INNOVATION

GENERAL OVERVIEW AND CHALLENGES

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SUMÁRIO

PRESENTATION

Dear reader, it is with great satisfaction that we present this collection entitled *Innovation: general aspects and challenges;* As can it be seen, the matter of innovation coexists with the inherent necessity for improvement; that is, there is no way to think about innovation without taking into account what already exists or has already been built.

Innovating is a denial of what already exists, it is rather the addition of new elements for something to become transformative; in other words, it is about presenting more functionality in the face of new demands due to the dynamics of things.

Innovation is inevitably full of challenges, even because, despite always looking for something new, the strength of the human being's culture, customs, beliefs and traditions sometimes prevent him from accepting the new; that is due to the fear of the unknown and the illusion of security in the face of what is already familiar.

Such is the mindset that brought life to the present collection, in which texts were produced with great desire and dedication by the authors, each of them present their wealth on different themes, as we highlight below.

Text one, by José Lauro and Pedro Demo, discusses *The challenge of technological innovation when tradition speaks louder (our translation).* We highlight the difficulty that educational systems have in order to reinvent themselves. What should be the frontier of knowledge can accompany the most backward sectors of society. In some moments or in some situations, innovation is expected, in such cases there is not so much resistance.

The second text, by João Nunes da Silva, deals with *the issue of entrepreneurship and innovation in capitalism (our translation).* The text makes a critical analysis of the relationship between entrepreneurship and innovation and the contradictions of capitalism. Therefore, it is based on the theoretical contributions of authors such as Keynes, Karl Marx, Adam Smith and Schumpeter. From the dialogue between these authors, elements of discussion and reflection on the future or destiny of capitalism and the entrepreneur in the face of the dynamics that involve social, political and economic relations.

Text three, by Karin T. Dia, Rafael Lima de Carvalho and Alexandre T. R da Silva, deals with *Innovation in public administration in Brazil*

Text four, by Cintia Fernandes da Silva Maximiano and Francisco Rilson R. Porto Junior, deals with *Tocantins, a Brazilian state in the process of building its innovative DNA* (our translation);

The fifth text, by Kléber Abreu Sousa, Marli Terezinha Vieira, Siméia Carvalho de Oliveira Marinho and Justino Cornélio Mendes, discusses *a Methodological proposal for the construction of the innovation policy: the case of the Federal Institute of Education* (our translation).

The sixth text, by Miguel A. Medeiros and Claudia Narciso Sakai, deals with *Technological prospecting through patents from UFT and other institutions* (our translation).

The seventh text, by Wandeson Mendes Pessoa, Gláucia Eliza Gama Vieira and Danilo Gualberto Zavarize, refers to *Innovations in the transfer of technology in dairy activities: mobile application "inovazão" and its benefits to farmers* (our translation).

Have a great reading

PREFACE

THE ISSUE OF INNOVATION AND ITS CHALLENGES

João Nunes da Silva

Talking about innovation requires sharpness, sensitivity and willingness to consider the different challenges that the theme requires. It is that every innovation requires, in some way, the apprehension of the constituted reality and, especially, to understand that the demand for something innovative does not exactly mean the negation of something that exists, but simply its complementation. Innovating is not simply doing something new.

If someone thinks of something innovative, it is necessary to ask, at the very least, why they present themselves in such way, and therefore, why they may be called innovator, considering that anything, in order to be considered innovative, must at least have some reason for being really new in the sense of being innovative.

Innovation is also something intrinsic to the human being. Everything that a person or collectivities have in their surroundings become, or seems to present, in a way, a certain solidity, something seems to have taken root, to the point of making certain people fear for what is new, once it is not known by them. In this perspective, to innovate is to challenge.

To innovate is to consider what exists and ask how it could be better and what is possible to do to make it better. But this is not only for those who create something in the face of a necessity, primarily and individual one, but which is also a need of all humans, for example.

There is no way to live without the need for the new (innovative); it is even possible to innovate by doing the same, however with a particular difference. It is like the wheel that serves humanity so much, but that has been gaining new meanings and uses with the added attributions; this mainly if we take into account the necessity and uses of the wheels in varied gears. Yes, there is innovation in the face of it, which resignifies itself according to the needs of its use.

What are the challenges of innovation? Yes, they are several and incalculable, as well as, of different order. The main challenge of innovation is to show what it really deserves to be called that way.

Human needs are the driving force behind innovations. And it is not because we do something in what we can call “here” and “now” (called new or brand new), at the present time, that we may call it innovative.

In fact, innovation deserves this name for several reasons for which they respond to the diverse wills and needs of an entire society, a people, a nation, a collectivity, etc.

Innovating is already a challenge in itself. Hence the need to be aware of how everything in the world works; and this goes for everything and for all areas: economic, social, political, cultural, artistic, scientific, technological, philosophical, among other areas.

Innovation also carries a sociological character or perspective; in other words: in general, when you think about innovation, you immediately think about doing something that does not only refer to the person who proposes to do something innovative. Deserving the brand of innovation does not mean just doing something new, but doing even what seems to be the same thing that already exists, but in a different way that becomes the brand of a new way of being that differs from the others and that may be able to change attitudes and behaviors. And so, innovation benefits everyone.

If you, reader, stop to think about the different writers with their particularities, you will soon realize that, practically everyone does the same thing, but in a peculiar way that presents itself as a new way of seeing the world and, with that, they are capable of causing changes and revolutions, even if slowly.

This is how novels, short stories, chronicles, poetry, theater and novels are produced continuously, but always with something new capable of promoting profound changes. This is how authors like Dostoiéviski, Turgueniev, Machado de Assis, Clarice Linspector, Haruki Murakami, a Tolstoy, Golgol, Miguel de Cervantes, appeared among many others who enrich us with their writings and their particularities without which the world would be much crueler and harder to live.

The same goes for all arts, all philosophers, economists, doctors and scientists who, with their abilities to perceive and read the world and create, are able to bring about significant changes for all of humanity.

It is in this perspective of understanding and living in the world that this collection of innovation fits: general aspects and challenges. Yes, it is a very significant title in view of the challenges we face in today's society, particularly in Brazil. Yes, we urgently need innovation, courage to face the challenges and obstacles that prove to be Herculean, especially when it comes to the public University, scientific research and technologies at the service of humanity and the common good.

Innovating is always necessary. To innovate is to challenge.

THE CHALLENGE OF INNOVATION WHEN TRADITION SPEAKS LOUDER

José Lauro

Pedro Demo

Master is not the one who always teaches,
but that who suddenly learns.
João Guimarães Rosa,
on Grande Sertão: Veredas.

INTRODUCTION

Innovation is a challenge to education systems. Education conservatives have always been around with speeches that supposedly presented some form of pedagogical innovation. But incremental innovation can be used exactly to avoid significant changes. This causes any proposal for disruptive innovation to be questioned and prevented from taking place. Educational ecosystems are extremely complex, involving many resources and people. From these the most remembered, teachers and students and even textbook publishers. The traditional ways keep the social and economic system relatively balanced, any sign of innovation will not interest some ends of the system, which will react when their interests have been affected and the most common strategy is to disqualify the proposal or the proponents (FIGUEIREDO, 2011).

We will discuss in the sequence of this chapter about the difficulty that educational systems have to reinvent themselves. What should be the frontier of knowledge can accompany the most backward sectors of society. In some moments or situations, innovation is expected, in such cases there is not so much resistance.

Since the dawn of mankind, some humans have stood out for having skills that interested the rest of the group members and could contribute on innovative initiatives to the community. These people played an important role based on the relative scarce information and, consequently, it was common for people who had the role of information repository to obtain some form of deference from the group precisely, because innovations depended on these people.

Later, the mastery of writing made a big difference, we can see in ancient history that the role of scribes goes back until the Sumerians (4,000 BC). In Ancient Egypt, scribes were important precisely because, knowing how to read and write, they were able to manipulate the kings and the wealthy of society who were commonly illiterate. They maintained a similar role to that of the sharpener and thus had control of the landlord's possessions and finances. Alongside the powerful who have always manipulated society, scribes were the first to discover that knowledge can be a source of power.

Although many understand “teaching” as a divine mission, a distinction must be made between teaching as a profession (in theory only a few accredited could teach, at least in formal education) and teaching as a spontaneous activity of all cultures. It is natural for parents to teach their children and the reason for teaching, in this case, is to contribute to the autonomy of children towards adult life. Teaching as a profession is a consequence of social infrastructure, with this there is the possibility of accumulating knowledge and contributing in a systematic way so that society does not depend on spontaneous knowledge.

In today’ s society the flow of information is spectacular and there are many people with the intention of teaching and not so many willing to learn. Teaching is natural and its reason is learning. Both in domestic life and in a traditional school, teaching that does not result in learning has not achieved its goals. If we observe how many times the same information is repeated in the home environment for a child to assimilate, process and convert family information into learning, we would not have as much expectation of how much an expository class can contribute to learning. For, we know that learning depends more on the learner than on whoever proposes to teach. No matter how well prepared the teacher is to build a narrative that makes it easier for the student to grasp the information, there is no guarantee that it will be assimilated by the simple fact that teaching happens from “outside to inside” and learning is from “inside to outside. All the learner receives is information that needs to be processed and there is no method that can bring ready knowledge to the learner’s intellect.

CHARMING LESSONS

Figure 1 Laurentius a Voltolina pinxitsec, University of Boloña, 14th cent.

The expositive lesson is the most common teaching strategy used to communicate the supposed "knowledge" in the formal school systems. It has played an important role when information channels were scarce. The classic ritual of someone who knows and talks about something that others need to know, listens, takes notes and gives back on formal assessment.

In the picture above is possible to see a typical class from the Middle Ages: in a high pulpit, the wise person speaks or do the *lecture* (from the Latin, *lectura:* "the one who recites") and the students listen, while in the background someone asleep or is distracted; it has always been like this: the vast majority of classes are not worth attention. There are also good listeners who write down almost everything the master says and takes as if it were an oracle. When teaching materials were not available, this was in fact the main source of information.

The lecture has its weaknesses, the most common is that the classes are copied from teaching materials by teachers who do not research and only talk about the knowledge of others. Not always the teaching reproductivism is the fruit of simple scientific incompetence; but, because of the common use of this strategy and by following this script, teachers are paid less and more students are placed in classrooms without argumentation. It's only necessary for someone with good rhetoric, some knowledge and willing to train a few minutes in front of the mirror to delight an audience of teenagers. In the academy it is not very different, give an hour of expository class, add some texts and time for reading, then a few minutes for a pseudo-socialization and that's it: you lectured 4 hours of class.

