment 2). Annex 3 contains the financial feasibility study, since, if the project were executed in its entirety, it could offer several extension courses in the paying modality to the external public.

The project identified the need for the creation of a dynamic and didactic learning environment, where simulation equipment and software will be used to help in the development of new concepts, products, and solutions for the industry in Mato Grosso. The investment in the structuring of the Management Laboratory allowed the centralization of the academic body of professors, students, and researchers, enabling the development of several study lines simultaneously. It also allows the concentration of interdisciplinary groups of professors, students and researchers, in practice, and the implementation of teaching-learning strategies.

Photos 1 and 2 - Aerial, Railroad and Waterway Logistics Mockups



Source: authors (2022)

Pictures 3 and 4 - Lean Logistic Business Game



Source: authors (2022)

Pics 5 and 6 - Lean Board Game



Source: authors (2022)

In photos 1 and 2 it is possible to see the project of the assembly of logistical models, in photo 1 it is possible to observe a model that simulates an airport and in photo 2 the model that simulates a port and a railroad that will join the road and duct road modals, used for learning situations and classes that aim to work in an integrated way with Integrative Projects. A new model is being quoted to simulate a Logistic Distribution Center. Pictures 3 and 4 show the Lean Logistic business game acquired for the Management Laboratory. In this game it is possible to simulate from an International Supply Chain, where it is possible to approach Foreign Trade concepts, as well as discuss about the Incoterms (International Terms of Foreign Trade), to a national and/or regional delivery environment, simulating a delivery route of products using the 5 (five) Logistic Modals. In pictures 5 and 6 the Lean Board Game is presented, which simulates an industrial environment and the application of Lean Manufacturing concepts on the factory floor.

In 2022 the Management Laboratory is in the third phase of completion and is already presenting impressive results in student learning, and especially in the motivation of students to analyze in a practical way learning situations prepared and discussed in the laboratory environment. The use of models and simulators arouses in the student a curiosity that the theoretical classroom environment alone does not provide. Another important and widely used pedagogical strategic tool is the development and implementation of Integrative Projects, which aim to systematize the knowledge acquired by students during the academic development and similar a practical-professional experience through the application of knowledge in real situations with the help of the Management Laboratory.

## 6 FINAL CONSIDERATIONS

In this article, the creation of a Management/Business Laboratory for practical classes of the courses of the Management and Business axis of the Fatec Senai Mato

Grosso college was addressed as the main theme. With the creation and implementation of the project to create the Management Laboratory, it was possible to consider as a fundamental part the initiative to create a pedagogical and learning environment where theory can be applied in practice.

The Management Laboratory is in operation and producing academic knowledge since 2021, as well as helping to solve problems brought by companies and where the college can intervene in an academic and intellectual way. Another

With the use of games and simulators, the students of the Management & Business area have already produced more than 100 articles published in congresses and magazines. Even during the pandemic, it was possible to make use of simulators and software to enhance the classes and stimulate students during online classes.

Another important point is the documentation of applied research, the use of the laboratory has provided a variety of learning situations rich in stimuli for the student and for the groups as a whole. The use of laboratory practices makes the student feel more secure when making decisions simulated in the academy or real ones inside companies. This is consolidated by the success reports that the students themselves make to the teachers and students.

Therefore, it is recommended to all higher education institutions to adopt the laboratory implementation model for management courses. The learning model is not limited to a classroom environment and with massive and theoretical content, sometimes discouraging, it is important that the student is challenged to solve problems and situations that he or she may face within organizations and develop knowledge, skills and attitudes recognized as essential in the labor market.

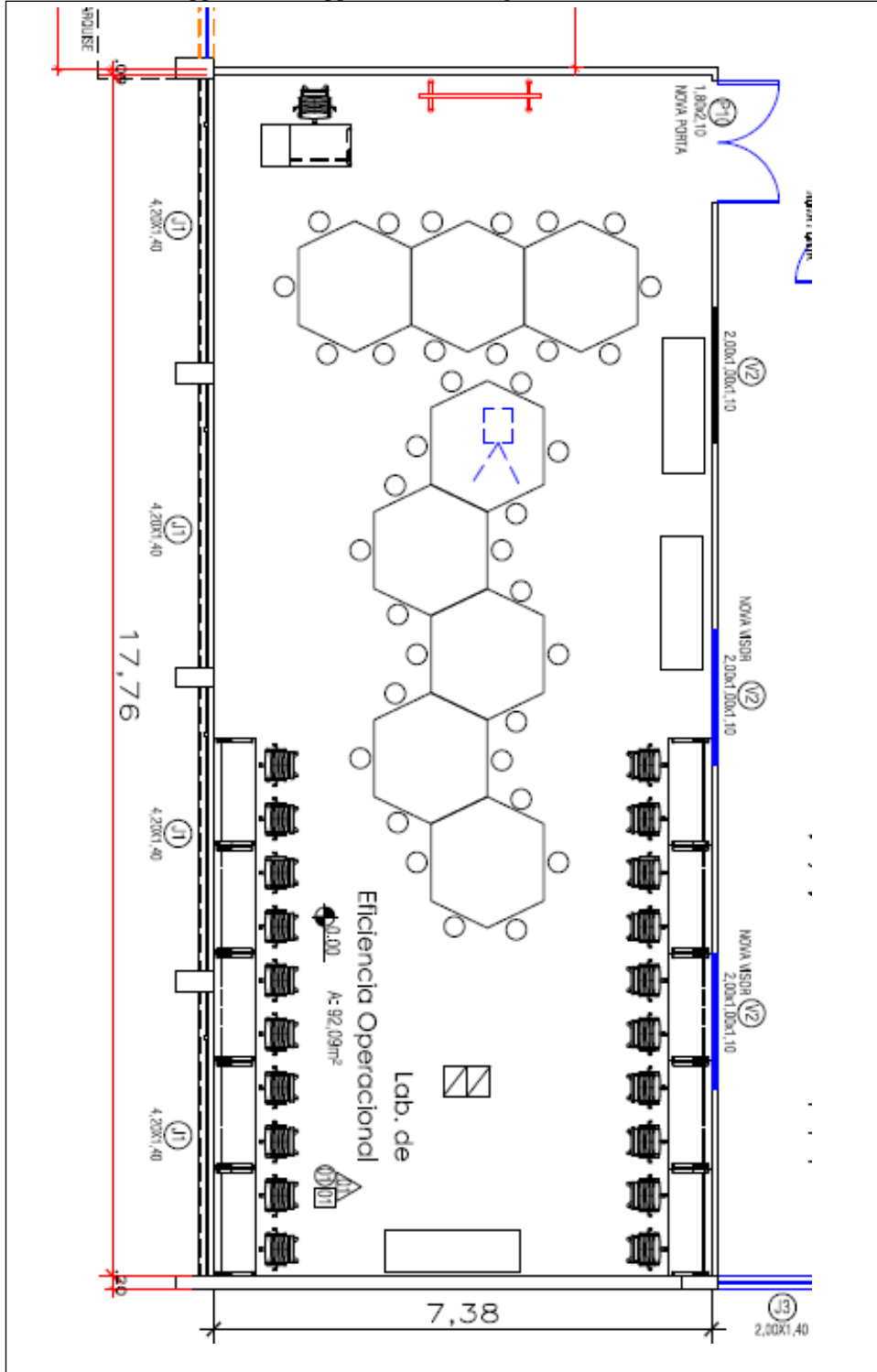
Showing the student practical evidence that the theory in the books works inside the Management Laboratories can be a strategic differential for teaching and for the consolidation of the IES in the market.

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Appendix 1 - Application area of games and simulations



Annex 2 - Project Financial Schedule

Period Actions		Unit Value	Total Value
Phase 1			
	20 computers	R\$ 3.000,00	R\$ 60.000,00
	2 Zebra printers.	1.200,00	R\$ 2.400,00
	1 Logistics Mockup	xxx	R\$ 5.000,00
	1 5S visual management board	xxx	R\$ 484,99
	1 Picture of problem analysis and solutions	xxx	R\$ 884,94
	1 Management board at sight	xxx	R\$ 528,69
	Software installation WMS Proton	Já adquirido	Já adquirido
	Training program WMS Proton (1 teacher)	R\$ 6.000,00	R\$ 6.000,00
	Bizagi software installation	Gratuito	Gratuito
	Lean Board Game acquisition	xxx	R\$ 32.000,00
	Purchase of Anylogic simulation software	xxx	R\$ 18.900,00
		<b>Total 1st Phase</b>	<b>R\$ 126.198,62</b>
Phase 2			
		R\$ 200,00	R\$ 2.000,00
	20 goggles, virtual reality	R\$ 12.800,00	R\$ 25.600,00
	2 Sensorization Kits	R\$ 3.500,00	R\$ 7.000,00
	2 3D printers	xxx	R\$ 32.000,00
	Purchase Supply Board Game	Total 2nd phase	R\$ 66.600,00
Phase 3			
		Free	Free
	Integration with Food Lab.	Free	Free
	Integration with Automation Lab.	Free	Free
	Integration with IST laboratory.	Free	Free
		<b>Final Total</b>	<b>R\$ 192.789,62</b>

Annex 3 - Financial Feasibility Analysis

COURSES (24 HOURS) OFFERED WITH THE IMPLEMENTATION OF THE LAB	NUMBER OF STUDENTS EXPECTED	VALUE PER STUDENT	TOTAL
3D printer basics	20	R\$ 50,00	R\$ 1.000,00
Process mapping using Bizagi	20	R\$ 50,00	R\$ 1.000,00
Use of WMS system for stock control	20	R\$ 50,00	R\$ 1.000,00
Practical use of Quality tools	20	R\$ 50,00	R\$ 1.000,00
Application of Sensorization in Industry	20	R\$ 50,00	R\$ 1.000,00
Fleet routing	20	R\$ 50,00	R\$ 1.000,00
Use of augmented reality for training new employees in industry	20	R\$ 50,00	R\$ 1.000,00
Basics of Lean Logistics	20	R\$ 50,00	R\$ 1.000,00
Lean Office basics	20	R\$ 50,00	R\$ 1.000,00
Basics of Lean Manufacturing	20	R\$ 50,00	R\$ 1.000,00
Application of product traceability	20	R\$ 50,00	R\$ 1.000,00
Using Big Data for Decision Making	20	R\$ 110,00	R\$ 2.200,00
Simulation of Lean production lines	20	R\$ 50,00	R\$ 1.000,00
Simulation of industrial layout changes	20	R\$ 50,00	R\$ 1.000,00
Simulation of financial and capital markets	20	R\$ 110,00	R\$ 2.200,00
Introduction to Digital Manufacturing	20	R\$ 50,00	R\$ 1.000,00
IoT applied to production processes	20	R\$ 50,00	R\$ 1.000,00
Integration of production systems	20	R\$ 50,00	R\$ 1.000,00
Development of applications in augmented reality	20	R\$ 50,00	R\$ 1.000,00
Discrete events simulation	20	R\$ 50,00	R\$ 1.000,00
		<b>Total</b>	<b>R\$ 26.200,00</b>

## **Legal analysis of good practice guidelines for emergency remote teaching in the humanities center of the Universidade Federal do Oeste da Bahia**

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### **ABSTRACT**

This scientific research seeks to analyze the administrative act "Good practices for remote teaching tips for students and teachers," under the premise of legal dogmatics, especially the administrative, civil and criminal law, comparing the information presented by the guiding norm and the Law, majority doctrines, scientific-academic articles and case law. In this sense, an examination is made of the legality of the act in conjunction with the constitutional principles guiding the Public Administration, substantiating the concrete case and the applicable rules.

**Keywords:** law analysis, crime, civil law.

### **1 INTRODUCTION**

The present study is a joint effort of students at the Universidade Federal do Oeste da Bahia (UFOB) to analyze the concrete case experienced in one of the university's centers, and to reflect on information exposed by Federal Autarchies in such a complex period as the Covid-19 pandemic. The study was based on a legal analysis, supported by legal texts, dominant doctrines and jurisprudential precedents.

Starting from the beginning of the Covid-19 pandemic and the changes resulting

from it, education, in order to become viable and respect the rules imposed to contain the viral advance, had to adapt to the virtual context. Thus, with the new ways of providing student education, new violations of rights have also emerged. In view of this, the Humanities Center (CEHU) has tried to prevent them through guidelines.

In this context, the research will be developed by calling the attention of researchers to the orientations of the UFOB/CEHU, for being orientations of a repressive/preventive character, in face of a pandemic context, in which people face serious emotional problems, where information coming from the Public Administration must be congruent, in order to make it impossible for doubts to arise and to make the process as simple as possible.

Therefore, the need arises to study the legality of this information, from the administrative, civil, and criminal law perspective, instructing both students and teachers to practice acts that corroborate with legal preservation, enabling the fulfillment of one's own and others' rights and duties.

The research problem is: How are the guidelines for the execution of the emergency remote teaching of the Humanities Center of the Universidade Federal do Oeste da Bahia posed from the legal-dogmatic point of view? And what are the consequences of this relationship?

The objective of this research is to analyze the administrative act in question, with the aim of understanding whether its content is true in light of the principles of legality and motivation. In view of this, specific objectives subsist.

The objective of the research as already demonstrated is to study the administrative act, in search of discovering if such act, with due publicity duty, is legally verifiable in its information.

The specific objectives of this research are to study the legality of the administrative act by the scope of its validity and to examine the repressive information by the administrative, civil, and criminal law viewpoints.

The methodology used will be a documental bibliographic review, based on a material of 6 (six) guiding images made available on the site of the CEHU/UFOB. Based on this documental review, the provisions in these documents will be confronted with the applicable legal doctrines, by means of a literature review.

In this sense, the methodological path used: documentary review, selection of doctrine from legal books, initially, and later the selection of academic texts (articles) of

relation, to substantiate a set of literature, to in review, confront from the practicing dogmatic view, analogical interpretation to studies, and reach a conclusion.

## **2 LAW ANALYSIS**

After December 31, 2019, when the first case of Covid-19 was confirmed in China, more specifically in the city of Wuhan, life in the world had to adapt to the new pandemic context, based mainly on the idea of social isolation to be able to control the spread of the disease. What was supposed to last only days, became years, and the ways of living under the influence of a lethal viral pandemic became the new normal.

Remote education has become a reality for many Brazilians, and with it new problems have emerged, evidencing the socioeconomic discrepancy existing in the country. Many students and even institutions didn't and don't have the necessary tools to make distance learning effective, either because of the poor quality of the 'internet', or the lack of financial conditions to get computers, smartphones, or to have an 'internet' network capable of supporting online classes.

The entire educational system, especially the public one, had to go through major structural changes, with the acquisition of programs and training of personnel, especially teachers, so that the teaching network could make viable the continued operation of the institutions, and regulations, to be able to avoid violations of rights that could arise during remote learning, such as, for example, the violation of image rights.

Given this context, the Public Administration performed its acts, which, although in the middle of the pandemic, needs to meet the constitutional principles. Thus, this study proposes to analyze a specific administrative act, emanating from the Humanities Center of the Universidade Federal do Oeste da Bahia, which guides its academic community to take or not to take certain postures. Such act, the "good practices for remote teaching", connects directly to the pandemic reality experienced, which transfixes the experiences, the emotional, the mental health, therefore, in addition to the responsibility inherent to the information provided by the Public Administration, it becomes indispensable to be even more precise and strictly truthful.

From the beginning of the classes, the CEHU/UFOB made available a material of 6 (six) images containing tips for the teachers about remote teaching, and among the issues addressed, it is worth highlighting the protection given to the image of students and teachers during the classes. It was mentioned the prohibition of the use of class content,

images of teachers or colleagues for any form of communication, the exclusivity of the class content and material for teachers and students registered in SIGAA (Integrated System of Management of Academic Activities), the need for authorization from the teacher responsible for the curricular component in case any student wishes to share an image or given matter, and the warning to be careful not to expose the privacy of whoever is in class through the camera or microphone.