Figure 2: Drawing of William Hogarth from 1736 , Scholars at a Lecture

In the picture bellow, it is possible to see academics marveling at the class based on reading and commenting on the text. At that time, it was common for the text to be a manuscript that only the teacher had access to.

Today everyone could have a copy of this production and if something is misunderstood anyone could go to the web to look for commentators on the work or one would look for the teacher to clarify doubts. In its most canonical format, the class is a “reading”, a presentation of information produced by others on a specific subject. In this case, what differentiates the teacher’s speech from the speech of a politician, the sermon of a pastor or even the presentation

of a product by a seller is the curriculum. The teacher, in theory, is unable to do its own wishes, as a rule it must follow the curriculum guidelines of the institution or the course. However, the oratory technique used in the classroom can be learned from politicians, pastors or good merchants.

As the teaching position was being consecrated, it surrounded itself with rituals, clothing, clothing, pulpit mannerisms, the credentials that are used to preserve the "distinctions" (BOURDIEU, 2007). Even today, in the guidance rituals the defense in a master's or doctoral degree is part of a caring for the hierarchy, as a rite of scientific initiation.

The school would not escape Foucault's irony (1977) who placed it in the prison world in order to discipline and control bodies. If we look carefully, schools have a lot to do with the prison organization, let's see: the hierarchy between those in charge and those who obey; limitation of locomotion in the physical space; inmates are not allowed to express their opinions, to speak they need authorization; time is hierarchically managed and so on.

Classes are also criticized based on the Socratic teachers "who embody the master who takes care to produce new masters", as well as the ideal relationships of parents with children. In class, the measure of what a student can do is what is allowed by the teachers, the one who dares to go beyond disturbs the educational process. Traditionally the image of a good teacher is related to that which has control of the students in the classroom and a good student is the one who respects the limits dictated by the school. There is no construction of autonomy as a principle, the dependence and obedience of the students is expected (MARTINS, 2017).

Universities ended up dividing themselves into controversial routes, when the *stricto sensu* graduate program chooses to train with methodologies and authorial content, in undergraduate courses the rule of direct instructional transmission remains. Even though there are initiatives well evaluated in undergraduate courses for inserting students in research as teaching, as was the case with the brazilian programs for initiation scholarships - PIBIC (CALAZANS, 1999). What could be a way to start a process of pedagogical innovation was discontinued due to lack of investment by national Ministry of Education and Science. Some institutions still maintain these programs with their own resources, but do not have the financial strength to expand the volume needed to convert it into a policy of pedagogical innovation.

There was a time when failure was the highest indicator of teaching quality in public universities and part of basic education schools, especially in the field of exact sciences. What should be the reason for the dismissal of the teacher, has become a seal of quality through the inversion of values. With Private Schools, the strategy was different: invest in administrative and teaching management so that everything seems perfect to attract more customers and approval is the rule. Neither extreme nor the other, learning should be the rule. Passing or failing is unnecessary and you can organize the curriculum with flexible time to meet learning time.

The self-assessment used in some courses could be a good strategy if there was an ethical education for students and a strong training in student autonomy. In theory, only the learner would know what has learned and there is no magical formula capable of identifying through any evidence how much was actually learned. This requires clear information about the learning goals and learners must develop a strong commitment to their training. As it stands, it deserves criticism from Kruger & Dunning (1999), Zell & Krizan (2014), Ehrlinger et alii (2008), Brennan & Magness (2019), Bok (2017) and Falchikov & Boud (1989).

Digital technologies are invading schools and universities, courses online are accommodating, and quality criteria is becoming increasingly clear. In the 2018, the last edition of ENADE (brazilian program used as a quality indicator of higher education courses), distance courses with the maximum grade, for the first time, have resulted slightly above the face-to-face courses. The only importance of this is that any narrative of the quality of classroom courses loses its effectiveness because, when evaluated by the same instrument, both had a similar level. The problem is that both modalities are preferably instructional. Higher online courses must innovate to survive, because the dropout rate is huge. At least in online courses, they have been investing in methodologies for the use of digital technologies and face-to-face institutions maintain traditionalism with great difficulty in innovating in their curricula.

In the recurring rhetoric, many seek technological innovation to further commercialize the educational offer (DEMARIA & BONGIOVANNI, 2010), others want to renew (HRASTINSKI, 2008; LEBLANC & LINDGREN, 2013; LITTLE et alii, 2006; MCBRIEN et alii, 2009; SWAN et alii, 2000), being one of the most common ways is to add the "research" factor (MATHIEU, 2013. CLARK, 2016. Research Institute for Higher Education. 2010) without leaving the classroom. The terms "teach and research" are easily combined. They also appear in the very common idea of "training" mentors for online courses, without realizing the stark incompatibility between training and teaching (HANDELSMAN et alii, 2005; PFUND et alii, 2006; 2013; 2014; SORKNESS et alii, 2013).

While the ineptitude of instructional undergraduate courses ends up being acknowledged, the introduction of research remains subordinate because the teacher, in the name of his didactic autonomy, does not admit any change that requires leaving his comfort zone. We understand that the most correct term would be "to educate through research" (DEMO, 1996), since it does not combine to postulate "teaching" or "training" as formative proposals.

Instructionism has the most grotesque practice in the notion of "passive learning", a contradiction in terms, as learning is always an activity. Another nonsense is the fashionable term: "active methodologies", as if there were a passive methodology. Biologically, one of life's prerogatives is not to be passive. Our organism has its authorial dynamics that reacts seeking room for maneuver in the face of environmental conditions (HARARI, 2015; HERCULANO-HOUZEL, 2016).

Formal Lectures does not seek the participation of listeners: they are just listeners. We see countless publications on participatory class, dialogue in the classroom, but all postulate ideal conditions impossible to be replicated in classrooms full of students and in a short time of 50 minutes of class. The academy establishes expository classes as a fast, inexpensive and efficient way to teach crowds of students. Classes are like a generic amulet that they defend because it represents the status quo of academic traditionalism. There have always been classes acclaimed by students and teachers who are passionate about the pulpit; thus, its place is guaranteed in society beyond its abuses (MCDANIELS et alii, 2016). At school and university, every day is a school day. Learning? Eventually...

EXPOSITIVE LESSONS ARE NOT THE ONLY WAY

There have always been teachers who considered class to be a waste of students' time, some went on to laugh, like Schneider in his "Chalkbored" (2007). Finkel recommended "teaching with your mouth closed" (2000), since it is the students who must be the protagonists of their learning while the teacher must be the mediator. Asking "what is the use of classes?", Bligh (1972) questions the teacher as the owner of the knowledge that passes on to the student without knowledge and reaffirms: class only serves to transmit information.

No mind is empty and learning is not filling a void, it is reorganizing what exists, as shown by Piaget (1990) in his theory of equilibrium. The child sets up a "mental scheme" to accommodate the reality that surrounds him and then discovers that not everything fits into any scheme. It is forced to reorganize, seeking another level of balance. Learning takes place in this endless deconstruction and reconstruction. Our mind is a typically reconstructive entity in the face of reality, endlessly.

The learning process is the construction of autonomy in reading and interpreting the world. It is, *per se*, authorial. That is, it is not "taught," but it can be a collaborative construction with educators and study partners, as Paulo Freire (1981, p. 79) said: "Nobody educates anyone, nobody educates themselves, men educate themselves among themselves, mediatized by the world. ". It is not only the teachers who teach, but everyone who participates in the process is part of the construction of the learning subject.

The fun of the class is for the teachers who remain thanks to the audience who must register the frequency, for the learners it is like teaching how to bake a cake by delivering the finished dough. Some authors assume that this powerful place is like a stage where the teacher reigns in his monologue. Ayers combines teaching and freedom ("Teaching toward freedom") (2004), as if freedom provided a ready formula. Highet (1951) enjoys "the art of teaching", as if it were art to manipulate the minds of others. Elsen (1969) hails "the pleasures of teaching". This pleasure is what makes some professionals who associate with a university to be able to "teach", in these cases they are not teachers, they are in the teaching career for personal fulfillment and not for professional commitment.

Worthen (2015) makes a passionate defense of the class (*"Lecture me. Really"*), postulating wonders of good rhetorical students, but who do not provide the student emancipation. Ramsden (1992) promotes "learning to teach" in higher education, the crucial part of the teacher (de)formation training in college: learning to teach, as a teaching professional. These are cases in which they did not understand that the reason for teaching is learning; if that does not come, the other is not complete or was time wasted.

Nilson (2010), in his "teaching at its best: a research-based resource for college instructor" combines some contradictions: i) teaching as the peak of teaching achievement ("at its best"); ii) based on something averse to teaching, which is research; iii) in favor of the "instructor" (...). Penner (1984) claims that "many college teachers cannot teach" because class is not for everyone.

It is often heard from students that such a teacher knows a lot, but does not know how to teach. Other teachers take refuge in research because they do not know how to work with students. In practice, they are technicians who know nothing about didactics and appeal to trial

and error based on their experiences with students. It is a crazy world: on the one hand, we have notable researchers who do not like to "instruct" because they consider research to be their professional reason and to take care of undergraduate learning is to become smaller; on the other hand, we have classroom teachers who do not research and position themselves as teaching experts!

The academy is multifaceted and the problem with one of these facets is the specialization of professionals in an area and the credit to argue in areas without any domain. The most common tactic in narratives sold as innovative is to add new teaching strategies to the instrumentalist oldies. With that they deceive (and how much they deceive!) The society with stage practices that enchant the unsuspecting or with a difficult chatter that defies the intelligence of even the most prepared.

Criticism has grown and students have less and less patience to listen to copied classes (WAUGH & WAUGH, 1999; CANNON, 1988; CHAIMBERS & FULLER, 1995; CLEREHAN, 1994; SAMUELOWICZ & BAIN, 1992; VERNER & DICKINSON, 1967). Some authors continually indicate the need to overcome this pedagogical addiction (PAUL, 2015; SCHMIDT et alii, 2015; LIMBACH & WAUGH, 2005; MAIORANA, 1991; ALDERMAN, 1922; LARSON & LOVELACE, 2013). More critical authors are alarmed by the very low learning at the university, as is the case of Arum & Roksa (2011; 2014) when empirically verifying what they call "academically adrift" (2011) or "aspiring adults adrift" (2014). Although critics have done their job, the instrumentalist status quo remains a global standard of education and marked by direct instruction (WAUGH, 1994; BANE, 1930).

As much as the expository classes that represent the good intention of showing themselves before the audience, that the private institutions do their marketing with showman professors, it seems evil to postulate that if there is a class there is learning. The lecture is an academic myth that is difficult to question, even if they forget the basics, as we have already said: teaching is from the outside and learning is from the inside out.

IT IS NOT BECAUSE IT IS DIGITAL

Another aspect that collects the criticisms of conservatives is the use of digital technologies for mediation in the learning processes. There is still great resistance to virtual learning courses, even so the volume of enrollment in totally distance courses has been increasing alarmingly. According to the EAD.BR Census (2019) the increase in enrollments in EAD was 42% between 2016 and 2017 and 56% between 2017 and 2018. There were 2,358,934 enrollments in 2018. The growth in interest in online courses is a fact. We understand that because of the evolution of digital technologies that invaded today's society, education would not be left out. They are here to stay and the best we can do is use them with the necessary pedagogical competence.

Another thing that need to understood is that it makes no sense to distinguish between face-to-face and distant courses, as learning is always "in-person", there is no learning in absence! In the online course, the virtual presence places the learner and the teacher in the same space and time. The class does not end and the teacher does not leave. In other words, it is always about physical presence in the virtual.

We understand that hybrid courses will soon dominate. In fact, it is no longer possible to have an exclusively face-to-face course because for that purpose one would have to refuse the use of the Internet and, consequently, of all its resources. Let's face it, there are still teachers who prefer a photocopy on paper than text on digital media. However, when indicating any activity to be performed outside the classroom and away from the teacher's supervision, we have distance learning, the teacher is not present coordinating the student's study activities. However, totally online courses have their limitations and it is always good to consider and choose part of the face-to-face activities in the same physical space. Some laboratory activities, internships, research workshops or seminars. Even an activity that can be performed in a virtual environment must sometimes be performed with human contact with people instead of machines because "tutoring" also requires physical contact (TURKLE, 2011; 2015; TWENGE, 2017).

Finally, classroom teaching is not an indicator of quality and the technologies used do not make a course pedagogically innovative, it is the way of guiding the learning process that indicates its quality. A virtual course can be as bad as an in-class course (and *vice-versa*) if it is not strongly based on learning management, if the learner is not the center and/or if the dialog is not the referential of communicative quality.

The virtual activities serve to bring information, provide books, video texts, video lessons, podcasts, but if you stop there it is the same instructionism criticized in traditional courses. What makes a good quality course, whether in person or online, is the way it is organized to involve learners in the construction of knowledge. Any form of curricular organization that favors teaching is out of place. What ultimately matters is learning, authorship, the construction of learners' autonomy.

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THE MATTER OF ENTREPRENEURSHIP AND INNOVATION IN CAPITALISM

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What comes to mind whenever we refer to Entrepreneurship and innovation is generally the image of something at least good and spectacular to society. Which means, there is some sort of glamorization related to such concepts. The present paper aims at presenting elements to discuss the concepts of Entrepreneurship and innovation in order to provide input to debates around the inherent contradictions of capitalism that objectifies social relations in such manner that might even ignore the human being, making them clients and even a commodity.

The following debate is based on the ideas of Karl Max (1990), Schumpeter (1961), (1985) and Weber (*2000), (2004)*, important authors with opposite positionings about the market, however they share similar perspectives when referring to the future of capitalism. In view of those theorists, we aim to problematize the idea of entrepreneurship and innovation, and to provide a critical look at the contradictions of the dynamics of capitalism, as well as to the composition of public policies, especially the ones regarding economic crisis (PAIVA, et al 2018, p. 156).

ABOUT ENTREPRENEURSHIP AND INNOVATION

The terms Entrepreneur and innovation are generally connected to the idea of market; which means, whenever one thinks about those two terms, a straight relation to the capacity of generating profit is quickly made.

With that, an extremely economics-based and corporate comprehension is slightly shaped, in a way that erases the subjectivities of the agents involved in the social relations that involve the people inserted in certain processes of production, of circulation, of sale and purchase.

What is not considered is that any action, whether or not labeled as entrepreneurship and innovation, is inevitably contained in mindsets, values, behaviors, and intentions that cannot be solely restricted to the act of selling and profiting.

The concept of entrepreneur is no longer applied exclusively to the private initiative, rather, it is also applied to the Third Sector and to public Administration, therefore it does not refer solely to the innovation sphere, but to the adaptation (MARTES, 2010, p. 1).

Schumpeter understands that innovation can generate both development and unbalance, especially if it is taken into consideration that technology has become a determinant factor when it comes to modern competition, which is not only defined by price (MARTES, 2010, p. 1).

The entrepreneur is, on the other hand, an agent, the one who practices a social action in the Weberian sense of the term; which means, entrepreneurship and innovation are practices moved by meanings and senses that cannot be simply restricted to the idea of profit.

Therefore: the term entrepreneur, as important as innovation to understand the functioning of capitalism, arose before Adam Smith referring to the individual capable of observing and taking advantage of discrepancies between supply and demand in the market, in order to make profit (BLAUG, 1995, p. 460 apud. PAIVA, et al 2018, p. 156).

If the idea is to take advantage of the discrepancy between supply and demand, it is fine, so far; However, the matter is not merely the motivation for profit. It is rather about having the capacity of sociological perception of different factors that contribute somehow for the individual to decide to produce, which might result in success with its fulfillment, bringing benefits to society.

And that is not possible if the so-called entrepreneur is not able to have a clear perception of social, political, cultural, aesthetic, among other factors that cause a pre-existing product to be rejected, and, as a consequence, another product finds its acceptance.

In this sense, entrepreneurship means not only investing economically, but sociologically, considering possible changes that a service or product might be able to generate from the relations that involve its production, circulation, and consumption.

The term innovation consists on the process of transforming an idea of invention into a good or service (INNOVATION, s.d. apud. PAIVA, et al 2018, p. 156). Meaning that innovation, directly related to the idea of entrepreneurship, in order to transform an invention into a good or service needs support from diverse factors that motivate the action that aims to be innovative.

Therefore, innovating is not simply creating or doing something new, the same way that entrepreneurship is implicitly an action of keeping or transforming a given structure or social reality, besides, generating profit, in case it works.

As an example: the invention of Coca-cola and its maintenance and transformation with time. What motivated the invention of Coca-cola and why does a product that has almost nothing natural remain on the market, even though it has corrosive properties and are contrary to a person's health?

The answer to the question above is that it is not only due to the fact that it is a product created for the market; the factors that lead to its maintenance are directly related to strategic narratives that stimulate people to consume it, which has, consequently, generated an individual and collective behavior, especially when it comes to parties, leisure, entertainment, confraternizations, or the mere individual consuming associated to the narrative created by publicity and marketing around the Coca-cola product.

However, would the creator of Coca-cola have previously considered everything that was stated above about how to make a product to become consumed practically uninterruptedly throughout the years? Obviously not. Rather, the market needed to think and innovate in order to make Coca-cola to keep being consumed. And the reason lies on the strategic narratives created by marketing, publicity, and advertisement from the realities constituted and imbued of several factors that influence the so-called entrepreneurship process, which includes social, environmental, personal, cultural, organizational matters, among others.

For Schumpeter, the producer may be the responsible to have consumers to be taught to desire new things, or things that differ somehow from the ones they are used to consuming (SCHUMPETER, 1982, p. 9).

In this sense, the Schumpeterian thinking contradicts the purely economics-based idea focused on the utilitarian that is naturally shaped in the capitalist process. As for the latter, the famous theorist highlights

> The fundamental impulse that puts and keeps the capitalist machine in operation comes from new consumer goods, new methods of production or transportation, new markets and new forms of industrial organization created by the capitalist company (SCHUMPETER, 1961, p. 110, our translation).

In the above quote, the Schumpterian understanding of the entrepreneur as the focus on the individual's particularity can be clearly perceived, the person responsible for innovation, the one who makes an attentive reading of the world and its dynamics in which it is inserted and shows itself capable of presenting something new. It is "he who creates new combinations of productive means, capable of promoting economic development".

The Schumpeterian entrepreneur is not only able to create something new, a fact that earns them a profit, but also, their innovative character becomes sufficient capable of creating a new atmosphere, so that similar new ventures arise under the influence of that, which, in turn, triggers disputes for greater profit (PAIVA, et al 2018, p. 164).

In Schumpeter's understanding, just as the market changes due to innovation in order to favor profit, expansion of employment, and income, new conditions established by innovation can soon generate a reflux process as well.

Thus, there may be a "complete reorganization of the industry, with increased production, competitive struggle, overcoming of obsolete establishments, possible dismissal of workers, etc." (SCHUMPETER, 1982, p. 132).

Considering the ambivalent situation presented, with regard to innovation in capitalism, Schumpeter recalls that it is necessary to consider such system as an organic whole whose parts interact so that one must also consider its various processes, its different phases and pay attention to necessary time to understand the mutations generated by innovations in capitalism. Thus, the author highlights

> All examples of economic strategy acquire their true significance only in relation to this process and within the situation created by it. They need to be observed in the role they play in the eternal storm of creative destruction, as they cannot be understood independently of this process or based on the hypothesis that there is a perennial calm [1](SCHUMPETER 1961, p. 111, our translation).

With the above statement, Schumpeter dismisses the merely economics-based view, especially the false idea that the market itself operates a general equilibrium, as the idea of the

1 Todos os exemplos de estratégia econômica adquirem a sua verdadeira significação apenas em relação a esse processo e dentro da situação por ele criada. Necessitam ser observados no papel que desempenham na tempestade eterna da destruição criadora, pois não podem ser compreendidos independentes deste processo ou baseados na hipótese de que há uma calmaria perene (SCHUMPETER 1961, p. 111).

invisible hand of the market whose competition system guarantees the best for society. It is the idea of self-regulation in the liberal economy.

It is important to note that Schumpeter is not a Marxist, but he does consider Marxist criticism to understand liberalism. In this sense, we can say that Schumpeter is a man of the twentieth century who is not deceived by the idea of a market as a god that puts everything in harmony. He draws attention to the importance of the concept of innovation in the sense of seeking to understand capitalism and its contradictions.