The proposed analysis of this study goes through three main theories of law: the administrative, under the point of adequacy to constitutional principles of administrative acts, the civil, under the articles cited in the fifth document and the criminal, related to articles 151 to 154 of the Penal Code.

The administrative act, "good practices for remote teaching", was emanated by the directorate of the Humanities Center, in its own appropriate instrument. Thus, it meets the criterion of the act being ordered by a competent authority. Besides, the act is legally adequate, since it passes through the legal authorization (Law of Directives and Bases and the Constitutional University Autonomy), through the criterion of formality. This is the interpretation of Hely Lopes Meirelles (2005, p.87):

"legality, as a principle of administration, means that the public administrator is, in all his functional activity, subject to the commandments of the law, and to the requirements of the common good, and cannot deviate from them, under penalty of practicing an invalid act and exposing himself to disciplinary, civil and criminal liability, as the case may be"

In addition to legality, the act must comply with the other principles: impersonality, publicity, and efficiency. Impersonality is an administrative principle correlated to constitutional equality, i.e., the Public Administration must treat everyone equally, without personal privileges. Publicness refers to the government's obligation to be transparent in its acts, by rendering accounts and making public whatever is not secret. Efficiency, furthermore, fits the best application of public resources and expenditure of public work force at all times (MEIRELLES, 2005).

In direct application of this doctrinaire understanding, majority, it is observed that the act to the principles mentioned above, as it is applicable to all administrators who relate directly with the CEHU/UFOB, without illegal distinctions, of public domain and easy access, as well as using the appropriate means in an efficient way, without unnecessary waste. The dissemination of this material, specifically, was covered by the appropriate formality, not only in the legal-normative scope, but also in the inherent characteristics of

being a public, impersonal, and efficient act.

In this premise, it is also observed that in the repressive-administrative area of the CEHU/UFOB, the guidelines that are the responsibility of this repressive area, concerning documents one to three, are adequately established, and the non-complying agent can be held responsible, through an appropriate administrative process. Although the repression concerning document four is possible, its motivation - an important element that binds the administrative act - may encounter legal barriers to its practical application, because its content requires a legalistic analysis, based on the strict legal-normative precept and the constitutional principles linked to the due administrative process. This is the majority doctrinal understanding, which enshrines the idea that the Public Administration can only perform its acts in strict compliance with the Law - in a broad sense - being subject to the legal precepts and cannot deviate from them (DINIZ, 2012).

The controversy regarding document four is of inevitable own examination, in evidence to the main guidelines issued. This set of guidelines is divided into four, being that, the mandatory and punishable, are found eminently in the first and third "guideline", those that assume a core of punitive forecast. The first one, with the content "It is strictly forbidden to use class content, images of teachers or classmates for any form of communication", demonstrates a clear judgment of censorship on the situation.

This guiding provision, although coated with the formality shown, is not sustained by directly confronting the legal science of administration, because it is known that the popular external control of public administration is one of the appropriate mechanisms for monitoring the public service, so that any individual can directly question the administrative acts as to their legality or any of the constitutional principles (CARVALHO, 2015).

Therefore, based on the fundamental precept of citizenship and popular sovereignty - Article 1 of the Federal Constitution - such form of administrative control is allowed, as well as, the dominant doctrine understands to be possible to supervise through audiovisual recordings, by direct incidence of the Federal Constitution, in its Article 5, the prohibition of obligations not created by law (LENZA, 2014). Therefore, the content addressed, if applied as it indicates, would prevent even the communication in UFOB's own ombudsman, such as by the Office of the Comptroller General of the Union, or for purposes of public disclosure by press agencies.

Point three of the aforementioned document is intertwined with the

aforementioned point one, and conditions the sharing of content (even in cited organs or for inspection purposes), the express authorization of the professional recorded or used in classes, which is far from the purpose of the preventive and active legal framework of the Brazilian citizen.

As for the last document, it brings two punishable points and an eminently recommendatory one, the latter being different from the first and the third. Point one itself, when it states: "It is strictly forbidden to share the link for synchronous moments with those who are not part of the curricular component;", attributes a prohibition with a possible sanction (administrative, in the terms of the university's own regulations and regiments), without, however, relativizing it in the supervisory contexts of the public administration.

It is evident that the classroom, virtual or not, is destined to students enrolled in components, or even to the common citizen, as long as he complies with the requirements regulated by the public university itself (listener mode, for example), however, he cannot distance himself from the possibility of action of students in search of the effectiveness of their rights. The prohibition imposed, then, influences the student to understand that there will be sanctions to the cited conduct, without any exception, which is not sustained when the agent acts in the strict term cited, to prove illegal conduct practiced by the members of the classroom, in synchronous moments.

In addition to this discrepancy between the established "guideline" and the common understanding of legal science, conflicts and technical inadequacies are observed in the last guideline, the third point. A crime is any conduct that is punishable by detention or imprisonment, in the Penal Code or in extravagant criminal law, provided that it is expressly indicated in the law in the strict sense (BRASIL, 1940). Nevertheless, the text of the third point, directly states "Recording the class or filming/photographing the teacher without authorization is a crime. For more information, see arts. 206 and 207 of the Federal Constitution; arts. 151 to 154 of Decree-Law 2.848/40 - Criminal Code and arts. 13 to 21 of Law 10.406/02 - Civil Code, (...)", a clear technical inaccuracy, since the articles cited are of limited effectiveness, i.e., those that depend on further regulatory complementation (LENZA, 2014), and do not constitute a crime, as well as the Civil Code, which by its own nominal diction also does not provide for criminal infraction, besides the other laws cited.

Given this situation, it is necessary to study the prohibition cited, in line with the articles and laws cited, excluding the constitutional ones, for the reason presented.



The civil code, in its chapter II, deals with the rights of personality, which in the lesson of Gustavo Tepedino (TEPEDINO; OLIVA, 2020), are expressions of the general clause of protection of the human person, contained in the first article, item III of the Federal Constitution, and as conceptualized by Maria Helena Diniz (2009, p. 142)

"Subjective rights of the person to defend what is proper to him, that is, his physical integrity (life, food, his own body, alive or dead, another's body, alive or dead, separate parts of the body, alive or dead); his intellectual integrity (freedom of thought, scientific, artistic and literary authorship) and his moral integrity (honor, concealment, personal, professional and domestic secrecy, image, personal, family and social identity)."

Among the rights of personality, the right to image, which is divided into portrait image, attribute image and voice image (TARTUCE, 2020), protected in Article 20 (twenty), represented by speech, writing and image, is protected by the will of its owner and, in case of disclosure of writings, transmission of speech, or publication, exposure or use of image, These acts may be prohibited and nothing will prevent the compensation that may be due, if they affect his honor, good name or respectability, or if they are intended for commercial purposes and, in this last case, the Superior Court of Justice issued the Precedent 203, establishing the understanding that regardless of proof of damage, there will be compensation for the unauthorized publication of a person's image.

Regarding the need for permission to publish the image, the doctrine and jurisprudence agree with the relativization of this rule, when it is in the interest of public order or the administration of justice, requiring the judge's assessment of the framework. The Civil Code weighs the right of image with other interests constitutionally protected, as in the case of the right to information and freedom of the press, as illustrated by Enunciado n. 278 of the CJF/STJ, but if there is damage to human dignity, the principles of prevention and reparation will be applied (TARTUCE, 2020).

In the penal scope, the cited articles refer to the crimes of inviolability of correspondence (arts. 151 and 152), and inviolability of secrets (arts. 153, 154 and 154-A) - specifically, disclosure of secrets, violation of professional secrecy and invasion of computer devices. The articles initially treated, on violation of correspondence in its modalities, are not directly related to the case of classrooms at a public university, except for greater analytical precision of art. 151, § 1, sub II, which states: "II - whoever unduly divulges, transmits to others or abusively uses telegraphic or radio communication addressed to a third party, or telephone conversations between other people;" (BRAZIL, 1940).

This article, however, is applicable to cases of correspondence between one individual and another, when a third party discloses, transmits or uses telegraphic, radioelectric or telephone information, and cannot be extended by analogy in *malam partem*, said to be harmful to the eventual defendant, to encompass virtual messages, images or videos. Not only that, the legal type is clear when citing the means sent to a third party, that is, it is a relationship between two people (sender and receiver), not in line with the idea of virtual classroom (BITENCOURT, 2019).

In terms of the definitions of Cezar Roberto Bitencourt (2019) of the crimes of violation of secrets, they are aimed at private or public secrets (those secretive documents), or related to the invasion of computer devices and disclosures coming from invasions in the same sense, and there is no relationship with the act of disclosing recorded classes in a virtual classroom, being a public provision of educational services. Furthermore, in face of the aforementioned reality of popular external inspection, criminal conduct cannot be considered in this popular prerogative, because, if it is an illicit act, who can say criminal infraction. In this sense, there is no possibility of criminally punishing a conduct not provided by law, as is the overwhelming understanding of the doctrine, led by Luiji Ferrajoli (2002, p. 785-786):

'garantism' designates a normative model of law: precisely, with regard to criminal law, the model of 'strict legality' SG, proper to the rule of law, which under the epistemological plane is characterized as a cognitive system or minimum power, under the political plane is characterized as a technique of tutelage suitable for minimizing violence and maximizing freedom, and under the legal plane, as a system of constraints imposed on the State's punitive function in guarantee of citizens' rights.

Therefore, according to the interpretation of legal science, the provision present in point three of the document is in disagreement with the legislation and the widest range of its interpreters, in its content of sanctionary-prohibitive provision, distancing itself from the reality of legal practice. In this line of reasoning, it is indispensable to analyze the material legality of the administrative act, given the probable lack of the duty of veracity of the information presented.

### **3 FINAL CONSIDERATIONS**

It is partially concluded, observing the incongruence of the information provided by the Humanities Center at the Universidade Federal do Oeste da Bahia, in presenting it to its administrators with prohibitions and sanctions that are inapplicable, in practice, due

to the absence of illegality. In summary, it can be seen that part of the information is not in line with the dominant understandings of the law, or even, in any doctrinaire or scientific understanding.

When it comes to the relationship between the Public Administration and the citizen, also known as the administered, the care with the issued rules, even of an orienting nature, must be doubled, under penalty of incorrectly informing or even coercing the administered into an "unlawful" situation. Unlike the citizen, the Federal Autarchy in locu has its own administrative and legal body, including a Federal Attorney at the University. Thus, actions, especially those that inform about their rights, and may cause some danger/damage, require an adequate legal opinion/support from the specialized agencies.

Although, in certain occasions, it is possible to incur in torts, in the case of disclosures different from the right and duty of inspection, with the purpose of damaging the image of third parties, offending the honor (such as vexatious exposure), or even unassimilated administrative non-compliance with this right, in practice, the prohibitions disclosed are incomplete, untrue, or completely groundless.

These conditions affect not only the norms of Administrative Law or other branches of law, but the public educational service itself, and the experience of those who study at a Public University.

Therefore, although the aforementioned presumed legitimacy/legality of administrative acts is an almost cogent reality in Brazil, such presumption, in concrete, cannot distance itself from the Brazilian dogmatic-legal dictates, especially in what the Brazilian jurisprudence calls "crass or gross error", even more so with the duty to present truthful and adequate information to the administrators.

Repeated presumptions, such as the veracity of the information/acts of the Public Administration, is not only a privilege, but a duty of public entities (FILHO, 2014).

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## **Values: the construction of a more humanized society based on the school and community mediator teacher**

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### **ABSTRACT**

Appreciating the study presented by the philosopher Hannah Arendt (1999), who describes the "Banality of evil", there is a cry for alert and immediate measures regarding the construction of a more humanized society, since there is a relevant probability of recurrence of acts committed and recorded historically, as the recent massacre at the "Raul Brasil" State School in Suzano, where the authors of the crime were inspired by the attack that took place at Columbine High School in the United States, in which two students invaded the school and shot 12 students claiming to suffer bullying, reinforcing Arendt's thesis.

**Keywords:** values, teacher mediator, dialogue.

### **1 INTRODUCTION**

Starting from the assumption of the excessive rate of people debating about the considerable increase of complaints of mistreatment, physical, sexual, symbolic violence, child exploitation, drug trafficking, intolerance, prejudice, violence to animals, environmental degradation and so many other atrocities, it becomes indispensable an investigation committed to seek scientifically based information that indicate effective actions capable of arming society against a worldwide collapse, as occurred in Germany, during the Nazi period led by Adolf Hitler.

Appreciating the study presented by the philosopher Hannah Arendt (1999), who writes about the "Banality of evil", there is a call for alert and immediate measures regarding the construction of a more humanized society, since there is a relevant probability of recurrence of acts committed and historically registered, as the recent massacre at the "Raul Brasil" State School in Suzano, where the authors of the crime were inspired by the attack that took place at Columbine High School in the United States, in which two students invaded the school and shot 12 students claiming to suffer from bullying, reinforcing Arendt's thesis.

We consider that, by maximizing the disclosure of massacres, murders, attacks, through the media, chat rooms, electronic messages, and other media instruments, one is not informing a news story, but rather, propagating events immersed in violence and perversity.

There is a cultural tendency to strengthen bad information and isolate positive actions that have managed to transform lives. It is common, for example, to contain in the end-of-year retrospectives, desolating facts, natural disasters, strikes, scandals involving celebrities.

Unified actions are evidently needed, starting from Public Policies, that mobilize all institutions with society, in favor of a friendly relationship among all citizens, providing quality of life, safety, respect, empathy, peace.

Deriving from the idea that there is a need to educate the individual to live in society, the school has become the main tool to transmit values and citizenship.

The 1988 Constitution of the Federative Republic of Brazil records in its Preamble:

"We, representatives of the Brazilian people, gathered in a National Constituent Assembly to institute a Democratic State, intended to ensure the exercise of social and individual rights, freedom, security, welfare, development, equality and justice as supreme values of a fraternal, pluralistic and unprejudiced society, founded on social harmony and committed, in the internal and international order [...]" (BRASIL, 1988, p. 9)

And it also ensures in article 205 (CF/88) that:

"Education, a right of all and duty of the State and the family, will be promoted and encouraged with the collaboration of society, aiming at the full development of the person, his preparation for the exercise of citizenship and his qualification for work." (BRAZIL, 1988, p. 123)

It is evident above, the responsibility of the State, the family and the school converging efforts and collective practices that subsidize the integral formation of the individual.

The role of the family will not be discussed in this research, even though it occupies a relevant fraction in this process, nor the role of the State, understanding that, only if this problem is recognized as a national problem, will it lead to the elaboration of Law Projects that enable and sustain consistent and relevant pedagogical and social actions for social welfare, promoting the mobilization of the State in this sense.

I will, therefore, emphasize the role of the school in this process, under the premise

that this institution is composed of men and women who have appropriated the pedagogical, philosophical, sociological, and psychological knowledge that is the basis of its educational practice, being, therefore, professionals based on scientific premises that act critically and daily in the school routine.

Some questions that delimit the issues to be discussed in this scientific research become pertinent, since this subject causes many controversies in the act of transmitting values to a human being.

But, what are values? Who transmits values? What is the classificatory method of values in each individual? What is the responsibility of the State, the family and the school in the transmission and internalization of values? How can the school contribute? School dropout: what does it cause in society? Which laws are the basis for these educational practices? What kind of individual is expected to be formed and what knowledge will guide the teaching practice? How should the education professional position himself regarding his "praxis"? How is the Integral Formation of the individual understood? Who is the mediating teacher? What functions does he/she develop? What results have already been achieved through this project?

It is the object of this research to answer these questions and others that may arise during the course of this work. Therefore, the foundation of this research is to expose to educational professionals the importance of reflection on their "praxis" and, then, to guide the development of intentional actions that promote values to all those who can be reached.