What is important in Schumpeter's thinking about the relationship between entrepreneur, innovation, and capitalism is exactly the perception that innovation is the fundamental element for the perpetuation of capitalism.

And this innovative character means being able to a new combination of the means of production that the entrepreneur faces, including there a) routine conduct in the business world, b) the mental routine, c) "the reaction of the social environment against the one that aims at doing something new" (MIGLIOLI, 2002, pages 101-102, our translation).

For Schumpeter, the entrepreneur's innovative character is directly related to certain motivations that are beyond the economic prism; which means, it is the particularity and subjectivity of the entrepreneurial individual that favors him as an innovator when taking action in pursuit of his goals. We have, therefore, that the Schumpeterian perspective here dialogues directly with the Weberian thinking with regard to the idea of social action.

Now, we can think to what extent Schumpeter's thinking has something similar to Karl Marx's ideas regarding the future of capitalism. Like Marx, Schumpeter considers the dynamic character of the economy and society to be extremely important. Thus, Schumpeter also perceives the ambivalent character of capitalism, so that it is because of the constant need for innovation that this system puts its future at risk.

Schumpeter does not make a deterministic reading of capitalism, as we find in Marx, placing the working class as the gravedigger of this system, but rather, he considers the contradictory aspects of capitalism, when it needs innovation to maintain itself at the same time as innovation in confrontation with inevitable disputes within the market inexorably produce problems, even leading to crises which need to be contained.

As for the existence of classes in society, Schumpeter considers that a class can indeed rise, if its leadership grows and if its function becomes more important and recognized in society (MIGLIOLI, 2002, P. 104).

Note that, for Schumpeter, the idea of leadership is also important to maintain or to transform. However, what really matters in Schumpeterian thinking is that the issue of innovation is closely related to the individual's capacity for motivation; and that is why this theorist points out the entrepreneur or the businessperson as the indispensable figure with regard to innovation for the development of capitalism.

In a Schumpeterian comprehension, the crises in capitalism can be explained by the exhaustion triggered "due to the swarm of primary innovations and the wave of secondary innovations that follow it", which justifies the action of certain nations to seek the foreign market as an alternative way to make new combinations and, thus, allow the growth to continue (CÂMARA, 1991, p. 147).

Innovation is indispensable for the system that benefits from technologies, but it is the entrepreneur's ability that can break down economic, mental and psychological barriers, which enables a new conduct and forces discontinuous and spontaneous transformations (CÂMARA, 1991, p. 147).

As it can be seen, technologies are fundamental to motivate innovations, but it is the entrepreneurial capacity that uses the necessary means to generate new possibilities for economic and social development.

If you consider entrepreneurial ability as something extraordinary, the miraculous type that is born from a certain gift, that is not what Schumpeter refers to. Such theorist considers the concrete reality of the market, the influence of the capitalist, the one who has the necessary capital to invest in something that will bring him financial return in the best possible way, as quickly as possible.

Let us then regard how Schumpeterian thought recognizes or dialogues with Karl Marx's ideas, in order to explain capitalism and its contradictions. Let us therefore consider that for Marx, the basis of his analysis rests on the dialectic, which takes into account the dynamics, the transformations and the totality.

Marx understands that the basis of capitalism is exploitation, which he explained in detail when he demonstrated the way in which this system works from the Added Value (or more value), which means the unpaid work that is in the capitalist's power.

If you have only a cold analysis of how economy advocates with regard to market relations, you will undoubtedly ignore the worker as a human being, with the capacity to feel, think, and act from his relationship with the world. Well then, let us take into consideration how the economic logic is based on the fetish, in the search for profit above all, for the action of the entrepreneur or entrepreneur in the face of the need for innovation as a mechanism to sustain the capitalist system.

Marx's ideas about added value allow us to take a critical look at commodities in capitalism. According to him, commodity hides the relationships of exploitation that occur from the first moment of the extraction of matter in nature until its production, transport, and sale process.

From the Marxist concept of added value, it is possible to expose the exploitation of the worker in capitalism, so that innovation, in turn, being perceived only by the mercantilist logic, ignores this whole process of exploitation. Marx, therefore, also allows us to critically analyze the mercantilist logic itself, which puts profit above everything and, with this, it reduces the idea of innovation and the capacity to use productive forces in order to generate more profit.

Such logic triggers unceasing competition, so that innovation generates more competition and, consequently, the one that presents the greatest capacity for investment and innovation goes forward, a fact that leaves behind those who cannot keep up with the competitive pace.

The point is that the conduct of the entrepreneur in the capitalist perspective has no concern with ethical or religious values, even though such factors influence in some way, as Weber argued about *The spirit of capitalism and its relationship with Protestant ethics*. What is the primary motivating factor is the relentless pursuit of profit and a certain obsession with prestige and power based on economic success. Those are the factors that, taken as a whole, and in the

face of market demands, somehow result in enrichment for some and loss for the majority, as described by the Marxist reading of the contradictions of capitalism.

Considering the perverse logic of capitalism, profit for profit above all, an extremely motivating factor for entrepreneurs to strive for innovation as a way to stand out from the rest of the market, there is no need to find any glorification of the business community, since that, if there is one thing that they do not care at all, or at least demonstrate no concern, it is with ethics in the sense of benefiting humanity.

The flame that moves the entrepreneur, except for some particularities, is the maximum gain of profit and, therefore, in order to become bigger and better than the others, which itself is something that is put in a certain way in the humanitarian sense, such as philanthropy or solidarity, this is something to be thought of after profit.

It was due to criticisms that emerged to Schumpeter's ideas regarding the entrepreneur as fundamental in the innovation process, that such theorist decided to affirm that he never wanted to portray the entrepreneur in the sense of glorification, as something extraordinary, as he personally asserted in one of the editions:

> It may not be superfluous to point out that our analysis of the role of the entrepreneur does not entail any sort of 'glorification', as some readers of the first edition of this book seemed to think. We maintain that entrepreneurs have a distinct economic function (...), but we do not describe every entrepreneur as a genius or as a benefactor of humanity, etc. (p. 63[2])

Schumpeter's recognition that there is no need for any 'glorification of the entrepreneur, as if they were geniuses, is important to remember that the innovation processes carried out by entrepreneurs in general is focused on competition, profit and, also, they do not take place without the capital factor, without credit, which makes the race for greater gains increasingly insane. Such factors triggered by the race for profit inevitably bring greater enrichment for those who are already economically privileged, in addition to generating serious negative consequences such as unemployment, poverty, and misery for those at the bottom of the social pyramid, as well demonstrated by Karl Marx, when he dealt with the fetish of merchandise and the concept of added value.

FINAL CONSIDERATIONS

This work aimed to present some elements for the discussion about capitalism, entrepreneurship, and innovation. To this end, it took into account the ideas of important theorists of Sociology and economics, especially Karl Marx, Weber, and Schumpeter.

The goal was to demonstrate how those theorists can serve as support in the analysis of the contradictions of capitalism and its inherent need for innovation for its perpetuation. Thus, it was shown that although the authors mentioned present different and distinct ideas, at certain

2 Pode não ser supérfluo salientar que nossa análise do papel do empresário não acarreta qualquer 'glorificação' do tipo, como alguns leitores da primeira edição deste livro pareceram pensar. Sustentamos que os empresários têm uma função econômica distinta (...), mas não descrevemos todo empresário como um gênio ou como um benfeitor da humanidade etc. (p. 63)

moments it is possible to perceive that such theorists dialogue and present positions that are complementary.

Karl Marx is undoubtedly an indispensable classic for the economic analysis of society and, more precisely, for understanding contradictions that are inherent to capitalism. It was not by chance that Marx was one of the main responsible for the definition of the term capitalism, whose system is based on maximum profit and to the detriment of the working class, this became a commodity in capitalism.

The concepts of added value and commodity fetish are fundamental to the analysis of capitalist society. Furthermore, Marx remains very useful to analyze capitalism and its transformations in the modern world, especially when it comes to entrepreneurship and innovation, which are fundamental to economic and social development. Marx dialogues and even influences Schumpeter's thinking, when he describes the roots and contradictions of capitalism.

For Schumpeter, the downfall of capitalism seems to be inevitable, considering its own logic and contradictions. With Schumpeter we can conceive that and the entrepreneur is a central figure in the innovation process capable of dynamizing the economic system and developing capitalism, this theorist does not deny that entrepreneurship and innovation are not enough to guarantee the infallibility of capitalism; this is because, as it has already been demonstrated, the central motivating factor for the entrepreneur to make use of innovation is the search for profit, it is the need to aim for financial success, status, and power.

We can perceive, therefore, with this text, that the economics-based comprehension of the relationship between the entrepreneur and innovation is not enough to understand the contradictions of capitalism and its inevitable overthrow.

Innovation in the mercantilist sense practically only mobilizes resources and actions to maintain a system where there is no place for the majority. This is just a maneuver mass.

Finally, the thinker Max Weber offers a reading of rationality in capitalism, so that the Protestant ethics joins the spirit of capitalism in the sense of making a profit.

The Weberian perspective also dialogues with Marx and Schumpeter in order to understand the mechanisms and practices of capitalism; hence, we also understand the relationship between entrepreneur and innovation in a way that the use of technologies and capital are vital in production and market relations.

This text did not intend in any way to exhaust the subject of capitalism, entrepreneurship, and innovation, but only to present subsidies for discussion in the sense of seeking ways to clarify the uses and abuses of capitalism in society and, mainly, to avoid any romanticism or naivete about the contradictory nature of that system.

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INNOVATION IN PUBLIC ADMINISTRATION IN BRAZIL

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When studying the history of Brazil we see how it evolved from a colony to a democratic state of law, with territory, autonomous and sovereign. However, the administrative aspect that sustained this evolution is always approached superficially, making it difficult for citizens to understand the functioning and purpose of the portentous management structure responsible for ensuring that the public administration develops its activities for the common welfare.

In the republican era, the landmark of the implantation of the classic public administration, replacing the patrimonialist model, is the creation of the Department of Public Service Administration - DASP, in 1936.

The expansion of the social and economic intervention of the State, associated with the period of the military dictatorship, not at the end of the 60s, are the first indications for an attempt to decentralize competences for an indirect administration. This movement left gaps in the centralized or strategic administration, as it was known, which ended up being filled by professionals recruited from the private sector's business environment (KLUMB, 2016).

The Federal Constitution of 1988 sought to eliminate the problems that prevented the realization of the bureaucratic model, accentuated the legalistic control by choosing to eliminate the flexibility and autonomy of the decentralized administration. In the same line of understanding, it extended the rules and controls of direct administration to all public organizations, including in this package public tenders for access to the civil service, the bids for purchases and the salary isonomy between public servants.

The Brazilian public sector enters the 21st Century plagued by an institutional and managerial crisis at all levels (federal, state and municipal). There are, at this moment, different attempts to build a substitute model with a focus on society, on the citizen.

The crisis becomes more visible when we observe the speed of changes and the spread of management technologies in the private sector, in contrast to the resistance and to the rigidity of the public sector.

The trend that has been observed in this movement and that characterizes this new administration format is the adaptation by public managers of organizational references and governance most commonly seen in the private sector. In this context, what is sought is to improve organizational performance, reduce conflicts, align actions and bring more security to society.

In view of the need increasingly demanded by the final user, the public administration seeks to incorporate more agile methodologies. Therefore, the public administration, in an attempt to accompany this movement, has been profoundly changing the current management model. About this theme this chapter deals with.

THE PUBLIC ADMINISTRATION

Initially, we will understand what public administration is, and only then will we enter the intricacies of management.

The Master Hely Lopes Meirelles teaches that Public Administration

> in a formal sense, it is the set of departments established to achieve the Government's objectives; in a material sense, it is the set of functions necessary for public services in general; in an operational sense, it is the perennial and systematic, legal and technical performance of the State's own services or assumed by it for the benefit of the community. In a global view, the Administration is, therefore, all the equipment of the State preordained to the performance of its services, aiming to satisfy the collective needs. The Administration does not practice acts of government; it only performs acts of execution, with greater or lesser functional autonomy, according to the competence of the department and its agents. (MEIRELLES, 2013)

He completes explaining that the government is a political and discretionary activity, while the administration is an activity linked to the law or to the technical norm, therefore, neutral.

In the words of Maquiné (2017), public administration is the set of departments, services and agents of the State, which aim to ensure the satisfaction of society's needs. In other words, they are intended to put into practice political functions and services provided by the government.

Historically, we can observe an evolution in public administration which is represented by three models, namely: patrimonial, bureaucratic and managerial. According to theorists, this evolution occurred in order to make up for some deficiency of the previous model when introducing new concepts or changing inefficient and harmful concepts to the State apparatus. Fiates (2007) teaches that "the configuration of public management models is influenced by the historical moment and by the political culture that characterize a determined time in the country".

At the time of the Empire, the patrimonial public administration dictated an absolute state and an extension of the sovereign's power, confusing the patrimony, with undesirable characteristics such as corruption and nepotism. Bureaucratic public administration emerges in the 19th century as a way to fight corruption and nepotism, it is the Vargas Era with strict control of processes and focus on the internal environment (careers, functional hierarchies, formalisms). Based on this, in the 20th century, managerial public administration emerges in the context of the Democratic State with the duty to generate common welfare and focus on the user-citizen, bringing with it the concepts of efficiency and control of equivalent results.

Table 1 summarizes these concepts and proposes to facilitate the understanding by the reader about the models of public administration.

Table 1 – Public administration models

Model	Features
Patrimonial public administration	Typical of monarchies, pre-capitalist, but still existing; The state apparatus functions as an extension of the sovereign's power; The sovereign's auxiliaries and servants have the status of royal nobility; Positions are considered prebends (little work and high pay); Public activities are carried out without responsibility (sinecure); The res publica (public goods) is not distinguished from the res principis (sovereign thing); System of personal privileges: gerontocracy, oligarchy, favoritism. Consequential: Corruption, nepotism and non-fulfillment of society's interests.
Bureaucratic public administration	It appeared in the Liberal State (democracy) - 19th century; System idealized by Max Weber based on the rational-legal system of organization; Purpose to fight corruption and nepotism; Professionalization of public service: merit, career, formalism, hierarchy, impersonality, public office; Professionalization of public service: merit, career, formalism, hierarchy, impersonality, public office; Dysfunctions: excessive queuing, formalism, corruption, clientelism.
Managerial public administration	It appeared in the second half of the 20th century; It stems from the economic and social activities developed by the State; Seeks the efficiency of the public service and quality in the provision of these services; Development of the managerial culture within Public Administration: use of modern techniques of managerial administration (managerialism); Supports Bureaucratic Administration in the use of its principles. Control over results, not processes.

Source: Extracted from MAQUINÉ 2017.

On the other hand, administratively, the Brazilian State is divided into three levels of government: federal, state and municipal. Each public sphere has its responsibilities and different levels of autonomy, the latter being responsible for determining the matters that can be legislated and the limits of the Executive's action. This shows the lack of hierarchy among the federal entities (26 member states, one Federal District and 5,570 municipalities). In other words, as exemplified by the Politize Portal, "the President of the Republic does not rule over governors, who also do not rule over mayors". The table below summarizes what the federal, state and municipal do.

Table 2 – Responsibility of the three levels of government for health, education, security and justice, infrastructure and others

Level/ Service	Health	Education	Security and Justice	Infraestructure	Others
Federal	It has no direct responsibility for health services, but organizes and finances SUS (Unified Health System)	Creates the National Education Policy Regulates educational institutions University education Technical education	National Defense (including the Armed Forces) Federal Police Federal Prisons Higher Courts	Major infrastructure projects (ex: federal interstate highways, railways, dams, international airports) Electricity generation and distribution (including the construction of hydroelectric and thermoelectric plants)	International relations and trade Fiscal, foreign exchange and monetary policies Social Security Land reform
State	Assistance for more complex cases, diagnoses and therapies (ex: hospitals)	High school education 2nd part of elementary school education Some states also offer higher education	Military police Civil police Fire Department Criminal Executions System State Courts	Highways connecting state cities Regional airports Water supply works	Popular housing (the Union and Municipalities can also participate) Intercity public transport (buses and trains)
Municipal	Basic care (ex: health posts)	Daycare Child education Education of 1st part of elementary school	Municipal Civil Guard	Basic sanitation (water and sewage) Street lighting Asphalting of the streets Municipal highways Public spaces (such as parks and gyms) Urban mobility (ex: bicycle lanes and bus lanes)	Urban planning Garbage collection and recycling Urban cleaning Traffic management Urban public transport

Source: Extracted from (MATTOS, 2017).

The main activities carried out in each administrative sphere of government necessarily involve public spending and, considering the necessary transparency in the handling of public resources, the Federal Constitution (BRAZIL, 1988), in Title IV of the Organization of Powers, provides

> **Article 70.** Control of accounts, finances, budget, operations and property of the Union and of the agencies of the direct and indirect administration, as to lawfulness, legitimacy, economic efficiency, application of subsidies and waiver of revenues, shall be exercised by the National Congress, by means of external control and of the internal control system of each Power. (CA No. 19, 1998)
>
> **Sole paragraph.** Accounts shall be rendered by any individual or corporation, public or private, which uses, collects, keeps, manages, or administers public monies, assets or values, or those for which the Union is responsible or which, on behalf of the Union, assumes obligations of a pecuniary nature.

Thus, in Brazil, external control is mandatory at all three levels of government, such as the levels of autonomy of responsibility for the services provided by each federative entity, with no hierarchical level between them. In this sense, article 75 of the Brazilian Magna Carta is also legislated (BRASIL, 1988).

In the year 1942 the Law of Introduction to the rules of Brazilian Law (BRASIL, 2018) determined in Article 3 that nobody can excuse himself from complying with the law claiming that he does not know it.

Going further, in 2018 this precept was extended, nominally, to the administrative and controlling spheres, beyond the judicial, and recorded in the Article 22 that "In the interpretation of a rule on public management, the real obstacles and difficulties of the manager and public policy requirements under their responsibility, without prejudice to administrative rights ". Therefore, it appears that accountability to external control, through the use of public resources, in addition to a constitutional provision was definitively incorporated into the Brazilian legal system.

A brief mnemonic exercise can give an insight into the importance of external control for public administration. Previously, as shown in Table 2, it is possible to see that the public administration comprises different services, all aimed at serving the collective. In a simplified way, by multiplying the first five retro services indicated by the 5,570 Brazilian municipalities, plus the Federal District and the twenty-six member states, it is possible to obtain a pale dimension of the mechanisms spent so that the machine called public administration works and meets the needs of the public. purposes for which it is intended. In view of this, it is believed that it would be even more complex if there was no supervisory body that would curb the many attempts to circumvent this system in municipalities, states and the Union, making it difficult to find public resources. Thus, this is the function of external control, more specifically, the function of the courts of auditors.

INNOVATION IN PUBLIC MANAGEMENT

To understand management, it is imperative to first understand the concept of governance in the public sphere. In the exact words of the Federal Audit Court (TCU, 2020), Governance in the public sector essentially comprises the mechanisms of leadership, strategy and control put in place to assess, direct and monitor the performance of management, with a view to conducting public policies and the provision of services of interest to society. Governance for the public sector adapts the principles of corporate governance to the public area (SILVA, 2011).

Governance and management are disparate but complementary functions. This dichotomy in these concepts highlights concerns in the public sphere regarding the capacity to effectively and decisively solve public problems, the reason for their existence and the reframing of the concept and existence of the State (PETERS, 2013). Furthermore, it defends a concept of governance with a focus on the basic functions that must be developed to govern itself, in line with the vision under which this work is approached. Still in the text, Peters (2013) clarifies that "governance comes from a Greek word that means direction", which, interestingly, is the root for the word cybernetics or the science of control. However, of course, the fundamental meaning of governance is to direct the economy and society towards collective goals.

Thereby understood, governance in the public sector today is seen from four perspectives or major axes (TCU, 2020), namely:

- Society and State: define the rules and principles that guide the performance of public and private agents governed by the Constitution and create the structural conditions for State administration and control;
- Federative entities, spheres of power and public policies: they are concerned with public policies and with the relationships between structures and sectors, including different spheres, powers, levels of government and representatives of organized civil society;
- Departments and entities: ensure that each body or entity fulfills its role;
- Intraorganizational activities: reduce risks, optimize results and add value to departments or entities.