Considering that, if man is systematically influenced by non-formal instruments, then this same man will be effectively provoked to practice citizenship, having experienced stimuli intentionally built by educational professionals for the construction of a more humanized society.

There is also in this research, the concern to statistically investigate the parameters presented through records containing the occurrences during the 2019 school year and the performance of a specialized professional to mediate school conflicts and the relationship of the school with the community, enabling the measurement of extremely subjective actions, but that result in concrete actions of each individual.

## **2 VALUES AND EDUCATION**

As presented in the introduction of this report, the orientation for the development

of this essay occurred with the objective, through bibliographical research, of surveying and analyzing the occurrences registered in the aforementioned Institution, which made the necessary files available for the work. The study came from the reading and appropriation of the bibliographic references suggested by the orienting professor, which are listed at the end of this work.

Considering the need to establish a relationship between subjectivity and facts, we will start this discussion by presenting some theorists who defend the importance of the school institution to transmit, besides scientific knowledge, the values as action orientators.

Starting from Puig's assumptions (data), several questions mentioned initially will be answered and that fomented the realization of this essay, sharpening the need to understand the relevance of being worked, diligently in all institutions, the teaching of values, in order to guarantee a society aware of its rights and duties.

Puig is recognized as one of the greatest specialists in moral education in Spain. He has as the epicenter of his trajectory the commitment to preserve the principles built in his experience, debating and multiplying ethics and values, believing that these principles are the foundation of life in society.

According to the dictionary (<https://www.dicio.com.br/valores-morals/>), values are understood as "Principles, precepts, moral or social rules that, transmitted from one person, society, group, or culture to others, guide the actions of individuals, following justice and social equity: the society indicates the moral and ethical values that guide the citizen in relation to what is right and wrong. All human beings transmit values, even if unconsciously.

Thus, the classification of values is individually constructed, since the experiences that each one of us has undergone during our lives influence the appropriation, development, and practices that concretize the subjectivity of each being.

As previously mentioned, we emphasize the responsibility of the State and the family in the commitment to transmit values that prepare the individual to live in society, without removing from the school the commitment to the education and integral formation of the citizen.

Considering the excessive transformation in which society is currently constituted, with the ideal of happiness and peace being constantly reconfigured, making empathy to be forgotten, it is up to the school to commit to the promotion of moral values.



Puig defines: "The third level of our values formation model turns its gaze to the formation given by school institutions, and to the way in which this institutional format creates a moral climate or culture". (2007, p.93).

As the school is the proper environment for comprehensive education, it is noted through data presented in the article "School dropout at the root of extreme violence in Brazil", published on May 28, 2017 on the BBC website, that the exit of children from the school environment opens gaps that, according to the article, have been filled by teachings that have led children and young people to criminal practices.

Sociologist Marcos Rolim, interviewed a group of 16 to 20 year olds who had served time in the "Fundação de Atendimento Socioeducativo" in Rio Grande do Sul.

When collecting information, Rolim found that school dropout was a common fact among all the interviewees, who had abandoned school life between the ages of 11 and 12.

The school dropout has contributed incisively to marginality and criminality, as shown in the indexes presented.

Having as one of the objectives of this research to rescue philosophical assumptions which underlie a conception of the humanized social being, based on progressive perspectives of education and appreciating the works developed by Puig, it became conceivable to consider for this analysis, the definition of the "Four ethics for learning to live" (2007, p.67), where the author exposes in a unique way his conception of ethics as an indispensable component to the integral formation of the being and his need for self-knowledge.

- Self-Ethics - Learning to be

- A Alter-Ethics - Learning to live together

- Socio-Ethics - Learning to participate

- Ethical Ethics - Learning to inhabit the world - make up the four ethics that the author defends.

According to the author, Self-Ethics is a personal ethic composed of the following aspects: The formation of autonomous and critical thinking - becoming capable of being aversive to situations considered unacceptable; building the capacities that regulate one's own conduct - self-regulation; exercising the capacities of self-observation - increasing self-awareness and harmony with the world.

Alter-Ethics aims to overcome isolation, individualism, reinforcing the importance of the other, group coexistence, generating fraternity and, in this way, decimating egocentrism and the false idea that one has the right, for the sake of one's own interests, to use one's neighbor as one uses an object.

Socio-Ethics defends the relevance of developing the individual's capacity to fight for his rights, but also to commit to the fulfillment of his duties. It is necessary to consider multiculturalism and planetary coexistence, which aim at the well-being of all, respecting humanity without abstaining from the feeling of belonging to a certain group, nation.

Eco-ethics, on the other hand, is concerned with educating people to inhabit the world, aiming at the formation of people who are aware of and committed to the future of the planet and of mankind, changing habits that ensure quality of life for future generations.

Bringing to this research this concept of integral human being, we present in this discussion the role that the "School and Community Mediator Teacher" - P MEC, has been playing in the São Paulo society, valuing the integral formation of the being in educational institutions, as ruled by the Constitution of the Federative Republic of Brazil - 1988, and considering the consequences of the absence of values in society, whether reflected in crime rates, mortality and the like.

In July 2010, contemplating the school unbalance indexes that compromised the quality in the teaching and learning process, the "School and Community Mediation Project" - P MEC, was instituted in the state education system of the State of São Paulo.

The P MEC was conceived so as to provide an opportunity for dialogue between the school and the school community, with all employees working in the school participating in the promotion of the culture of peace.

In article 6 of Resolution 41, of 09/22/2017, rules about the effective presence of a P MEC - School and Community Mediator Teacher, in schools that have considerable vulnerability index, falling within "Group 3,4 or 5", as classified by the IPVS - Paulista Index of Social Vulnerability and as a result of the records made in the ROE - School

Occurrence Register, replaced in November 2019 by "PLACON" - CONVIVA SP Platform - Integrated System of School Records.

Resolution 41, 22/09/2017 is objective as to the need for the professional's commitment to exercise the function of PMEC based on actions committed to ethics and values.

### **3 THE PMEC AND THE RESEARCHED EDUCATIONAL INSTITUTION**

Considering the relevance of the role of the "School and Community Mediator Teacher" in the school environment, which has as one of its main objectives, to promote the culture of peace beyond the school walls, this essay sought information in records made during the 2019 school year, in a public school of the state of São Paulo located in a city of Alto Tietê and that supports, according to the aforementioned legislation, the effective role of PMEC.

The school that provided the data to be analyzed is composed of 803 students, 90% of whom are under 16 years old. Most of them live with their parents, but a good number live with relatives who take responsibility for the minor and most of them do not live in their own homes. The clientele comes from different neighborhoods and uses municipal school transportation to attend classes, which makes it difficult for them to participate in projects during the extra shift or during the weekend, notes that public transportation is insufficient and that this precariousness also makes it difficult for parents or guardians to participate more effectively in the school routine. Half of this clientele survives on a family income of one minimum wage and 55% makes use of the Family Grant Program. The school also has students with intellectual and physical disabilities, and has the responsibility to support them and to make the appropriate curricular adaptation for them and invest in the training of these students with the support of a specialist teacher in the area of Special Education.

In 2015, students in the early years of the city's public school system scored an average of 5.7 on the IDEB. For students in the final years, this score was 4.4. When compared to cities in the same state, the score of students in the early years placed this city in position 532 out of 645. Considering the grade for students in the final years, the position was 556 out of 645. The schooling rate (for people aged 6 to 14) was 97.7 in 2010. This placed the municipality in position 410 out of 645 among cities in the state and in position 2574 out of 5570 among cities in Brazil.

The School Pedagogical Project shows the vision of what the school intends to do, its objectives, goals, and strategies, thinking of the social function of education and the formative and symbolic value, as well as a comprehensive training for students.

The school cites in the "Management Plan - QUADRIENUM 2019-2022", aspects defined as basic mission of the school in order to offer a quality education to the student, welcoming and respecting him as a human being, some of them being:

"Contribute to the construction of a fair and solidary society; Value, increasingly interpersonal relationships, which will result in a more effective and meaningful work for all who participate in the community; Seek the effective participation of students and guardians in school decisions; Value youth protagonism, encouraging artistic and cultural development; Develop actions that favor ethnic respect and cultural diversity."

The following are considered to be community and public partners available to the community: City Hall; Tutelage Council; Military Police of the State of São Paulo; CRAS (Reference Center for Social Assistance); CREAS (Specialized Reference Center for Social Assistance); NGO Instituto Reviver; Lar Santo Antônio Project; Associação Presbiteriana da Graça; Guri - Music Program; "Crê-Ações" Project.

The school unit is structured in a building that offers the first floor and the 1st floor. Thus it is composed of 14 classrooms: 02 for regular education, 01 for CRPE and 01 for Resource located on the first floor and 10 on the 1st floor for regular education; 1 lunch storage room; 1 elevator; 1 principal's office; 1 secretary's office; 1 storage room; 1 coordination room; 1 teacher's office; 1 Accessa room; 1 reading room; 1 video room; 1 Physical Education room; 1 internal courtyard; 1 external courtyard; 1 cafeteria; 1 kitchen; 2 storage rooms in L-shape; 1 storage room under the stairs; 1 bathroom for employees (female); 1 bathroom for employees (male); 1 bathroom for employees in the courtyard; 1 handicapped bathroom; 1 bathroom for students (female); 1 bathroom for students (male); 1 covered multi-sports court; 1 accessibility ramp; 1 laundry room.

The building is well maintained, clean, and bright. All rooms are airy and bright. There are books and magazines available to students, employees and teachers, both in the reading room and in the school entrance hall. For entertainment and socializing, there are two ping pong tables in the internal area - the rackets and balls are stored in a container near the office, allowing free access to the students. At the moment, concrete tables and benches - purchased through a partnership with local businesses - are being installed in the outdoor play area for the children to use at opportune moments.

In 2018, as decided by the school management, according to the approved legislation, which guided the school to opt for the PMEC or the "Family School Program" Project, the institution chose to keep the Vice-Director of the Family School who, according to the legislation in force at the time, also acted as a mediator teacher. Thus, there was not an exclusive professional to act in school mediation.

In 2019, the school returned with the "School and Community Mediator Teacher" Project. The teacher who took over the project and started to develop the function in the analyzed institution, had already fulfilled the same function in the institution in 2014, 2015, and 2016 in this same institution, returning in 2019.

Analyzing the portfolio "School and Community Mediation Project - Activities and projects developed at school - 2019", it was possible to chronologically follow the lectures and activities worked with the students during the school year and, also, observe the photos that showed the actions developed by the professional and the collectivity, in favor of the students' comprehensive development.

In addition to the names of the lectures, projects, activities and images, PMEC reported in the portfolio the goal, target audience and people involved in each action, for example: "Peace at school - Everyone for peace" - Goal: "Increase empathy around peace; reflection on the true meaning of peace; seek peace alternatives with transforming actions in everyday life. – Target public: "6th to 9th grade" - People involved: "School management, teachers and employees".

The records show other events developed at the school, such as: "Multiplier students - Cyberbullying" - Activity developed by the Student Guild "The future awaits us" / 2019, guided by PMEC - "Yellow September - Hug for life" - Project developed in the town square, upon authorization of those responsible For the students - "Research: Psychotropic drugs" - Preparation and exhibition of posters - "Lecture: domestic violence" - Project: "OAB goes to schools" - "Research on burning in the Amazon Forest" - "Lecture: "The importance of discipline" - "Walk for peace" - "Peace Forum" - "Restorative Circle".

The "Restorative Circle" project was developed throughout the school year, and provided the opportunity for dialogue among the students who had practiced actions contrary to school rules, especially when they were recurrent and/or the reason was related to physical aggression and bullying. The objective of this action was, by means of dialog, to develop the perception of how impulsive attitudes, contrary to empathy, affect both parties involved. This intervention occurred between the mediating teacher and the

students involved in some conflict, who were invited to participate in these moments, the teacher, employee, or other colleague who was related to the occurrence, even if indirectly.

#### 4 RESULTS

In 2019, 4,454 occurrence records were obtained from a public school in the state of São Paulo located in a city in Alto Tietê.

The occurrence records in the school unit are divided into two distinct documents. The first document analyzed was the "Occurrence sheet per class", which accompanies the "Student Attendance Control" folder and stays in the respective classroom during the school term. The second document is the "Livro de Registro de Ocorrências - ROE" - (Register of School Occurrence), replaced in November 2019 by the "Livro de Registro de Ocorrências - PLACON" CONVIVA SP platform - Integrated System of School Records.

After performing the survey of the data recorded in both documents submitted by the educational institution, it became possible to group the occurrences by common multiples, found in Table 01 facts related to "Pedagogical issues", in Table 02 - "Physical and/or Verbal Aggression", Table 03 - "Indiscipline", Table 04 - Recidivists and Non-Recidivists", Table 05 - " Support" and in Table 06 - " Providências -PMEC".

Table 1

Did not perform the proposed activities	1379
Impaired the development of the class	982
Used a cell phone or similar during the class	178
Arrived late for class	40
Left the class without prior authorization	174
Has not brought material needed for the class	75
Is busy with side conversations	881
Has not handed in the required assignments	81
Has presented himself/herself with inadequate clothing	7
Did not do his homework	184
<b>Pedagogical Issues</b>	<b>3981</b>

In Table 01, the occurrences recorded in the "Classroom occurrence form", called "Pedagogical Issues", were listed, as they refer to episodes related to the daily life of the classroom.

Observing the data collected, which total 3,981 records for the school year 2019 related to pedagogical issues, it was found that about 39.9% of occurrences are linked to

the non-performance of activities proposed by the teacher, and it is also possible to identify that the items "hindered the development of the class" and "is busy with side conversations" result in 1,863 occurrences, representing 46.8% of the records related to situations that directly compromise the pedagogical process.

Table 2

Physical and/or Verbal Threat	12
Disrespecting a Public Official	212
Damaged school property	24
Withdrew class	29
Indiscipline and/or violence	<b>277</b>

Table 02, identified as "Indiscipline and/or Violence" corresponds to 277 records, and that the 'item' "Disrespect to Public Official" stands out, representing 76.6% of the records. It is worth noting that the school presented only one official police report related to disrespect, which is a consequence of occurrences related to one of the recidivist students of the school unit.

This survey was based on the "Livro de Registro de Ocorrências - ROE" - (School Occurrence Register) and the "Livro de Registro de Ocorrências - PLACON" - CONVIVA SP platform - Sistema Integrado de Registros Escolares.

Table 3

Physical Assault	153
Verbal Aggression	43
Physical and/or Verbal Assault	<b>196</b>

The table above shows the rates of "Physical and/or Verbal Assault", which reached 196 records, adding those recorded in the "Record of Occurrences Book - ROE" (School Occurrence Record) and in the "Record of Occurrences Book - PLACON

- (School Register of Occurrence) and in the "Book of Occurrence Register - PLACON" CONVIVA SP platform - Integrated System of School Registers, noting that physical aggressions represent 78% of the total contained in this table.

Table 4

Recidivist Students	54
Non-recurrent students	84
Repeat or Non-recurrent	<b>138</b>

Table 04 shows the portion of "Recidivist and Non-Relinquent" students who were directly involved in what was exposed in tables 02 and 03.

Through the data presented, it was possible to ascertain that, adding the total of occurrences recorded in table 02 - "Indiscipline and/or Violence" and table 03 - "Physical and/or Verbal Aggression", 473 registrations related to physical and/or verbal aggression resulted.

"Physical and/or Verbal Aggression", resulted in 473 records related to serious actions that attack the rules of the "School Rules and Regulations", being against the current legislation, such as "Disrespect to Public Officials", supported by Art. 331 of the Penal Code

- Decree Law 2848/40.

In analyzing the 473 records of occurrences considered serious and that are related in tables 02 and 03, it was found that "Non-recurrent students" represent 60.9% of the calculated indexes, while "recurrent students" occupy 39.1% of this amount.