It is important to note that governance practices are based on general principles applicable to public or private undertakings, in an indiscriminate manner, as the objective is to improve controls and transparency. In this line of understanding, governance for the public sector adjusts the principles of corporate governance to the public area, principles that are characterized as the guiding pillars of this process, as defined (BRASIL, 2020):

- accountability, the obligation of governance agents to account for their functional performance, on a voluntary basis, fully assuming the consequences of their acts and omissions;
- fairness, guaranteeing the conditions for everyone to have access to the exercise of their civil rights (freedom of expression, access to information, association, voting, gender equality), political and social (health, education, etc.);
- transparency, doing what needs to be done with adequate quality at the lowest possible cost, in order to seek the best relationship between quality of service and quality of expenditure.

Governance is a reflection of the interaction and organization of different actors. And, as defined in the Basic Governance Reference of the Federal Court of Accounts - TCU (BRASIL, 2014), it involves "administrative structures (instances), work processes, instruments (tools, documents, etc.), the flow of information and the behavior of people directly or indirectly involved in the assessment, direction and monitoring the organization ".

On the other hand, it is important to note that the advent of the internet has not only broken the geographical and knowledge limitations for humans. The globalization process has led to discussions and debates around the world among people separated by continental distances, which has caused significant changes in human understanding and behavior.

> In this process, some countries are moving towards a complete reorientation of the government's role in society, with a reshaping of the administrative political relationship designed to ensure greater responsibility and a reduction in the power of administrators. Control, historically, has been working as an extremely important instrument for public administrations to provide transparency in the actions taken by their agents. (SILVA, 2011).

The G8[3], the World Bank, the International Monetary Fund - IMF and the Organization for Economic Cooperation and Development - OECD, are some institutions of great international relevance that are dedicated to promoting governance (BRASIL, 2014).

Society is the highest level and to which all activities developed by both governance and management are aimed, the latter characterized by tactical or operational activities.

The word management derives from the Latin gerere, which means to administer/administration or act of managing/management (QUEIROZ, 1961). If we consider that managing is planning, controlling and directing people to achieve the goals of an organization, then management would be the use of the functions and knowledge necessary to achieve the goals of the organization efficiently and effectively. It is a necessary practice for the system to be successful. Evaluating metrics and results based on day-to-day decisions ensures controls and transparency necessary for decision making inherent to the activity (BRASIL, 2014). More objectively, management is a governance activity.

The management of people, processes and systems is a long way to be taken by public institutions in the search for better results. Like practices in the private sector for problem solving, unlike the public sphere, for the business world, the manager is the person with the capacity and responsibility to solve problems.

This process of incorporating business management practices into public management is taking place at an increasingly accelerated rate. This fact, added to the speed in the incorporation and dissemination of new technologies, has characterized a symptomatic tendency of the public administration to incorporate what we can call

> waves of innovation in the field of administration. It is not a question of underestimating the possible gains that the incorporation of these managerial technologies may bring to the public sector, but rather of pointing out the absence of a model that can deal with both managerial problems and institutional problems of what is public. It is in the public field that the main problems arising from the complexity that live are: conflict of interests, unequal income distribution, poverty, degradation of urban life, violence, land conflicts, unemployment, among others.
>
> The current situation is one of confrontation between the administrative rigidity of the State - incompatible with the new context of political, economic and

3 Meeting of the eight most developed countries.

> social transformations - and a great force of change has been manifesting itself increasingly, under different forms and dispersed incidence. Constitutional reform projects under discussion in the Executive and Legislative branches, full of conflicts and dubious consensus: the movement to escape the legal-institutional bonds in the public service through various forms of public-private association not always favorable to the public interest and questionable legality : and the growing interest of society in collective matters manifested by all types of society organizations demonstrate the transformation. (GALVÃO, 1997)

Although it is desirable to incorporate more agile methodologies into the public sector, it is important to align the business objectives with the innovations to be incorporated. This is only possible if leaders are involved in this process, indicating and identifying where to improve and the opportunities for innovation to be developed or adopted.

Therefore, has if to innovate is a fundamental capacity in this new management model.

In 2008, FAPESP's scientific director, Carlos Henrique de Brito Cruz, pointed out in an interview that in Brazil "It is assumed that the private sector wants to take advantage of the public sector or that the public sector wants to put itself up for sale. The examples of these countries show that the two sectors can collaborate, for the benefit of both the public and private interests, and that this can be good for the country "(MARQUES, 2008). The nations to which the interviewee refers refer to the following countries: United States, France, Canada, Ireland, United Kingdom, Finland and Japan. These countries were the subject of the research Mobit - Brazilian Mobilization for Innovation, whose focus was to compile initiatives adopted to form research networks, articulation of resources and public and private efforts, in particular to form consensus on the objectives to be achieved.

The project Measuring Innovation in the Public Sector in Nordic Countries, (Mepin – Measuring Public Innovation in the Nordic Countries), the Innovation Unit and the National Endowement for Science Technology and the Arts (Nesta), in the UK, and the Australian Public Sector Innovation Indicators project (APSS – Australian Public Sector Innovation Indicators Project), in Australia, are examples of how countries have made efforts to institutionalize innovation in conceptual and methodological terms in order to create conditions for the continuous improvement of public services and citizenship (ISIDRO, 2017).

In Brazil, this movement has, over the successive administrations, been named a new administration, entrepreneurial government, new public service, direct administration, administration of the people to the people, characterizing and externalizing efforts for the best delivery of services to society and effective compliance the primary attribution of each department or unit.

At the core of the many reform movements that have taken place in different administrations, what is observed is that innovation is also the insurgency of some public servants and emerges as the guiding thread of transformations implemented in the internal processes developed, always with a view to qualitative improvement delivery of services to society.

If, by one side, innovation is the guiding thread, technological innovation is responsible for the great qualitative leap that influences large-scale decision-making.

FINAL CONSIDERATIONS

The advent of the internet and the end of territorial boundaries for knowledge were driving the changes of this globalized world in which we are inserted, but before that it is imperative to understand that society has transformed itself and started to understand the space and the institutions that surround it under a new perspective, starting to demand more agility and quality in the products or services provided.

In this pitch, the Brazilian public service has been seeking to adapt and build a substitute model focused on society, centered on the citizen. However, the speed of changes and the spread of management technologies in the private sector make it difficult to incorporate them in the face of public sector resistance and rigidity. All that remains, on this horizon, is only to seek to improve organizational performance, reduce conflicts, align actions to bring more security to society. It is observed, therefore, that this movement of insurgency in public administration profoundly modifies the current management model, which is the theme on which we discuss.

Given the above, it was possible to realize that, although it is desirable to incorporate more agile methodologies to the public sector, it is essential to align the business objectives with the innovations to be incorporated. This parity is only possible if the central or high-level managers are trained and are involved in this process. Given this, it was also noticed the existence of a growing movement within the public administration that understands that innovation is a fundamental capacity to do more and better and overcome challenges in all areas, to serve this transformed society.

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TOCANTINS, A BRAZILIAN STATE IN THE PROCESS OF BUILDING ITS INNOVATIVE DNA

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The Brazilian innovative capacity is constantly questioned, especially regarding the capacity of companies in Brazil to start a virtuous circle of innovations that results from public and private investment in Research and Development and Innovation - P,D&I (KISSLER; HEIDEMANN, 2006; MCTIC, 2020; FORTEC, 2018; CGEE, 2010). In recent years, many efforts have been made by public entities, especially in the creation of mechanisms to create support environments and allocate voluminous credit and grant resources. This is a mirror of the realities found in the states, including the State of Tocantins, located in the Northern Region of Brazil and integrated with the Legal Amazon and MATOPIBA.

Amazônia Legal was created by the Brazilian government in the 1950s as an attempt to develop and integrate the Amazon basin region through fictional incentives, as well as to plan and promote the social and economic development of the states of the Amazon region, which historically share the same economic, political and social challenges. It includes the states of Amazonas, Roraima, Rondônia, Pará, Amapá, Acre, Tocantins, Mato Grosso and part of Maranhão. With an area of approximately 5,015,067.749 km², corresponding to about 58.9% of Brazilian territory. It encompasses 37% of the Cerrado Biome, 40% of the Pantanal Biome and small stretches of varied plant formations. The Amazon has approximately 40,000 species of plants and over 400 mammals. The birds total almost 1,300, the insects reach millions and the Amazonian rivers keep thousands of fish species.

The MATOPITA region is considered the great Brazilian agricultural frontier of today, comprising the Cerrado biome of the states of Maranhão, Tocantins, Piauí and Bahia and is responsible for significant grain and fiber production. In recent years, only the State of Tocantins has expanded its planted area at a rate of 25% per year. The flat topography, deep soils and favorable climate for the cultivation of the main grain and fiber crops made possible the vertiginous growth of the region, which until the end of the 1980s was dedicated to extensive cattle raising.

It is pertinent to affirm that public policies should foster socially relevant activities and, in addition, provide the appropriate incentives for the promoters and promoters of innovative environments. Science and innovation are done by and with qualified people, adequate structures and favorable political and economic environments. Based on the Brazilian System of Technology - SIBRATEC, created by Decree No. 6.259, of November 21, 2007, and complemented by the Resolution of the Management Committee SIBRATEC No. 001, of March 17, 2008, designed to meet specific demands of business and strategic sectors of the country, established in the

Action Plan of Science, Technology and Innovation for National Development 2007-2010 and the Productive Development Policy. In the state of Tocantins there are no records of Scientific and Technological Research Institutions - ICT, although the FORMICT report, made available annually by the Ministry of Science, Technology, Innovation and Communications points out these structures in the state of Tocantins, both public and private, linked especially to Higher Education Institutions (MCTIC, 2019, 2020; VELHO, 2019; KISSLER; HEIDEMANN, 2006; DOSI; PAVITT; SOETE, 1990).

Regarding the innovative environments of the State of Tocantins, the municipalities of Araguaína, Palmas and Gurupi have business incubators, installed within public and private educational institutions. As well as Technology Parks with physical and digital structures, linked to the State Government and Sebrae Tocantins. There are few references of the presence of these actors in other municipalities that make up the macro regions North, Central and South Tocantins.

The state of Tocantins is made up of 139 municipalities, which total more than 1.5 million inhabitants, according to the population estimates of the Brazilian Institute of Geography and Statistics -IBGE. The state capital, Palmas, is the most populous municipality and has more than 279 thousand inhabitants, followed by Araguaína and Gurupi respectively. Similarly, Palmas, Araguaína and Gurupi make up the three municipalities that contribute most to the GDP of the state.

Although the Tocantins government provides studies that present the state's vocations and trends, the structures that promote innovation environments within the state do not have structured planning linked to these vocations and potentialities, especially those presented by the CERTI Foundation to the State Government in 2017. It was noted that part of the courses offered at technical and higher education institutions has sought alignment in this regard, especially with regard to post-graduate course offerings.

The highest incidence of Higher Education Institutions is in the municipality of Palmas, followed by Gurupi and Araguaína. Although the research is limited to the three largest municipalities in the regions, just over 20% of the institutions have institutionalized structures dedicated to promoting innovation and entrepreneurship, especially business incubators, technology transfer innovation centers and science and technology parks. However, the capillaries of federal and state institutions, such as the Federal Institute of Tocantins-IFTO, Federal University of Tocantins-UFT and State University of Tocantins-UNITINS, have not taken advantage of the site in promoting the installation of these environments.

They are the fostering institutions that support innovation, technology, research and entrepreneurship in the state of Tocantins, whether with their own resources or those of third parties, financial and/or economic. Respecting the regional characteristics in which the state fits in, one can perceive similarity with the other states in the Northern Region of Brazil, in terms of the availability of investments and incentives from private and public initiatives. The greatest concentration of these environments is in the municipality of Palmas, and several factors can be pointed out, such as: greater number of educational institutions installed in the municipality, greater concentration of population, greater concentration of political environment, among others.

Although some of the State institutions promote training cycles, pre-acceleration, financing programs, rounds of investment, among others, actions in this sense are still considered punctual. Tocantins does not have effective public policies to encourage, promote and sustain innovation, technology and entrepreneurship. And the adherence to national programs, observing the particularities and needs of Tocantins can be considered timid.

The state of Tocantins, with support from the Ministry of Science, Technology, Innovation and Communications and the State Government, seeks to foster the constitution of a solid Innovation Ecosystem that allows for the systematic emergence of innovative ventures, especially from universities and knowledge-generating centers, capable of diversifying the region's economic matrix and boosting installed skills. Faced with this context, in 2017, the CERTI Foundation was hired by the Tocantins Scientific and Technological Support Foundation - FAPTO to support the structuring of the Technological Park and its Innovation Center.

The Innovation and Technology Transfer Centers, installed in State Higher Education Institutions, can be perceived as mediators in the relations between Researchers - Universities - Companies, since their actions are based on the development of an innovative culture, in terms of intellectual property and market appropriation of technologies. The existing configurations in the public institutions of the State are similar, since they seek to parameterize the performance in national network.

In the state of Tocantins, few municipalities have a basic structure supported by legislation to promote research, science, innovation, technology and entrepreneurship. With greater relevance we can mention the program Inova Gurupi, idealized, camped and managed by the Municipality of Gurupi, in partnership with other actors of the local ecosystem.

Within the structure of the State Government, at each management, arrangements are created with a view to promoting science, technology and innovation. However, Tocantins does not have structured and perennial programs that enable sustainability and continuity of processes. The constant exchange of managers and teams can be one of the aggravating factors of this reality.

In relation to scientific and technological development, as disclosed by the latest editions of the FORMIC report, the potential for technology transfer resulting from research to the market, Tocantins is visibly behind schedule. There is an urgent need recognized by the State Government to involve more sectors of society to contribute to changing this scenario. Today Tocantins is seen as a corridor of outflow, but there is a real prospect of progress in several sectors, especially in public-private partnership.

Thinking about an ideal model of innovation management, especially regarding the relationship and positioning of actors, is challenging. Before proposals are idealized, when it comes to states and municipalities, it becomes important to understand how these processes take place and, especially, how the actors have moved within an ecosystem that is relatively new, given the maturity characteristics of the state.

Regarding the generation of resources, one of the challenges is to promote strategies that enable the development of incubators, science and technology parks and innovation and technology transfer nuclei, with the possibility of interaction and fundraising with private initiative. Achieving financial sustainability represents a challenge for the structures mentioned above.

Another challenge involves macroeconomic aspects that reduce the speed of implementation and expansion of these actors. Due to their innovation-oriented nature, they are associated with risks that, together with a slowed down economy and lack of investments, may reduce even more the willingness of those involved in the processes. In a situation where public resources are scarce and there is no transparency in the application of resources destined to science, innovation and technology, the development cycle is slower. State results indicate an important point of reflection for managers, since the scarcity of favorable political environment, structures, public resources and bureaucracy may make innovation by institutions impossible. The fact is that government incentives can reduce pressure in the search for these state actors, promoters of innovation, for sustainability and perenniality. For example, approximation with private initiative and international institutions.

The creation of a culture that encourages research, development and innovation in companies in the region is sought after by public and private educational institutions in Tocantins. Although there are several initiatives that foster entrepreneurship, innovation and technology in the state, the achievement of the scientific and technological park, in which companies can benefit from intense interaction with governments and academia to generate innovations, still seems distant.

Bringing the scientific community and the market closer together is still an obstacle to promoting innovation in the tocantinese ecosystem. Although often incubator centers of innovation and parks are within universities, the existing barriers between researchers and entrepreneurs tocantinense are great. A situation that may aggravate these processes is based on the assumption that researchers are still evaluated by academic or scientific indicators, whose activities are distant from the needs of the market and, in particular, the political and economic objectives of the region. In addition, communication between researchers and entrepreneurs tends to be quite truncated and does not provide a favorable environment for the parties to be interested.

There is a demand for the creation of tools that can contribute to the capture and installation of companies, including in these environments the companies that can anchor processes linked to the macro axes of the State. Institutional structures, such as laboratories, should be made available not only to the installed enterprises, but also to the community and local companies (ARANHA, 2016; ARBIX et al., 2010; AUDY; PIQUÉ, 2016; AULICINO; PETRONI, 2012; CAVALCANTE, 2013; CGEE, 2010; CHESBROUGH, 2003).

What do we want as results with innovation, science and technology in the State of Tocantins? What do we need to achieve the results that contribute to the promotion and development of the region? How can our innovative environment be improved? The answers to these questions converge to the understanding that innovation is a way to promote the economic development and development of municipalities, state and country. Developed countries have already understood that through technological development it is possible to create new companies with qualified jobs, which develop innovative products. These companies have a greater chance of being more competitive in the global market. But for us to have a virtuous cycle it is necessary to develop and strengthen the following elements: talent, knowledge centers with advanced research and development activities, entrepreneurs willing to create new technology-based companies, research and development in companies, innovative products, interaction and cooperation between universities and companies, networking and organized clusters.

Innovation policies in Brazil have expanded considerably since 2000, even with these advances, the governance of such policies is perceived with great complexity, given the number

of institutions responsible for designing and implementing programs, most of them disjointed. Policies successfully implemented and managed in other Brazilian states, including other countries, can be observed by Tocantins.

Successful international experiences indicate that without an established and efficient institutional framework, the implementation of innovation policies becomes volatile and incapable of supporting actors, especially those linked to the private sector, to innovate in the requirements demanded by global competition. The governance structure of innovation policies in Brazil is robust, complex and diffuse, despite the sophistication of support instruments.

As for the process of decentralization of federal development, its effectiveness is still questioned, given the existence of institutional overlaps that do not make such a governance structure more agile and effective. The ideal is that these governance structures vary according to the type of productive system of each region. This, in turn, is determined by the structure of production, agglomeration of companies, coordination between agents, penetration of industries in the market, institutional density and social fabric of the region.

Three internal elements can be pointed out that make it possible to take advantage of these opportunities: the environment conducive to innovation, creative people prepared and stimulated to innovate, and the systematic and continuous process of innovation. It is noted that in all these elements, people are considered the fundamental element. Other assets make an important contribution to the capacity to innovate, such as public policies, investments and government incentives, articulation between associations and federations of companies, opening up universities and institutes to partnerships, and financing and promotion of innovation (CAVALCANTE, 2013).

The governance of activities should not be obtained by an actor in isolation, but from the social capital accumulated by institutions that interact with each other and share useful knowledge during the process of innovative effort within the ecosystem. The figure of the State Government, here, would enter as the organizer of this political environment. Care should be taken regarding excessive organizational rigidity, otherwise immediate results tend to promote the weakening of purposes, with duplication of efforts, resources and the measurement of the negatively affected impact.

The monitoring of innovation policy has to deal with a triple institutionality, national, regional and local. The question opens discussion around regional economic development and how this institutionality helps in the processes of technological diffusion in specific regions, in this case the State of Tocantins: MATOPIBA and Legal Amazon, considered regions with great potential and that contribute significantly to the national context. The political actions originated from the movement of the Tocantins ecosystem should guide development processes for these macro regions. As well as in the implementation of measures that catalyze the processes of integration of innovation policies, of the State, with those of economic nature tend to accelerate the process of innovation within companies. This is a reality present in countries that have defined innovation as a strategy for economic development, in a growing and fragmented scenario of global value chains.

For the proper functioning of the tocantinese ecosystem, the presence of multiple actors is necessary, primordial in the process of strengthening and expansion. The actors are the ones who will provide the necessary resources for the nascent and already installed companies to

prosper. That provides start-up companies with the necessary tangible resources, including office space, telecommunications facilities, and transportation infrastructure. In addition to the promotion and investment of the structures already installed, the State has a commitment with public resources to evolve in these areas. Streamlining the process of installing the Technology Park, for example, will bring considerable gains for the development of the regional ecosystem.

Reducing costs and improving the business environment, while seeking to correct incoherent or inefficient policies, is the key to generating innovation policies, i.e., the adoption of innovation from a broader perspective, being stimulated and promoted through various integrated government areas.

Under these conditions, the state government has the autonomy required to decide the scope of its public policies and the allocation of its fiscal resources. Another aspect that should be considered, when thinking about governance and innovation ecosystem, after all, the State of Tocantins counts on resources destined to the application in science, technology and innovation. It is important to find out how these resources have been applied, including academic studies in this sense. It is ideal that the participation of the actors interested in the conduction and success of the processes related to the park be contemplated. This aspect may also be the object of study, especially with regard to the allocation of public resources and the recurrence of initiatives.

Cavalcante (2013) suggests that there is a diffuse consensus in Brazilian innovation policies that permanently opposes a confused dissent that in turn raises institutional obstacles to the implementation of these policies. The obstacles would not derive from the nature of the instruments, since they are quite similar to those adopted in developed countries, but result from the detachment of the institutional structure from those who operate them.