Table 5

Called the Military Police	3
Called Conselho Tutelar	5
Called Samu	1
Support	<b>9</b>

In the books, we found records that mentioned the contact of other responsible agencies, inherent to the occurrences presented.

There were 03 calls to the Military Police, 05 calls to the Guardianship Council and 01 call to the SAMU, after a student struck a blow on the upper orbital region of a student, who ran, bloody, to the school office asking for help.



Table 6

Preventive Lectures	6
Restorative Circle	251
Attendance of guardians was requested	473
Orientation to the involved	473
Guidance to the responsible(s)	473
Suspended/ warned / Others	126
Intervention - P MEC	<b>1802</b>

The table shows the actions that were developed with recidivist and non-recidivist students, the students' guardians and students who were victims of aggravating situations. The item "Suspended/Advicted" is one of the interventions supported by the School Regulations and represents 7% of the total occurrences listed in tables 02 and 03.

Besides the "Preventive Lectures", aimed at themes inherent to the juvenile public, it can be noticed that the "Restorative Circle" was one of the most used instruments for the mediation of conflicts.

Considering the "Restorative Circle"; "Guidance to the involved(s)" and "Guidance to the responsible(s)" The most used means by the professional to mediate conflicts and occurrences was dialogue, which represented approximately 66% of the interventional measures, coming from P MEC in partnership with the school management, teaching staff, school partners and public organs.

The data obtained in this essay have broadened the view regarding the routine of this school, the measures taken to prevent and to solve the problems that occur in everyday life, in order to enable the analysis of factors that have contributed too much to high rates of occurrences and conflicts, as it has been exposed in this essay.

Thus, when observing the data listed in the first table "Pedagogical Issues" and comparing them with the other occurrences, it was noticeable an exorbitant discrepancy between the indexes because, of 4454 occurrences recorded in the 2019 school year, 3981 of them correspond to pedagogical issues - occurring inside the classroom - with the presence of teachers.

This balance represents 89% as opposed to 6% of "Indiscipline and/or Violence" and 5% of "Physical and/or Verbal Aggression".

The index indicated above, referring to Table 01, raises the interest and the need to address the problem diagnosed, however, it is not the object of analysis of this essay and, for this reason, a critical reflection on this phenomenon will not be deepened at this time, postponing it for another occasion.

However, it is necessary to reflect even more strongly on the need to emphasize, especially effectively, the ethical and moral formation of educators, within the contents of the pedagogy course.

When they understand and internalize that there is no dissociation between the educational practice and the ethical and moral formation of the students, there will be an awareness and concern regarding their attitude towards the students? Will the planning of the classes intentionally contemplate these practices?

These questions promote the need to contemplate this phenomenon in a more emphatic way, which may be elucidated at another time.

Regarding the object of this research, by comparing the interventions made by the PMEC of the educational institution under analysis with the "Four Ethics" defined by the author Puig (2007, p.67) and other documents mentioned in this essay, concrete information was obtained, constituted through his subjective practices specified below.

According to the author, the four ethics: Self-Ethics, Alter-Ethics, Socio-Ethics and the Eco-Ethics, are indispensable components in the integral formation of the being.

Returning to the portfolio "School and Community Mediation Project - Activities and Projects Developed at School - 2019", there are actions developed by PMEC that agree with the four ethics proposed by the author.

The conception of the humanized social being through the four ethics, presented and defended by Puig (2007), can be perceived in the data of "Table 4" which relates the rates of "Recidivist and Non-recidivist" students who were involved in occurrences related to "Indiscipline and/or Violence" and "Physical and/or Verbal Aggression". These students, as well as the others, were introduced to the intervention measures adopted by PMEC, such as preventive lectures and the restorative circle, which endorses the importance of the role played effectively by the mediator teacher facing the problems presented in everyday school life and the significant results achieved through these actions.

The articulation of PMEC with the school group, partners, community and students has guaranteed in this school unit the struggle for the construction of a more humane society.

As we followed the evolution of this research, we understood the importance of having, occupying the position of PMEC, a trained professional who interacts with other agencies and social partners, as well as the school community - and who reinforces group work for the common good, and who is fully committed to the culture of peace, also

influencing the dropout rates, considering that many students drop out of school because they suffer silently with bullying, physical and/or moral violence.

This essay also provoked an uneasiness in relation to the training of this professional who, until then, receives periodic distance training which, all too often, does not address the real desires faced in their school routine.

Even though there is no lack of commitment, it can be seen that there is a deficit, both in the monitoring of their work and in their continuing education. Understanding the specific demand in their area of work, it would be interesting to have lectures with a School Psychologist, courses that provide tools to support their practices, periodic meetings with PMEC colleagues, in order to exchange experiences, learning and, besides these measures, others that could be indicated by them, through questionnaires.

Understanding that this performance - by requiring, in addition to the professional aspect, the emotional one, facing the increasingly violent and inhumane occurrences - compromises the health and personal life of this professional, a broader and more sustainable support that subsidizes their performance is necessary.

However, this paper becomes an instrument to know, analyze and reflect on the importance of the actions performed by this professional in the school and community sphere, and also on his training and preparation to develop his interventional and training practices.

## **5 CONCLUDING REMARKS**

Elucidating the initial questions initially presented by means of appropriate concepts, bibliographic references in discussion, it is concluded that the consolidated performance of PMEC - School and Community Mediator Teacher, implies directly in the rescue and construction of values such as respect, empathy of people who, for reasons imbricated in the school context, family, personal, among others, find in dialogue, affection, guidance of this professional, subsidies to reorient and modify their subjectivity and, consequently, their practices.

It becomes relevant to resume the importance of the school and of all those involved in the process of integral formation of the student, directly or indirectly, since this work will reflect on the whole society.

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## **Public transportation and energy utilisation during Covid-19 pandemic in Nigeria**

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### **ABSTRACT**

New public transport planning requirements are developed as many countries start to navigate their return to normality after the COVID-19 lockdown. This study combines key developments regarding public transportation and effect of the lockdown on energy utilization during the first and second wave of COVID-19 pandemic in Nigeria. Data were sourced from the National Bureau of Statistic and Nigerian National Petroleum Company (NNPC) on distribution of Fuel and gas energies which thematically analyzed the impact of COVID-19 on transportation systems in Lagos Nigeria. The decline in vehicular density on roads which leads to reduced fuel consumption coupled with infection risk in public transportation in the so-called post-lockdown phase. Domestic gas consumption

and electricity generation were slightly affected during this period. Changes in travel demands; Financial sustainability; Increased cost of transportation and Loss of revenue were revealed as significant impact of the pandemic. Lastly, this study identifies maintenance of key principles in mitigating the spreading of the virus, probable energy utilization, policy recommendations and future management of resources that are most inclined to the development objectives of developing nations in the time of COVID-19 and beyond.

**Keywords:** covid-19, public transportation, gas utilization, electricity generation, lagos, nigeria.

## **1 INTRODUCTION**

A nationwide lockdown was imposed in Nigeria amid the COVID-19 pandemic for three weeks from 24th March to 14th April 2020 following other countries and was later extended to 3rd May 2020 in order to cushioning the effect on the rise. Loss of life and human suffering is the first and foremost aspect of the pandemic. The coronavirus pandemic as evidenced that six million global confirmed cases of infection with closing confirmed death of 400,000 as occurred as at June 1, 2020 (Johns Hopkins University, 2020). However, significant and multi-dimensional effects of this type of epidemic always develop to environmental and economic consequences including essential lockdown in logistics (Siddique et al., 2016). The variety between the effects of the pandemic and the economy shows the rate of infection of COVID-19 placing 30% of the global population in total lockdown, with an order on stay-at-home, travel restrictions, social distancing, wearing of face mask, spacing of market days, restrictions on numbers of passengers on public transport and so on (WHO, 2020; Di Domenico et al., 2020). This is continuously showing severe economic effects with ~80% of the international workforce having their workplace closed, and with the expectation of 3% recession which may be adjudged as the worst since the Great Depression (Gopinath, 2020). Anticipated changes in road travel and road safety have been reoccurring since the advent of the pandemic which has created an economic crisis (Conference Board of Canada, 2020). The overall question for road transportation professionals is what effects could COVID-19 have on road and rate of fuel consumption now as well as when the pandemic subsides and also the significant knowledge about road safety in general from the substantially traffic levels? In an effort to apprehend the havoc on the economy, the effect of COVID-19 can be summarized on individual aspects of the world economy, focusing on the tertiary sectors including all service provision industries, secondary sectors involved in

the production of finished products and primary sectors which include industries involved in the extraction of raw materials (Nicola et al., 2020)

Lagos State is an interesting case study, as it is disputably the most economically important state of Nigeria, inclosing the nation's largest urban area (Nigeria Congress-Administrative Division Description Archived 2005). Lagos was the first state that suffered from COVID-19 in Nigeria and the fifth largest economy in Africa compare to a country and a major financial center (Ekundayo, 2013). With the highest population density in Nigeria despite some dispute between the official Nigerian Census of 2006, Lagos State houses headquarters of most conglomerates and commercial banks in Nigeria (National Bureau of Statistics, 2017). 22% of its 3,577 km<sup>2</sup> are lagoons and creeks (Nigeria-education.org, 2020). Lagos was the first state in Nigeria that suffers from COVID-19. Nevertheless, Lagos state still remains the financial center of the country, and also grew to become the most populous megacity in the country (National Bureau of Statistics, 2015). Apart from being the most populous megacity in Nigeria, Lagos State is one of the most emerging urban coastal cities and fastest growing economy in Sub-Saharan Africa (Sojobi et al., 2016). Lagos state has the highest energy consumption of fuel in Nigeria (NNPC). This increase in energy consumption is inevitable because of the growing numbers of vehicles owners and also domestic industrial market which is concurrently increasing export of goods, due to decades of globalization (Xu et al., 2017). As economic hub and the commercial nerve center of Nigeria and West Africa, Lagos state has five ports and generates internally generated revenue (IGR) between \$32–\$52 million monthly (Filani, 2012), while almost 60% of Nigeria non-oil revenue comes the state (Adelekan, 2010).

However, an evolving question is whether COVID-19 will push Nigeria and Lagos with other developing countries, backward in its economic maturing, and thereby prolong the transition period towards reduced energy (fuel) consumption, or if COVID-19 might reduce the increasing foreign trade and immediately force Nigeria into recession. Lagos as a coastal city is the West Africa's foremost port city and the second largest megacity in Africa after Cairo (Adelekan, 2016). The city of Lagos contributes about 30% (\$52bn) to the nation's gross domestic product (GDP) which is an evident of Nigeria's economic capital and is the leading contributor to the nation's non-oil sector of about (62%) GDP (LMEPB, 2013). Lagos accommodates over 60% of Nigeria's manufacturing industry, including about 2000 industrial complexes, 10 000 commercial

ventures and 22 industrial estates (Adelekan, 2016). The economic activities in the city are due largely to the concentration of population growth.

The future energy policies will be informed undoubtedly with such trends not only in Lagos Nigeria but globally in the period post-COVID-19. It is on this light of the coronavirus pandemic that this paper aims to do quantitative analysis, through data gathered from Nigeria National Petroleum Corporation (NNPC), National Bureau of Statistics (NBS) and Petroleum Product Pricing Regulatory Agency (PPPRA) in order to determine the significance and susceptibility of different economic sectors with unambiguous focus on the petroleum (fuel) demand (Gopinath, 2020). No published articles have been found on the rate of energy consumption (fuel) effects of COVID-19 on road transportation. The present study is an effort to assess the effect of the pandemic on economic activities in road transportation sector and proffer solution for any future occurrence. However, this paper aims to examine the link between the macroeconomic parameters especially the petroleum (fuel), gas and electricity demand and supply during the pandemic situation. The paper will also contribute to the policy of predicting the reactions of the demand and supply of energy (fuel) showing the government the impacts of economic sluggishness during and after a pandemic.

## **2 LITERATURE REVIEW**

Considering the literature, the influence of pandemics (and epidemics) on the economy has been examined as a severe global influenza with the estimating cost of deaths (such as the 1918 epidemic) of about 0.6% of global GDP otherwise reaching 500 billion USD a year (Norouzi et al., 2020). The comparison between the high-middle income and low-middle income countries tends to be affected within the range of 0.3% to 1.6% respectively. The joint report of World Bank and the World Health Organization (WHO) on the other hand projected that the effect of such epidemic is even weightier, with up to 2.2–4.8 percent of global GDP of 3 trillion USD (Maden and Baykul, 2012). Furthermore, International Monetary Fund (IMF) in another article compliments that less access to health care may cause vulnerable populations especially the poor, to suffer due to fewer protection in facing the financial disaster (Alinejad and Shadmehr, 2016). World Bank report in Africa, categorized a year as the fastest-growing economic period for Guinea, Liberia and Sierra Leone due to the impacts of Ebola in which most of the economic gains of these countries were affected in the years prior to the epidemic



(Bildirici and Ersin, 2015). Furthermore, WHO described the significant impacts of this type of outbreak in the private sector posing threats to cross-border trade with restrictions on movement, goods, and services and also food security due to the reduced agricultural production across the country (Norouzi et al., 2020) Social readjustment of daily routines, behaviours, and practices are caused by such events such as people have to adjust to being at home during quarantine, frequently without the choice to work or while doing it distantly. Road facilities are associated with economic indicators through exposure and risk; as travel decreases, economic activity declines, and drivers are exposed to a lower risk of collisions (Antonioni et al., 2016). Indeed, during this COVID-19 pandemic observation of fewer vehicles has been noticed on roads (Stavrinos et al., 2020).

The megacities of the Africa and Asia are predicted by the World Urbanization Prospect 2018 Revision that 90% of its population will be experiencing population growth by 2050 (World Urbanization Prospect 2018 Revision). The level of consumption and production of energy (fuel) have changes more importantly, on the usage patterns due to the current pandemic which is still on-going (Chen et al., 2020). Although the systems have been significantly affected by COVID-19 in which masses tend to look inward before embark- ing on any trip. The oil industry has been affected with reduced usage for transportation with global air traffic coming to a halt, as well as passenger and goods transportation in contention (McKibbin and Fernando, 2020).

## 2.1 TRAVEL DEMAND

A broad socioeconomic development road transportation plan with robust and sustainable business models should be introduce in order to allow transportation business to flourish. It is sensible that governments and financial institutions continuously re-evaluate and re- assess the state of play and ensure that ‘whatever it takes’ transportation sector will con- tinue to flourish without any encumbrances (Bu et al., 2020). With total lockdown during the first wave of COVI-19, the reduction in road traffic had gone to an unprecedented level but recently with a partial lockdown it is almost 40–60% (Khursheed et al.,2020). The global calculated road fatalities are 155.8/100,000 motor vehicles (Rodrigue, 2020), while on an average, 3700 people lose their lives every day on the roads with more than 1.25 million people die in road accidents each year. Additionally, 20–50 million suffer from non-fatal injuries, often resulting in long-term disabilities (Zhang & Batter- man, 2013). In order to evaluate the public health consequences of alternative

scenarios and strategies, it is essential to understand and quantify the spread of virus in public trans- portation systems (Tirachini & Cats, 2020).

Using public transport has now become a major concern since the initial restrictions; pas- sengers remain reluctant to adhere to the COVID-19 rules which are causing higher levels of concern about public transport hygiene (Beck & Hensher, 2020). Risk awareness may thus not only influence immediate travel decisions and trade-offs made between time and gathering (Gkiotsalitis & Cats, 2020), but may also have major effects for the ridership levels of public transport in the post-lockdown period and possibly even at the aftermath of the pandemic. During the different phases of this unprecedented crisis there is therefore a great level of uncertainty in relation to demand forecasting (Tirachini & Cats, 2020). Passengers are keen to use public transportation without fear of contamination even in cases where public transport services operate as usual (Qiu et al., 2020). Access to alter- native means of transport as was found in the context of the transition to a nationwide lockdown in India depends not only on prevailing perceptions of personal safety but also on travellers commuting to various destinations (Pawar et al., 2020).

## 2.2 ENERGY CONSUMPTION

The total white petroleum product (PMS and AGO) supplied into Nigeria during the pan- demic period is presented in Table 1.

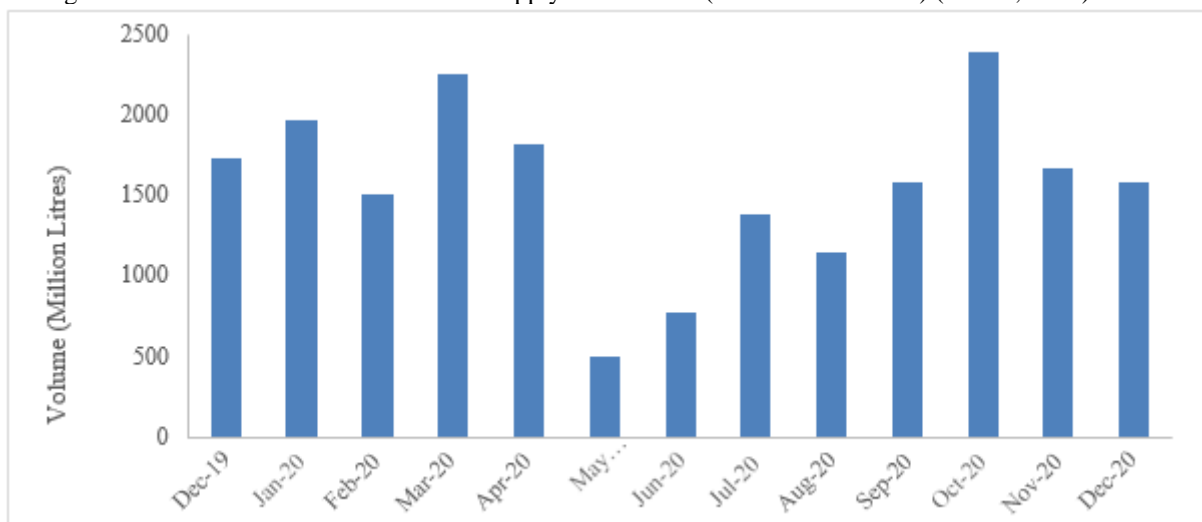
Table 1: Total White Petroleum Product Supply from NNPC (DSDP + Refineries) (NNPC, 2020)

Period	PMS (Litres)	AGO (Litres)	Total
Dec-19	1,637,848,043.15	95,014,557.83	1,732,862,600.98
Jan-20	1,961,410,760.15	-	1,961,410,760.15
Feb-20	1,396,547,333.80	115,242,192.48	1,511,789,526.28
Mar-20	2,250,559,764.25	-	2,250,559,764.25
Apr-20	1,812,808,207.22	-	1,812,808,207.22
May-20	495,100,973.57	-	495,100,973.57
Jun-20	767,421,646.65	-	767,421,646.65
Jul-20	1,374,949,628.99	-	1,374,949,628.99
Aug-20	1,139,274,296.63	-	1,139,274,296.63

As depicted in Figure 1, there was a sharp decline in petroleum supply between March, 2020 and May, 2020 which was the period of lockdown. The supply is mainly by Direct Sales Direct Purchase as there was no operations in domestic refineries due to

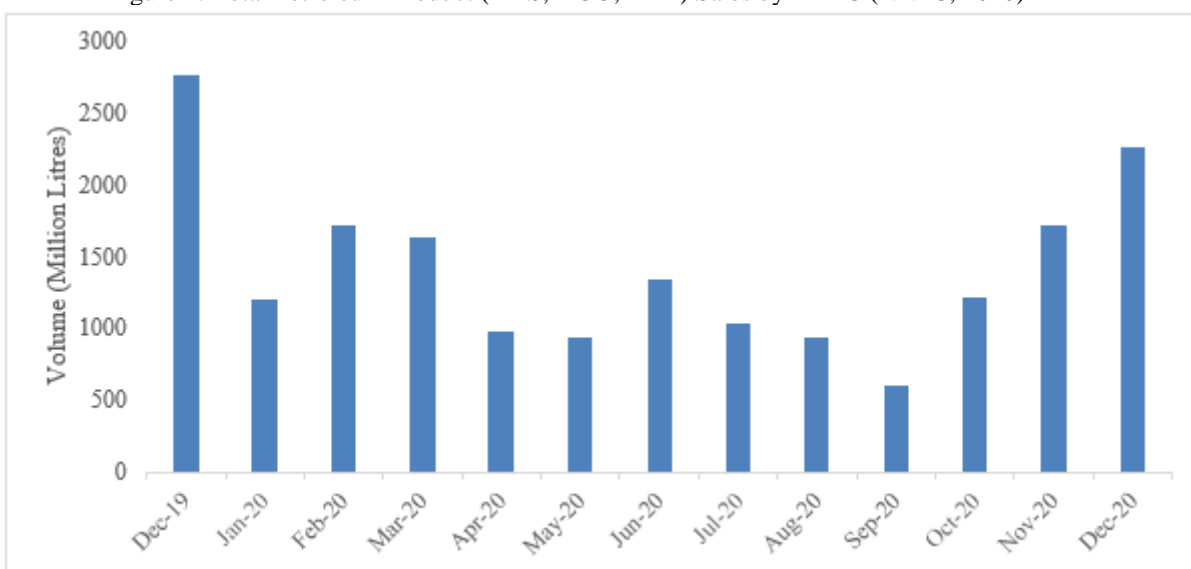
maintenance and rehabilitation. The supply increased gradually from May, 2020 as the lockdown restriction was relaxed.

Figure 1: Total White Petroleum Product Supply from NNPC (DSDP + Refineries) (NNPC, 2020)



The petroleum product sold during the pandemic period in 2020 is presented in Figure 2. The sales of petrol and diesel dropped by 45% between February 2020 and May, 2020 during the lockdown period. This indicates that transportation sector is a major consumer of petroleum products in Nigeria.

Figure 2: Total Petroleum Product (PMS, AGO, DPK) Sales by PPMC (NNPC, 2020)



### 2.3 GAS UTILIZATION

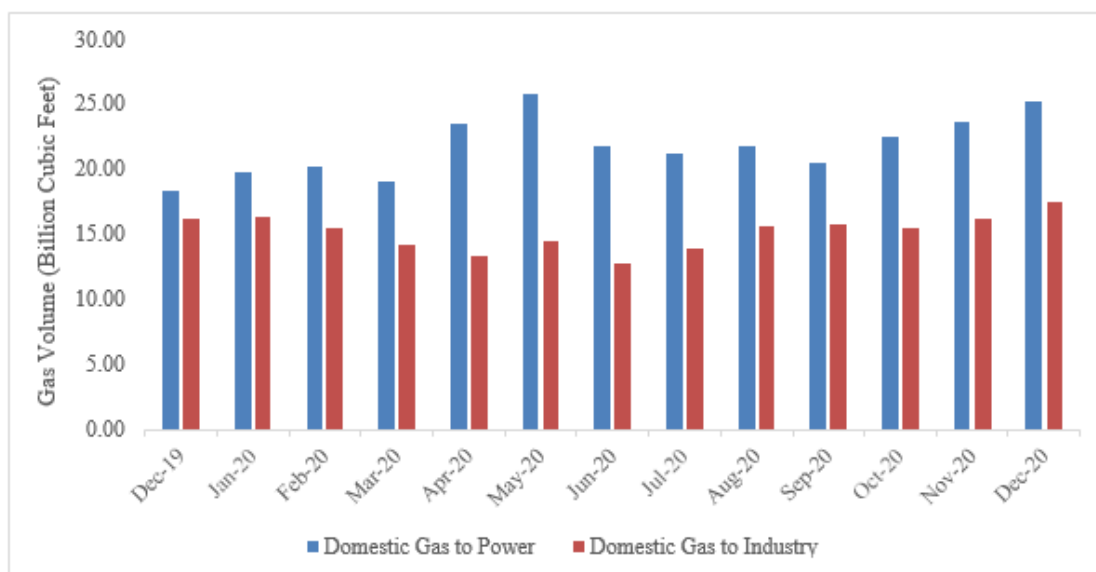
The monthly domestic gas consumption and the amount of exported gas in 2020 is pre- sented in Table 2. There was about 10% decline in domestic gas supplied to the industries between February 2020 to April 2020 while the gas supplied for power generation in- creases by about 16.6% as shown in Figure 3. This slight variation (compared to petro- leum products) in domestic gas consumption was because about 78% of domestic gas consumption goes to electricity generation (IEA, 2019). Since the power generation com- pany was not affected by the lockdown, the impact of lockdown on gas utilisation was minimal.

Table 2: Total Gas utilization (NNPC, 2020)

	Commercialised Gas (BCF)				Total Non-com- mercialized Gas (BCF)	Grand Total (BCF)
	Domestic Gas to Power	Domes- ticGas to In- dustry	Total Do- mestic Gas supply	Total Export Gas		
Dec-19	18.48	16.29	34.77	113.54	90.05	238.36
Jan-20	19.83	16.37	36.20	114.96	101.24	252.40
Feb-20	20.27	15.56	35.83	110.71	93.89	240.43
Mar-20	19.17	14.28	33.45	87.28	96.28	217.01
Apr-20	23.63	13.36	36.99	99.45	90.58	227.02
May20	25.85	14.54	40.39	103.17	88.10	231.66
Jun-20	21.83	12.82	34.65	114.01	83.38	232.04
Jul-20	21.22	14.04	35.26	115.71	84.75	235.72
Aug20	21.81	15.70	37.51	110.21	85.93	233.65
Sep-20	20.59	15.78	36.37	104.08	81.46	221.91

The gas supplied to the industry declined from February 2020 to April 2020 as non-es- sential sectors were under lockdown during this period.

Figure 3: Domestic gas utilisation in 2020 (NNPC, 2020)



### 2.4 ELECTRICITY CONSUMPTION

The electricity generated by all power generation company in Nigeria in 2020 is extracted from Transmission Company of Nigeria (TCN) daily operation report and presented in Figure 4 and Figure 5. The amount of electricity generated varies slightly (about 5%) between February,2020 and March 2020. This slight variation corresponds to slight drop in gas supplied to the power sector as depicted in Figure 3. The quarterly average elec- tricity generated also show lower production in the second and third quarters.

Figure 4: Average electricity generated per month in year 2020 (TCN, 2020)

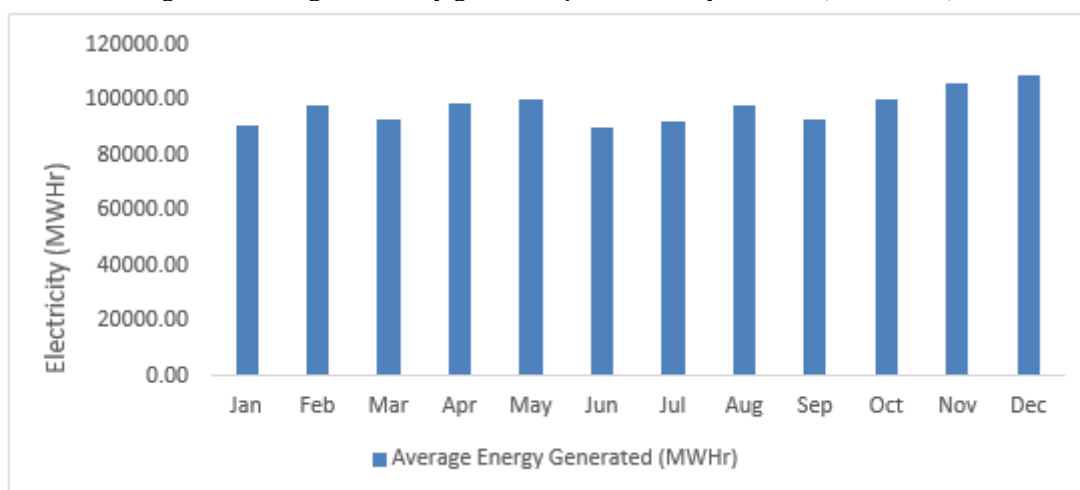
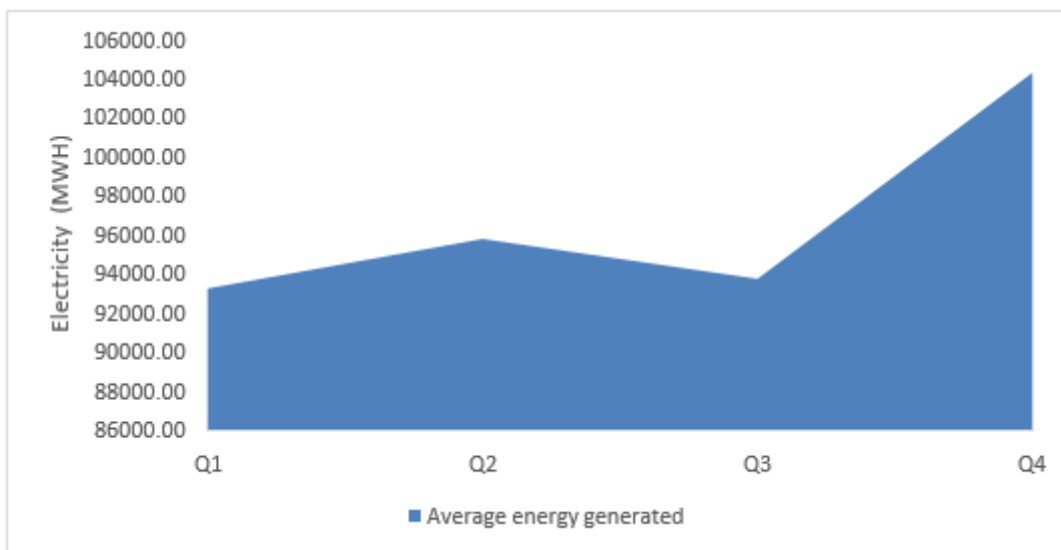


Figure 5: Quarterly average electricity generated in 2020 (TCN, 2020)



### 3 CONCLUSION

The COVID-19 pandemic and the associated shutdown impacts have already had significant effects on transportation and fuel consumption levels as manifested above as well as the operations and provision of public transport services. Public transportation systems worldwide had witnessed great challenges from the advent of COVID-19 pandemic. This study has shown the existing proofs as it relates to the effect of several factors on increasing or reducing the COVID-19 infection risk in public transportation, together with the enforcement of use of face mask, the exposure time (trip length), occupancy levels of vehicles and stations, and the application of improved hygiene standards (including sanitization and ventilation). At this stage, it remains indefinite whether the pandemic crisis will have long-lasting impacts on public transport systems since the on-going pandemic forces policy makers to make decisions in the context of uncertainty are confused. Previous knowledge advocates that large-scale crises, such as the energy crisis in the '70s, the SARS outbreak in the early 2000s, and the 9/11 terror attacks have not essentially changed travel patterns but have led to changes and modernization in cleaning and security standards in the industry. Any restrictions or regulations on public transportation use should be tailored differently depending on the phase of an outbreak because absolute risk of infection is highly dependent on the disease prevalence in the community at any definite time.

Public transportation operation fell significantly by 50% to 90 at the climax of the virus, which prompted several governments to order instructions by shutting down completely public transportation movement as one of the most affected sectors by the

pandemic. It is essential to issue a detailed analysis on detecting levels of infection that make public transportation use increasingly unsafe from a public health viewpoint. Petroleum product consumption was greatly affected by the lockdown while gas utilisation and electricity generation were only slightly affected by the lockdown. For the post-lockdown phase some encouraging indication is developing as to how to make public transportation safe or at least meaningfully decrease the infection risk. More research is needed to assess the true level of safety in public transportation as it is too early to arrive at definitive conclusions when the contagious virus will disappear at different stages of the pandemic. Maintaining many of the key principles in mitigating the spreading of the virus, including social distancing, use of face mask, hand sanitising can restore the segments of civil society and the economy with the gradual lifting of the lockdown measures at the peak of the pandemic. It is therefore critical to avoid contributing to stereotyping the use of public transportation as unhealthy because our societies need public transportation services to prosper and to address key societal challenges that may outlive the pandemic itself and hinder the long-term prospects of public transportation services.

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## **Case study: importance of implementing a project office in clinical engineering**

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### **ABSTRACT**

This study aims to show the importance of the implementation of a project office to manage the Clinical Engineering projects, using the proper tools to obtain the main requirements of the projects and the best way to succeed, demonstrating the principles of project management and seeking to justify the need for this implementation, in order to achieve efficient management, satisfactory results, and the best performance for this engineering sector, encouraging, improving, and operationalizing the adoption of project management in this area.

**Keywords:** project office, clinical engineering, project management.

### **1 INTRODUCTION**

The Project Office has the great expectation of contributing to the organization of projects in Clinical Engineering, helping in the planning, aiming at excellence, optimization of resources, constant improvement and especially satisfactory results. It is certain that this engineering sector demands many projects, so the Project Office would have the purpose of guiding, coordinating and giving support efficiently and effectively.

Moreover, the project office, using all the premises of Project Management, has as its main advantages the maximization of the overall performance, the production of reliable reports, the standardization of methodologies, minimizing schedule and risks, and raising the quality of the project. The strategic importance of projects for planning in public or private administration is evident, since for the implementation to be successful there must be a standardization of project management.

Therefore, the objective of this study is to show the advantages of the implementation of a Project Office in Clinical Engineering, consisting of research, bibliographic consultations and available methodologies, mainly citing the PMBOK - Project Management Body of Knowledge (Guide to the Project Management Body of Knowledge), since these methodologies have the purpose of obtaining the best results through a more efficient and effective management. With the implementation of this

office is intended to increase the maturity in project management of the organization and increase the success of their projects, thus contributing to the strategic objectives of the organization.

## **2 PROJECT MANAGEMENT**

According to PMBOK (2017) "A project is a temporary effort to create a unique product, service, or result. Its temporary nature indicates a defined beginning and end", it further states that "Project management is the application of knowledge, skills, tools, and techniques to project activities in order to meet project requirements". According to Valeriano (2002), "Management is a discipline, an area of knowledge [...]. And management is a function, in which the knowledge and skills are objectively applied", therefore, existing the project management and the project engineer.

In this way, it is understood that project management uses tools to identify the requirements of projects obtaining by planning, programming, and controlling tasks with the purpose of successfully achieving the objectives, leaving the manager in control, controlling and applying all available resources, and according to Kerzner (2020), the project manager needs to possess, within the organization, the necessary business knowledge for decision making, managing risks, and first knowing widely the organization's strategic planning.

In project management, there is the PMI (Project Management Institute) which, besides being a reference on the subject, is a non-profit organization made up of professionals in the project management area. As activities performed by PMI, are the formulation of standards, discussion of best practices in management and certification of project managers, with extensive knowledge of the proposed techniques, and with a greater possibility of success of processes and projects. The guidelines developed by PMI are often used in the construction of methodology for project management in organizations, one example being the use of the Guide to Project Management Knowledge - PMBOK Guide.

## **3 PROJECT OFFICE**

To better manage the projects, the Project Management Offices were created, which have as objectives to define the best methodologies and management principles among other functions, there may be even more than one office in the organization, being

responsible for the norms, standards and application of the project management knowledge.

The project management offices receive several denominations, such as project office, program management office, project support office, center of excellence in project management, among others. However, all of them have the same objective, which is to increase the efficiency of project management, being a trustworthy instrument of the top management for the implementation of projects.

According to Patah, Carvalho and Laurindo (2003), a project office is an organizational structure that is responsible for the application of project management concepts within an organization. This structure can present itself in the most different forms: from a simple sector to give support to project management to an important department where all the company's projects are managed, centralizing and coordinating them, and can operate continuously or not, from the supply of support functions to project management in the form of training, software, standardized policies and procedures to direct management, taking responsibility for the realization of the project's objectives.

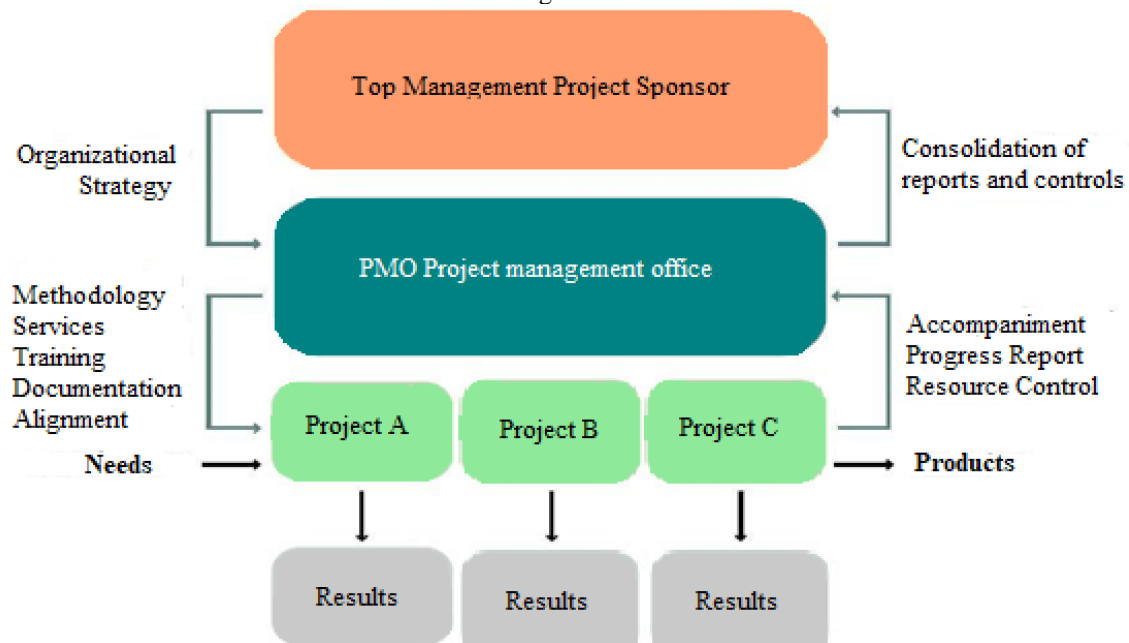
According to the PMBOK (2017), "A Project Office is a body or organizational entity that is assigned various responsibilities related to the centralized and coordinated management of the projects under its domain".

According to Kerznes (2006), the responsibilities of the top management are concentrated in the general planning, and the Project Office acts as support between the various levels of the organization to facilitate the achievement of goals and objectives of this planning, in such a way that continuous improvements are sought in the quality process, inclusion of new methodologies and management processes, closely monitoring the execution of projects, with the purpose of always seeking the best results.

According to Valeriano (2002), the project offices have several functions: project support, training, consulting, methods and standards for project management. These functions are performed in parallel with other attributions requested by the top management.

Figure 1 summarizes some of the activities involved in the Project Office:

Figure 1



Source: <https://aypbrasilpdi.webnode.com.br/>

According to Aubry, Hobbs and Thuillier (2007), one realizes that the concept of a Project office is very broad and not very specific, which is explained by the abundance of functions performed - 27 functions, - among them:

- Report project status to upper management;
- Developing and implementing a standardized methodology;
- Monitoring and controlling project performance;
- Develop people competence, including training;
- Implement and operate a project management system;
- Provide advice to upper management;
- Coordination between projects;
- Develop and maintain a dashboard of the projects;
- Promote project management within the organization;
- Monitoring and controlling PMO performance.

#### 4 CLINICAL ENGINEERING

Clinical Engineering enables the follow-up and technological development in hospitals, aiming at cost optimization, better quality, and information traceability. These are the main objectives of the institutions in recent years.

Clinical Engineering is a branch of Biomedical Engineering. According to Bronzino and Peterson (79), and Dyro (81), when biomedical engineers work in a hospital or clinical setting, they are more appropriately called clinical engineers.

The main functions of a clinical engineering department are:

- a. **Technology Management:** Develop, execute, and direct equipment management programs. Specific tasks include accepting and installing new equipment, establishing preventive and corrective maintenance programs, and managing medical equipment inventory. Issues such as cost effectiveness and quality assurance are an integral part of any technology management program.
- b. **Risk Management:** Evaluating and taking appropriate action on incidents attributed to equipment misuse or malfunction. Clinical engineers are required to summarize the technological significance of each incident and document the findings of the investigation. Reports must be submitted to the appropriate hospital authority and to external entities such as manufacturer and regulatory body, as per current legislation.
- c. **Technological assessment:** Analysis, specification and selection of new equipment. When there is a need for important investments in equipment, it is necessary to provide the hospital's administrators and clinical teams with a thorough evaluation, technical and economic, of the benefits and advantages of the different alternatives available. In addition, the process of technology evaluation of all installed equipment should be an ongoing activity.
- d. **Facility Design and Project Management:** Assist in the design of new or renovated clinical facilities that house specific medical technologies, such as operating rooms, imaging facilities, and radiology treatment centers.
- e. **Training:** Establish and deliver training for clinical or clinical engineering staff in the operation of medical equipment.

## **5 IMPLEMENTING THE PROJECT OFFICE IN CLINICAL ENGINEERING**

The need to implement a Project Office in the Clinical Engineering sector arose from the following points:

- Absence of top management.
- Absence of a sector or manager to centralize the projects.
- Absence of employees with experience in project methodology.

- Difficulty in managing projects from planning to delivery of results.
- Lack of communication with other sectors involved in similar projects.
- Not meeting the expectations of top management.
- Increased costs resulting from projects.
- - Long project delivery times.
- Absence of software for management

The Clinical Engineering sector needs to meet, especially when it comes to projects, the demands with efficiency, efficacy and effectiveness, and the Project Office must meet this and other demands to transform this planning into results, optimization of resources and expenses and increased technical, human and managerial competence, using the principles of project management.

How to implement, standardize, encourage, improve, and operationalize the Project Office in clinical engineering using project management principles? First it is necessary to elaborate a guiding plan with the adoption of the necessary project management tools, and this will depend on the organization that will be implemented. Next, have the necessary knowledge of project management and knowledge of the Clinical Engineering area, to be able to identify the main means of implementation of the Office.

According to CRAWFORD (2002), the main premises that are expected for the implementation of the Office are:

- Involvement of top management so that the needs, expectations, and objectives are met.
- The implementation should start with a Pilot Project to make the necessary adjustments as the projects are conducted, prioritizing at first the most basic functions of project management, until the organization has reached a certain degree of maturity.
- The key members should have the necessary experience in project management to efficiently achieve the expected results.
- Integration of the organization's existing information system with the Office's project management procedures.
- Analyzing, understanding and meeting, with the other stakeholders and other functional areas, the needs, demands and expectations of the several areas and hierarchical levels of the organization.
- Preparing and controlling the implementation plan and assigning the project



manager to execute it faithfully, so that the lack of planning does not harm the results, and to avoid postponing the beginning of the implementation.

- Establishment of incremental objectives, phased throughout the implementation, incorporating lessons learned from previous phases, and re-evaluations of previous approaches.
- Intellectual support from the office staff to provide expert project support, not just administrative support.

Projects always arise in the Clinical Engineering sector, and the most common concerns are the search for efficiency, deadline and the best result, among others. When aiming to implement a Project Office, its position in the organizational chart, objectives and attributions must be defined. Through this Office support, added to the Project Management tools, a better performance in Clinical Engineering can be achieved.

Among the main projects that may be managed by the Project Office in Clinical Engineering are:

- Equipment acquisition projects.
- Best equipment study project
- Equipment acceptance, quality and safety tests design
- Project for site mapping for equipment storage and pre-installation
- Project for the installation site (electric, hydraulic, gas network and others)
- Project for the acquisition of inputs and consumables for the equipment
- Equipment training project
- Maintenance contract project.
- Project for proper disposal of parts, accessories and unusable inputs

Thus, the project office can then contribute to the process of continuous improvement of Clinical Engineering, increasing the quality process, including methodologies and management processes, supporting and following up on processes, monitoring the execution of projects, to seek the best results and the intended goals.

The alignment between the Project Office and top management is very important, so that the projects will have support and appreciation, facilitating the achievement of the objectives. The projects, when aligned to the organizational goals, are necessary means to the expected results.

Among the main benefits that can be implemented in the Project Office in Clinical Engineering, according to Valeriano (2002), the following stand out:

- Greater alignment of the Project with the organization's objectives;
- Greater professionalism of project management;
- Higher productivity of the project teams;
- Greater rationality in the distribution of resources;
- Creation, development and improvement of management methods and standards;
- Creation and expansion of the culture of projects in the organization; and
- Use of the sector for strategic information systems.

Improving the efficiency of project management is among the main objectives of a Project Office. Dai and Wells (2004) complement that this improvement can be achieved through the following activities, in which criteria will evaluate efficiency:

- Develop and maintain project management standards and methods: develop and maintain a set of standards and methods, becoming a repository of documented project management knowledge;
- Develop and maintain project history files: provide a centralized system for collecting and storing project information;
- Provide administrative support: assistance with project management software, web site maintenance, reporting;
- Providing consulting: assistance to the project manager and his team in using project management methodologies;
- Providing training: in project management, software, and "one-on-one training".

To obtain the expected results from this office, it is very important to employ project management methodology, that is, to be able to standardize the planning, execution, control, and monitoring of activities in order to achieve the main objectives.

## **6 CONCLUSION**

The implementation of Project Management Offices in the public sector is still a challenge, and in Clinical Engineering, such practices are still recent to the point of not finding methodologies or specific studies. However, the demand for quality public services reinforces the importance of this implementation.

It is concluded that the Project Office's performance increases as the top management offers credibility, while the success of the managed projects are influenced by the environmental factors of Clinical Engineering, that is, they are all those conditions that escape the control of the office and influence it positively or negatively, which restrict or

modify the project.

It is through the implementation of the project office that the Clinical Engineering can optimize its results, aligning, in partnership with senior management, and centralizing the projects in a single sector capable of guiding, creating methods, among other actions, with the aim of optimizing the conduction, organization and implementation of the projects in their various stages.

It is expected from this study that the Project Office maximizes the results in the several interfaces related to the Clinical Engineering projects, such as scope, time, risks, resources, acquisitions, costs, quality, people, communication and making the integration among them, with the purpose of managing the projects as efficiently as possible.

This article was written based on exploratory research so that the next one can be prepared with a greater wealth of data collected after implementation, a greater understanding of the subject and future improvements.

### **RECOMMENDATIONS FOR FUTURE WORK**

This research can serve as a reference to those interested and involved in Project Management Offices regarding the practices to be applied in their conception, planning and actual implementation in Clinical Engineering. It is not intended to guarantee a positive result (or success) in this implementation with the application of these practices, but rather to contribute to this success.

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## **Environmental education for resilience: the importance of education for sustainability in the urban design of cities**

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### **ABSTRACT**

Bringing society closer to the concept of education for sustainability implies democratizing access to the education of citizens in light of the rational use of resources in harmony with the environment with the participation of the communities involved. As the neoliberal mode of production advances and the struggle for survival intensifies in Latin American cities, the ideal practice of this man-nature conciliation is distant. This chapter aims to discuss the 'interfaces' of Environmental Education, Urban Sustainability and Urban Design with a case study of the architecture and urbanism projects for Medellín and Brasília. In a first moment we approach theoretical and methodological issues about Environmental Education, its conceptual historical evolution and applicability in urban design for sustainable cities. It is intended to demonstrate the main characteristics of a conscious performance in sustainable urban planning, which promote actions that provide social justice in the city space and adapt in a positive way temporally as tools to promote socio-environmental citizenship. It is presented as a method an integration between actions in environmental education and sustainability principles based on the sustainable urban environmental design (DUAS) (Mansilla, 2022) in three stages of the urban project: the first or "before" the urban design, the second, "during" the design development and the last "after" with the execution of city planning and its unfoldings, based effectively on the policy and actions of sustainable development and environmental education.

**Keywords:** environmental education, sustainability, resilience, urban design.

## **1 INTRODUCTION**

This chapter deals with the relationship between environmental education and the planning and design of cities. According to the Tbilisi Intergovernmental Conference on Environmental Education "EA", held in Tbilisi, Recommendation No. 8, some classes of professionals and scientists who deal with specific environmental problems should receive special attention in their training, among them are engineers and architects. Despite the multidisciplinary nature that involves the area of regional urban planning, most professionals working in Brazil are graduated in architecture and urbanism courses.

However, to qualify as EE professionals, according to Tbilisi Recommendation No. 8, urban-environmental planning and management must be guided by the precepts of transdisciplinarity and social participation. In the view of Andrade (2014) the contributions of ecological science and transdisciplinary systemic thinking in Brazil are still little incorporated in urban studies, in the applied social sciences, there is, therefore, a distancing between Urban Planning, Urban Design and Ecology. The disciplinary field of urban design has drawn attention of researchers from other areas of knowledge, by documents produced for international organizations, regarding the possibility of mitigating environmental impacts, especially from the perspective of the urban water cycle (ANDRADE, 2014).

In the countries of the Global North, designers and planners have begun to experiment with these possibilities with new patterns of urban design, and through some of their experiments have developed a body of knowledge about the possibilities of cities being built and adapted to function differently. On the other hand, in the countries of the South, despite social problems, urban resilience is made possible by implementing greener infrastructures a priori, without having to implement the gray infrastructures in the informal settlements if you count on the participation of the population in the urbanization processes.

The city as a system is characterized by properties that emerge from the interactions of the parts, defining patterns of organization. In Capra's (1996) view these patterns are understood as the configuration of characteristic relationships among the components of the system, which determine the essential characteristics of that system.

Thus, urban systems are generally heterogeneous, and this heterogeneity derives from a combination of natural and planned landscape elements, such as the distribution and density of buildings, paving, and vegetation (ANDRADE, 2014). Sociocultural

characteristics and behaviors of individuals and institutions generate many urban heterogeneities and carry their changes over time. Such elements and characteristics often change within a city block, giving rise to heterogeneity of much more detailed scales, such as physical, biological, and social attributes. Urban design acts in deciding which elements will be present in the system, the quantities, and the configuration of these elements (CADENASSO, PICKETT, MCGRATH AND MARSHALL, 2013).

Figure 1 illustrates the importance of urban design for the preservation of ecosystems and water flows, as there was no concern in laying out roads and blocks, the houses do not relate to the lagoon and the impact of soil sealing caused the lake to dry up over the years.

Urban-environmental planning requires a background in ethics, ecology and essential social values, since any project is not value-neutral and determines the way people will live. According to Andrade (2014), the way we design our cities implies the configuration of relationships that exist in space, from the interface of survival strategies (shelter, water, energy, food and waste treatment) with infrastructures as well as the interrelationship between the displacements between housing, work and leisure and the preservation of ecosystems and biogeochemical processes. Therefore, the role of the urban architect is fundamental in the face of the planetary economic, social, and environmental crisis. A new "design" of civilization is needed. It is necessary to build "bridges" between different disciplines, through transdisciplinarity and the study of patterns of organization.

In this context, Environmental Education or Education for Urban Sustainability finds an interface with Urban Design. To educate to design or to design to educate, that is the question? Undoubtedly both tasks are intrinsically related as a dialectical process and can develop in urban pedagogical processes.

Cities continue to grow and develop a very questionable way of life as if natural resources were infinite, a situation that disregards the point of no return. In this context, it is necessary to minimize environmental problems with alternatives for continuous improvement of the environment, including social and cultural factors. Current actions should be rethought, reviewed, and proposed from the perspective of sustainability, but what would be the path? Every activity, work, and project has positive or negative impacts on the environment, and it is essential to focus on individual and collective actions that mitigate negative externalities, and especially mitigate climate change.



Figure 1 - Almost dry pond of the Roccio Residencial in Água Quente in the Recanto das Emas RA. Source: Grupos Periférico and Água & Ambiente Construído, PEAC Urban Sustainability in Recanto das Emas - Water Sensitive Brasilia. Image Valmor Pazos.



The proposal here begins in the collaborative construction of sustainable urban design for a given space in the city, containing effective actions of environmental education that ensure the use of urban space as a social and environmental responsible construction on the surroundings, after all; the city is composed of spaces for living, interaction, work, leisure and also education.

Making manifest the importance of education in the environment to keep active (and innovative) relations between urban issues and sustainability creates a spatial identity. This highlights a great cultural, spiritual, and educational challenge that supposes long regeneration processes. Education for the alliance humanity-environment, seeks an ecological and community conversion (Laudato Si, 2015), creating a virtuous cycle of environmental awareness, where professionals and academics propose, technicians build, citizens live, children learn, young people study and prepare to be those professionals who continue the gear. It is to rebuild links between nature, people, and territory through sustainable actions.

The objective of this research is to discuss the interfaces of Environmental Education, Urban Sustainability and Urban Design having as foundations the projects of architecture and urbanism for Medellín (Etcheverry, Fajardo) and Brasilia. In a first moment theoretical and methodological approach about Environmental Education, its

conceptual historical evolution and applicability in urban design for sustainable cities passing through awareness and, finally, the application of environmental education before, during and after sustainable environmental urban design (Mansilla, 2022).

It is intended to demonstrate the main characteristics of a conscious performance in sustainable urban planning, which promote actions that provide social justice in the city space and adapt in a temporal positive way as tools to promote socio-environmental citizenship.

## **2 THEORETICAL AND METHODOLOGICAL ASPECTS**

### **2.1 THE CONCEPT OF ENVIRONMENTAL EDUCATION, THE HISTORICAL EVOLUTION AND THE URBAN ENVIRONMENT**

The engine of social transformation in the city is education (Fajardo, 2008), and the first step to the dignity of space. In the case of Medellín, great efforts were implemented for the recovery of trust in the public sector to move from fear to hope. In 2014, the methodology of social urbanism was implemented, which opened space for education and culture. Education was defined as the central axis of the reconquest and integration of the poorest and most violent areas of the city (Etcheverry, 2012), strategic projects were adapted under the theme, "Medellín the most educated".

Culture and education as a public fact is expressed in new meeting spaces as in the physical and mental reconquest of some streets and sidewalks of the neighborhoods where there has been a reduction in the cases of violence. PUI (Comprehensive Urban Projects) were developed as a tool of social urbanism with three components: institutional, community participation, and the physical transformation of public space.

The environment is a collective good and currently exposes an ecological crisis that needs to be translated into new habits of consumption and production. According to Garcia and Priotto (2008) it is necessary to build the new concept of environment, after considering the environmental crisis as the crisis of the current civilization. Everything is connected, this is the principle of interdependence, for the same fact, we are all co-responsible before nature, we have a great challenge before our common home. To understand these diverse relationships, it is necessary to approach environmental studies from a systemic perspective, with complex environmental thinking in terms of interaction and interdependence and as a way of understanding space and territory.

If we consider our lives, in our daily lives we do not separate our actions, our thoughts. "We are all transdisciplinary" (MORIN, 2010, p. 135), we try to solve our diverse problems within the unity of our being, but when we start our studies at university, we become disciplinary. Perhaps the most important question is not the transdisciplinary doing, but what needs to be done, the "how to do it".

It is necessary to build a "bridge" between the different disciplines by continuing the interdisciplinarity that started in the middle of the 20th century. Most disciplines and disciplinary approaches are based on increasing specialization in isolation. There is a growing demand for transdisciplinary studies to solve problems, promote environmental literacy, and manage resources.

Environmental Education has multiple concepts, it can be considered as a dialogue between natural sciences and social sciences in a collaborative and interdisciplinary work. It is a powerful learning resource, facilitating the construction of meaningful knowledge.

The first Environmental Education council appeared in England in 1968, seeking to promote knowledge, care, and conservation of nature as an initial work of conservationist orientation, which starts in the educational bases, mainly in the natural sciences discipline. Later, in 1972, the United Nations Conference on the Human Environment, held in Stockholm, established a milestone for nature conservation with the declaration of 26 principles and a plan of action on environmental care and use of natural resources; one of them specifically establishes that education on environmental issues is essential, mainly to strengthen the sense of responsibility, care, and protection of the environment, which would also involve educational information.

After this conference, in 1975, it was officially established as a new educational model by UNESCO and UNEP at the Belgrade Seminar. Its product, the Belgrade Charter, establishes the goals, objectives and procedures of this model, highlighting mainly the relationship between physical and social problems. In 1977, in Tbilisi, the human-environment relationship was conceived in the Intergovernmental Conference and established the goal of improving living conditions, the rational management of natural resources, the continuous promotion of development, among others, and recommended considering the environment in its entirety and explicitly considering environmental aspects in development and growth plans under an ethic based on the respect for nature.

In the 1980's, in Moscow, 1987, the International Congress on Environmental Education and Training was held; in the same year the Brundtland Commission or World

Commission on Environment and Development was established, where the concept of sustainable development was defined as one that meets the needs of the present without compromising the ability of future generations; the concept acquired a presence in many countries to update and strengthen environmental education strategies.

The Earth Summit (1992) held in Rio de Janeiro established the development models contained in Environmental Education programs. The Earth Charter (1992) is a declaration of principles for the construction of a just, sustainable and peaceful society, and the Manifesto for Life (2002), sets out the "ethics of sustainability" as the moral responsibility of individuals, social groups and the State to ensure the continuity of life and improve its quality. In Mexico, 1992 and 1997, and in Caracas in 2000 develops the Ibero-American Congress of Environmental Education, respectively.

After the World Conference on Sustainable Development in Johannesburg the main focus was to merge the concept of the environment with the development of people mainly in social, economic and natural aspects. At Rio+20 in 2012, the final document produced "The future we want" (UN, 2012), with outcomes for sustainable cities and human settlements recognized that if well planned and developed, including by integrated planning and management methods, cities can promote sustainable societies economically, socially and environmentally. This requires a holistic approach to urban development and human settlements that provides affordable housing and infrastructure and prioritizes slum upgrading and urban revitalization. These local economies would provide local sustainable livelihoods and community solidarity, vital components for ecosystem resilience, decreasing the ecological footprint of cities.

We are currently in the race to achieve the Sustainable Development Goals of the UN Agenda 2030, launched in 2015, especially SDG4 for quality education, SDG11 on sustainable cities and communities and, the amalgam SDG17 for partnerships and means of implementation, these are only guidelines in a global agenda, so it is essential to build a local agenda, only then will it be possible to truly build sustainability in the people, our sovereignty guarantees.

**1.1** In Brazil, the law N° 9.795 establishes the National Policy for Environmental Education and states that they are the "processes by which the individual and the community build social values, knowledge, skills, attitudes and competencies aimed at environmental conservation, quality of life and its sustainability" (BRASIL, 1999).

**1.2** Despite the visibility of the impacts of urbanization in the face of devastation, degradation, and catastrophe events, the ecological awareness has not been installed in a great political thought, it still does not cause a generating force for change at the planetary level. We still adopt Cartesian thinking in public policies (ANDRADE, 2014). Public policies for the environment are still based on capitalist economic policies, and are fragmented, anchored in a neoliberal ecological policy. They are still held back by institutional and mental structures, by economic interests, despite the major world conferences that have marked the last decades (MORIN, 2013). Not based on the paradigms of systemic politics, they end up giving in to socioeconomic policies that consider nature an object.

**1.3** In the context of the "city as habitat" of the human being, in the view of Andrade (2014) it becomes necessary to apply all dimensions of sustainability, considering that the city has always been the stage of all decisive and decisive instances (political power, religious power, economic power, scientific development), of class struggles, as well as places of artistic creations, of entertainment, of spectacles. The communities in their local context are the ones truly responsible for the planet's evolutionary dynamics. However, public policies developed by a State that is increasingly subject to the capitalist system, dictating the rules and the very imaginary of reality, fragmented and not at all systemic, advance by ignoring the local contexts and the interrelation of the elements of nature in its entirety.

## 2.2 ENVIRONMENTAL EDUCATION, APPLICABILITY AND INTERFACE WITH URBAN SUSTAINABILITY

In the urban context, an important issue raised by Acselrad (1999, p. 81) is that the different approaches on the notion of urban sustainability can be classified into three distinct representations of the city, which aim at providing the integrity of the urban for the duration of cities: (i) the legitimacy of urban policies; (ii) the space of quality of life and (iii) the technical-material representation of the city. These approaches are not always worked on at the same level, nor are they integrated as presented earlier in the introduction. World congresses and conferences are divided into well-defined themes and

approaches. These approaches show the differences in priorities between developed and developing countries for urban environmental policies.

In the realm of technical-material representation, Andrade (2005) established a method, which consists of translating the principles based on Dauncey and Peck (2002) into strategies and techniques for the urban space design process. These principles are: ecological protection (biodiversity), urban densification in central areas, urban revitalization of degraded areas, implementation of neighborhood centers and development of the local economy, implementation of sustainable transportation and affordable housing, communities with a sense of neighborhood, alternative sewage treatment, natural drainage, integrated water management, alternative energy, and, finally, policies based on the 3Rs (reduce, reuse, recycle). The parameters for achieving resilience must be based on the principles of sustainability and supported by resilience mechanisms in all three spheres -- environmental, social, and economic. It is necessary to maintain adaptive ecological processes, natural flows; emerge inclusive and fair social processes for any social group; and provide economic support to meet the quality of life for all citizens.

According to Andrade (2005), the establishment of sustainability principles for application to urban design and planning is essential, even though the needs of each region are differentiated in terms of physical (geology, topography and ecology), cultural and socioeconomic aspects. The principles do not change according to cultures, habits, styles or fads, and it is up to the designer to adopt criteria and strategies according to the "spirit of the place" (bioregions or micro watersheds), so that urban interventions break with the prevailing urbanistic tradition, which establishes relationships of densities and morphologies, and start adopting sustainable planning and urban design strategies.

They should be applied to different scales of analysis, contrasting and complementary, and should occur systemically in various urban forms, to examine the interaction of the built environment with natural elements. The great challenge is to reconcile land planning strategies and the design of cities or neighborhoods, because land planning guidelines at scales of lesser visibility are dispersed as one approaches the detail of local reality, at the intra-urban scale (ANDRADE, 2014).

Sattler (2007) proposes building more sustainable places around the following themes: economic issues and education, urban implementation, energy, buildings, materials, food production, water, and waste. The design of more sustainable places

should convey to people how they should live, how to be more efficient in energy and water resources, how to employ low embodied energy or zero carbon emission materials, how to use sustainably managed wood, how to avoid the disposal of toxic materials and compost organic materials, how to avoid the destruction of the surrounding landscape and biological diversity, how to produce food on site in harmony with living spaces.

To bridge the gap between Urban Sustainability and Environmental Education, three points for context interpretation are suggested: (1) Environment; (2) Urban Resilience and (3) Sustainable Urban Environmental Design.) As for the meaning of Environment to apply Environmental Education, it implies a dimension within a complex system that interacts among natural, social, economic, technological, ethical, aesthetic, political and cultural aspects, according to Garcia and Priotto (2008). Urban Resilience is the ability of any urban system to absorb and recover quickly from the impact of any crisis stress and maintain the continuity of its services, according to the Urban Resilience Guide (2016). Environmental "sustainable urban design (DUAS) (Mansilla, 2022) comprises the meanings: environmental and sustainable are different, each with its own complexity and nature, although they are sometimes overlapping. Taking into account the "surroundings" besides seeking sustainability in time, its efficiency and effectiveness, is to incorporate as a priority in the basis of urban design the components of the environment, based on the internalization of the resignification of the environment (as a process of interaction and interdependence). The factors linked in the point dynamics of a given environmental factor, for example, soil, air, water, biodiversity.

Stedile et al (2021), develops a practice in the country school during the school term for environmental education to have a nexus with the community. In another application, Fotopoulos et al. (2021) proposes alternative means of learning from species crops in public schools in the municipality, in other words, identify new ways and techniques of environmental education to stimulate knowledge. Brandao (2021) reveals in his study, that active methodologies are applied to work on Critical Environmental Education in schools. Mamede (2021) highlights the role of environmental educators and their networks. Many textbooks on environmental psychology and quality of life in cities provide accounts of how urban form at all scales correlates with non-physical aspects of urban life (Rómice, 2020).

Environmental Education is installed as a tool for biocultural change to promote the conservation, restoration and sustainable use of nature. For Melguizo (2008), it comprises four axes: recognition to multiple organizations and community projects; strengthening of cultural entities and groups; modernization of cultural equipment and the political decision to ensure more funds for the municipal budget.

The Environmental Education policy for the park system proposed by Pellegrini (2001), consists of five actions to develop environmental education and interpretation programs, 1) planning and research for project development

3) communication and dissemination of educational material and awareness campaigns 4) direct and indirect participation of all people in the programs and 5) evaluation for follow-up and control of the whole process.

In the other case, the Medellín River Parks project has the environmental component in three areas: nature and city, sustainable mobility, and eco-urban culture (vegetation, associated fauna). The social management component comprises information, participation, systematization and memory, and finally, appropriation and citizen culture. It is necessary, therefore, to understand how the process of applying environmental education takes place before, during and after urban design. By the way, this example is a specific project consolidated for the city of Medellín, it is advisable to consider the proposed transition process there is sensitization on the basis of Spain's methodology for environmental education (figure 3).

Figure 2: Medellín River Parks.



Source: Mansilla Collection (2018)



### **3 APPLYING ENVIRONMENTAL EDUCATION BEFORE, DURING AND AFTER URBAN DESIGN**

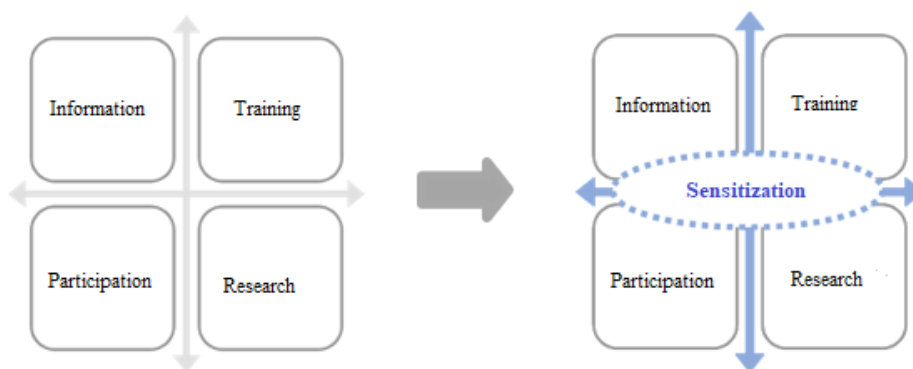
As mentioned earlier, it is essential to internalize and re-signify the environment in the processes of urban planning and architectural design. However, these actions are not only and exclusively aligned to norms or plans as fixed and inert objects; on the contrary, environmental education crosses the constant dynamics of the city that is always in movement, even in these pandemic times.

The problem is never nature, it is the way we relate to it. Raising awareness about the environmental crisis and its problematic that emerges in the dispute of interests around nature and common goods, generating socio-environmental and territorial conflicts, is fundamental. That is why EE must be integrated in all phases of planning and evaluation.

Following Spain's example, they work with environmental education along four interconnected axes of constant exchange and feedback: information, training, research, and participation (Figure 3). These are: information, training, research, and participation (Figure 3), and they go back and forth through each one to generate the mechanisms that ensure the good application of EE. In addition to this proposal, one more step can be incorporated considering its necessity in the areas of housing, commerce, institutions, education, but also in hostile, violent, and deprived places and spaces to empathize with them about the socio-environmental crisis we are living in, this step is sensitization.

It is recommended here that the good performance of EE is not based solely on technique, knowledge of the subject, methods and procedures and palliative activities and actions, all of which are important, but not only on that. The importance of not being indifferent to the problems with the effects and negative externalities is substantial here. It is necessary for each of us to be sensitive. Developing sensitivity to public things, to the commons, means impregnating a virtuous quality in the city that promotes sustainability. That is, in the first moment, after environmental literacy, it is detonating, then it is critical, and finally it is motivating for action under this reality.

Figure3: From the technical working tools (left) to an AE awareness process.



Source. Adapted from the White Paper on EE in Spain (1999)

Since the environment is always present, it is necessary to expand and strengthen sustainable environmental/ecological practices in the community. According to Vieiras and Tristão (2016), the potentiation of practices and experiences goes through problematizing and complexifying them. In this book, other chapters problematize and study the variables involved with violence and public space.

The EE implies an awareness, knowledge, interest and commitment to converge the thoughts and actions in the environment, where are involved, teachers, academics, technicians, entrepreneurs, neighbors, students, authorities, residents, all of them will build an "ecosystem of education", which over time must remain and strengthen step by step towards sustainability Linking the academic society with the urban design and civil society with life in space, both actors (of the same system) seek the same end, establishing networks of collective learning.

Next, alignments are presented to guide the application of EE during the process of environmental sustainable urban design (DUAS) (Mansilla, 2022) which includes three moments, before, during and after. In the absence of any of them the design may be completed, but temporal failures and technical - legal voids will pass account in social and environmental aspects mainly. In making this warning, it is suggested to present this guide to the project leader and share it with the rest of the beneficiaries. However, knowing the various deficiencies in the management of territorial planning or the scarce resources signed for the implementation, it is still possible and highly recommended to build the alliance between humanity and the environment towards an integral ecology.

### 3.1 BEFORE URBAN DESIGN

This is the first moment of the project idea management and coordination stage with key players based on the environmental scenario from the current situation that needs

to be changed, preserved or protected. If environmental education is a tool to transform reality (Thematic Commission on Environmental Education, 1999), it also promotes critical and innovative thinking. These actions may be led by people from civil society.

- a) Conformation of the multidisciplinary team aware of environmental issues.
- b) Expressing the commitment to collaborative and responsible work.
- c) Identification of the context and location of the project. The environmental scenario and its problems, scale, place, and available resources.
- d) Collecting ideas, collective imaginary with the participation of the community.
- e) Analyze and prioritize the project components. Definition of the intervention focus (according to the problem, according to the actors, according to the available resources, according to the degree of risk, time, etc.)
- f) Establishment of the urban design premises or project program according to the fundamental need of the target public defining essential environmental values. Permanent listening of the involved-society (for the prevention and resolution of environmental problems).
- g) Evaluation of environmental impacts and mitigation measures
- h) Work evaluation with qualified professionals in the technical area and with skills domain.
- i) Coordination of tasks and feedback.
- j) Capacitation and dissemination of the advances with citizenship (projected habit changes).
- k) Clear and periodic communication internally by the team and externally with the beneficiaries and inverters.

At the end of this first moment, which has the main objective of creating the idea of a transversal project to the environment, identifying its impacts and possible measures in a deep listening to the actors involved, the participative and collective spirit that prioritizes the city's common values is established.

### 3.2 DURING URBAN DESIGN

It corresponds now, still in planning and after establishing the project objectives, to apply guidelines and sustainability criteria to the alignments. According to the theoretical perspective of the urban design process revised by Elrahman and Assad (2019), different urbanistic actions are categorized in ten spheres of territory: planning,

public policy, city architecture, urban restoration, place making, smart growth, infrastructure, urban landscape, urban imaginaries, and communal councils. Therefore, in this new approach to urban design, it is important to incorporate and base the design strategy on three environmental dimensions: natural resources and ecosystem services, green infrastructure, and ecological footprint reduction, although these are overlapping. These steps are guided by technical and professional experts on the following topics.

Natural resources and ecosystem services:

- a) Potential land use
- b) Urban water cycle
- c) Improvement of air quality and noise reduction
- d) Biodiversity
- e) Ecological connectivity
- f) Urban climate
- g) Vegetation
- h) Waste management

Green Infrastructure

- a) Public space of quality and accessibility
- b) Urban green network
- c) Urban landscape
- d) Urban parks (different scales of public space: on blocks, sector, city, region)
- e) Storm water drainage

Reducing the ecological footprint

- a) Sustainable urban mobility network:
  - a. pedestrian zone
  - b. bicycle paths
  - c. access roads
  - d. public transportation
- b) Energy efficiency in equipment, buildings, housing
- c. Renewable energy supply
- d. Change in the population's consumption habits

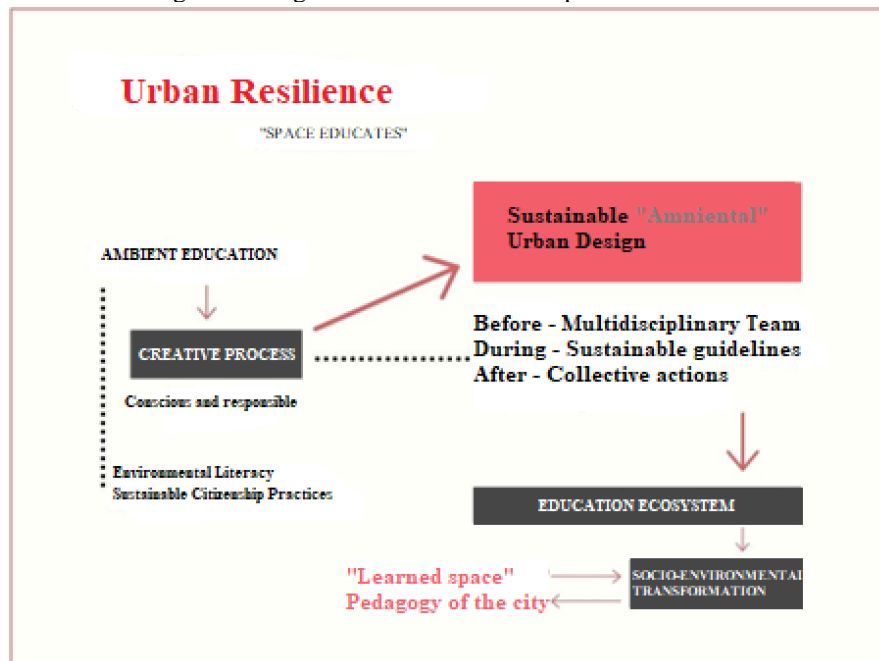
All of these components can be aided by the Big Data system in order to democratize the information to the citizenry and facilitate its administration, and can incorporate models, geoprocessing, simulations, and others supported by technological advances.

### 3.3 AFTER URBAN DESIGN

Moment of physical implementation of the design proposal. These steps can be guided by local governments or public entities. In the implementation phase of the project, the ideas are materialized and certainly in the city we have spaces that have been designed and others that have not, they have simply been occupied, but that result transmits a message, therefore the space educates. Teaching what has been thought out, designed, and transmitted is part of a continuous training process and is specialized, according to Vieiras and Tristão (2016), in everyday life. In turn, it comprises spaces/times of formation. It is about highlighting the positive and negative impacts of human activity on the environment. As an example, the green area is not only nexus between buildings and vehicular or pedestrian circulation routes, it is main biodiversity scenario, the focus is very different, the second adds value beyond the meaning.

The proposal is then to conceive the "learned space" and not only lived according to one's own experiences and values but also learning its meanings, values, and recognizing the sense of place. Space can be recognized, through a creative process in this case driven by EE. The propitious scenario for "sustainable citizenship practices", which according to Canciani et al, (2014) promote social participation (individual and collective) and learning spaces where citizens commit themselves to the socio-environmental conflicts of their territory, the purpose, to build an environmental citizenship. This begins with environmental literacy, which encourages understanding and reasoning about environmental degradation, violence, the reasons for pollution and other environmental conflicts, understanding their causes and effects in order to act actively and responsibly. All this path is traveled toward urban resilience based on an ecosystem of education (Figure 4).

Figure 4: Diagram of EA as a creative process of DUAS



In establishing this path, it will also be necessary to establish local networks and alliances to activate the actions more efficiently and obtain the expected results:

- a) Recreational education (urban animators)

Distinguishing the diversity of spaces for the invitation to live the city.

- b) Environmental and cultural interpretation (interpretation centers) Places with meaning. Re-signification of spaces.

- c) Collective memories (neighborhood units) Documentary of experiences.

- d) Pedagogy of the city (in different spatial scales)

### 3.4 LESSONS LEARNED, INSTITUTIONAL MISTAKES, GOOD/BAD PRACTICES

Learning not only from what was planned in the city, there are also natural disasters where humanity must learn and adapt, especially with climate change, the learning is constant whether there is the willingness for the first steps or the moment "before" the urban design. Considering the difference between countries in the Global North and South, is it possible to adapt EE in a spontaneously consolidated settlement that has not undergone urban design? Certainly yes, through the experience of the space, where it is possible to find answers and solutions to problems, but it is necessary to be careful and value local knowledge, pay attention to the circumstances and habits acquired so that they can be corrected and transformed into sustainable citizen actions and practices.

Certainly the urban design anticipates the project and can be a preventive action against urban problems. If it were considered how those informal consolidation processes, instead of planning, consume more resources (economic, human, financial), they would choose the path of resilience together with education.

#### **4 FINAL CONSIDERATIONS**

Developing environmental education programs in urban projects and schools, as shown in the examples of Brazil and Colombia in this chapter, reveals the need and importance of this approach as a follow-up in different age groups of society (children, residents), but the proposal is complemented by the processes of education in everyday life, in their living spaces.

As discussed throughout the text, education goes through knowledge, through the appropriation of space, it is necessary to go through different attributes of space that must be taken into account for sustainable urban environmental design, applying it to the environment with a focus on resilience. If we have come this far, we will be able to identify and reflect on the causes, effects, and trends in a given space, according to its use, form, appropriation, and identity. The great challenge is to guarantee sustainability in the hands of the actors involved, whether they are from civil society, academia, or government.

Consolidating the "ecosystem of education" in the city enables effective action for socio-environmental transformation and embraces urban resilience. It is recommended, therefore, not to conclude the urban design process in the laboratory, nor in the classroom, the process goes far beyond, "space educates". The discipline of architecture and urbanism can contribute to the construction of the "learned space" as a conscious and responsible practice facing the environmental crisis in the direction of sustainability, education for action.

Environmental Education and its dimensions are fundamental to the design, planning, management in teaching - learning processes and can be applied in the urban and rural sphere in cities. Environmental education as a tool for social and cultural change for the exercise of an environmental citizenship recognizes the social and ecological issue, which leads to distinguish the concepts of nature, environment and ecology, terms that are sometimes confused. In this work, we have tried to contribute to the clarification of

the conceptualization of education for sustainability, of environmental education, of the environment integrated to urban planning and design.

Several actions implicit in this path imply sensitization to make the problematic visible, awareness with critical thinking, communication for participation. Designing proposals, making alliances, thinking globally and acting locally, systematizing experiences to evaluate the process as empirical experience of institutions that shake these results.<sup>1</sup>

Developing local knowledge, skills, and practices that effect change in the global context is the result of an adequate understanding of the environmental problems and crisis in which we live. In the end, it is essential to strengthen the synergy between environmental education, urban sustainability and urban design as a key instrument to mitigate the effects of climate change in our cities.



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