Under the umbrella of public governance, citizens and other organizations are called partners, with whom the public sphere builds models of relationship and coordination in the process of public policy making. Kissler (2006) considered public sector partners as entities or individuals affected by the intentions, objectives, strategies, social and economic activities of the entities and who therefore have the right to know what the government intends to achieve in a specific period and what has actually been accomplished.

The State of Tocantins must have mechanisms that allow it to reach maturity in order to contribute with integrated and complementary innovation policies, so that, in the long term, they reach competitive levels that allow companies in Tocantins to operate in demanding markets with high added value, including promoting autonomy and performance of institutionalized structures, such as the Foundation for Research Support of the State of Tocantins - FAPT. It is based on the assumption that there is no effective and consolidated structure in the Tocantins State Government that understands and attends to the actors of the ecosystem. Isolated, unsustainable and disconnected actions can be identified when investigating sites and institutional documents of the Government, municipalities and Tocantins partners, but little connected.

The demands are always greater than the available resources, and Tocantins is a state with a high diversity of skills and needs. Based on the premise that innovation policies are aimed at economic development, an inclusive and systemic policy must foresee short, medium and long term actions and must consider the degree of maturity of the sites to be encouraged via public policies. The implementation of a macro institutionalization, focused on the delta of state opportunities, may be an alternative.

Creating indicators that meet the particularities of the MATOPIBA and Legal Amazon regions becomes fundamental in the process of promoting and identity of the tocantinense innovation ecosystem. Traditional indicators and new indicators of science, technology and innovation have their limitations in the face of the circumstances in which the globalization process finds itself. In light of this, Velho (2007) highlights that despite the efforts directed by the country to collect information, generate databases and produce scientific and technological indicators, it is still far from the information systems in science and technology established by European countries. The measurement of the degree of innovation of institutions, reflects in scale the degree of innovation of the ecosystem, provided that the indicators are aligned with macro purposes.

Requirements such as: the generation of new technology-based businesses; the approximation of researchers and medium and large companies; the support for new business models; the reduction of corruption; the reduction of bureaucracy; access to credit, especially for start-ups; the strengthening of institutions; a quality education; among others already mentioned are constantly demanded by actors of the tocantinese innovation ecosystem.

Faced with complexity, the innovative intention of companies and governments is not enough. First of all, collaboration is needed, such as interactions aimed at generating knowledge, cooperation aimed at reducing individual investment and sharing risks, for example. Cluster-based models of action (PORTER, 1990), public policies to foster networking, public policies to foster university-enterprise cooperation, implementation of technology parks, are examples of alternatives to collaborate in crossing existing barriers in the innovation trajectory.

Aware of this, actors interested in the economic development of the regions started to invest in the creation of business incubators. In this sense, in the state of Tocantins, several institutions and arrangements with complementary roles in the innovation process can be pointed out. Although we do not find consolidated scenarios in terms of governance models for innovation ecosystems in Brazil, it is imperative that models that do not contemplate the effective participation and performance of local actors tend to fail.

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A METHODOLOGICAL PROPOSAL FOR THE CONSTRUCTION OF THE INNOVATION POLICY: THE CASE OF THE FEDERAL INSTITUTE OF TOCANTINS

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ABSTRACT

Innovation is one of the factors that guides the country's economic, social and cultural development, so Brazil has sought to structure the innovation system of Science and Technology Institutions - ICTs and Federal Institutions of Higher Education - IFE´s. One of the stages of this innovative process is the construction of the Innovation Policy aligned with the primary objective of the institutions, which is to be an instrument for the regional development of the locations where they operate. It is noticed that, even after the legal determination for public ICTs to implement their innovation policies, there is a delay in these institutions in preparing such an instrument, due to several factors that are not the focus of this research. This article aims to present the results and discussions of the Federal Institute of Tocantins case in the construction of its Innovation Policy, and may be the indication of a method for these institutions that have not yet developed their policies. This article had the exploratory methodology in the case study and bibliographic modalities. In the case study, the experimental collection used by the Federal Institute of Tocantins was used to build its Innovation Policy that took place during 2019, through documentary investigation. Thus, it was concluded that the path taken by the Federal Institute of Tocantins for the elaboration of its Innovation Policy can be considered a satisfactory method for other institutions to build its Innovation Policies.

Key-words: Innovation; development; innovation policies

Abstracto

La innovación es uno de los factores que orienta el desarrollo económico, social y cultural del país, por lo que Brasil ha buscado estructurar el sistema de innovación de las Instituciones de Ciencia y Tecnología - TIC e Instituciones Federales de Educación Superior - IFE. Una de las etapas de este proceso innovador es la construcción de la Política de Innovación alineada con el objetivo primordial de las instituciones, que es ser un instrumento para el desarrollo regional de

las localidades donde operan. Se advierte que, aún después de la determinación legal de que las TIC públicas implementen sus políticas de innovación, existe un retraso en estas instituciones en la elaboración de dicho instrumento, debido a varios factores que no son el foco de esta investigación. Este artículo tiene como objetivo presentar los resultados y discusiones del caso del Instituto Federal de Tocantins en la construcción de su Política de Innovación, y puede ser la indicación de un método para estas instituciones que aún no han desarrollado sus políticas. Este artículo tuvo la metodología exploratoria en las modalidades de estudio de caso y bibliográfica. En el caso de estudio, la colección experimental utilizada por el Instituto Federal de Tocantins fue utilizada para construir su Política de Innovación que se llevó a cabo durante 2019, a través de la investigación documental. Así, se concluyó que el camino recorrido por el Instituto Federal de Tocantins para la elaboración de su Política de Innovación puede considerarse un método satisfactorio para que otras instituciones construyan sus Políticas de Innovación.

Palabras clave: Innovación; desarrollo; políticas de innovación

INTRODUCTION

Brazil, since 2004, with the enactment of the Innovation Law No. 10,973 / 2004, has sought to associate its strategic planning with the promotion of technological innovation and entrepreneurship across the country. And, with regard to legislation, there is a framework of rules that provides for incentives for scientific development, research, scientific and technological training and innovation, which became known as the New Legal Framework for Innovation, which determines the mandatory nature of Science, Technology and Innovation Institutions - ICTs elaborate their Innovation Policies.

The elaboration of the Innovation Policy must be in line with the different laws, starting with the Constitution with the provisions of Constitutional Amendment nº 85, of February 16, 2015, which changes and adds provisions in the Federal Constitution to update the treatment of the activities of Science, Technology and Innovation - CT&I, also, with the provisions of the Innovation Law, Law No. 10,973, of December 2, 2004, modified by Law No. 13,243, of January 11, 2016, regulated by Decree No. 9,283 of February 7 2018, which establishes that every public ICT must have an Innovation Policy. Still, within the scope of the ICT, there are the Internal Regulations and the Institutional Development Plan that must be observed when preparing the Innovation Policy.

The foundation of this legislative set allows ICTs to elaborate their Innovation Policy with the purpose of instituting, stimulating, promoting and mobilizing activities that promote the development of Research, Development and Innovation - RD&I, with the aim of increasing technological, entrepreneurial and innovative efficiency in production of goods, processes and services. However, due to several factors, the vast majority of ICTs have not yet developed their Innovation Policies, therefore, this article sought to analyze the positive outcome of the development of the Innovation Policy by an ICT, during the year 2019, where the study case study brought important discussion with promising results for a methodology for other ICTs.

This article presents the results of the study and analysis of the path taken by the Federal Institute of Tocantins - IFTO to elaborate its Innovation Policy. The conceptual presentation of Innovation and Innovation Policy stands out in the results and discussions, through a bib-

liographic study, and then goes into the Case IFTO item with the description of the entire history covered, afterwards the result of the discussion with the relevant points is presented of the tracked method. Thus, this article has brought positive results in the sense of pointing a methodological direction to be adopted by other ICTs in the elaboration of their Innovation Policies.

Therefore, it is expected, with the result presented in this case study, a possible method, or at least the beginning of a method, to be used by other ICTs to develop their Innovation Policies. Since, the vast majority of ICTs have not yet developed their Innovation Policies, even after the legal requirement, due to several factors that prevent or hinder the construction of the document, but which are not the subject of this research.

MATERIALS AND METHODS

The methodology used was exploratory research in the form of case studies and bibliography. Through bibliographic research, we sought to understand the various concepts of innovation and the importance of the Innovation Policy, which served as the foundation for the application of the case study research. The case study was the main research method, strategically chosen because it is a way of investigating contemporary events (YIN, 2001, p. 27) experienced by the Federal Institute of Tocantins in the elaboration of its Innovation Policy that took place in 2019.

Before starting the case study, it was necessary to understand it, and, according to Gil (apud Boaventura, 2007), one of the fundamental steps for those who want to carry out a case study is the "delimitation of the case-unit". the unit is delimited the IFTO case. For YIN (2001, p. 67) the case study can be multiple or single, and that the ideal is to use multiple case studies. But, for the author, a single case study is acceptable and justified "if the case constitutes a rare or exclusive event or if it serves a revealing purpose" (p. 67).

This research can be classified as primary, since the data were not previously collected by any other study or analysis. The data were collected through documents, researched and presented "with the purpose of meeting the specific needs of the research in progress" (MATTAR, 2001, p. 48).

To answer the objective of this case study research, documentary research was used in the electronic process No. 23235.004039 / 2019-66 available in the Electronic Information System - SEI with all the procedural history of preparing the IFTO Innovation Policy, and was assisted of one of the authors of this research having served as chairman of the IFTO's Innovation Policy drafting committee.

The IFTO experience is the only case analyzed, studied and investigated for this article, but it was possible to gather favorable results for the objective proposed for this article, with elements indicative of the possibility of a facilitating method for the process of elaborating innovation policies ICTs.

RESULTS AND DISCUSSIONS

INNOVATION AND THE INNOVATION POLICY

The high rush of the capitalist market brought demands for the public and private sectors to fit in to meet the imperatives of this market for goods and services, for this reason, activities in innovation have become fundamental for the maintenance of economic development. Thus, technology, innovation, research and development are increasingly present in the environment and its organizations (RORA, ROSA and ANTONIOLLI, 2018).

According to Pacheco and Almeida (2013), as one of the elements of determining competitiveness, innovation will be decisive to help shape the structure of the next decades: what profile of industry and international insertion will we have. In reality, there is a broad and growing consensus, public and private, of the relevance of innovation even for the competitiveness of each Brazilian company, both for the growth of productivity in general. (PACHECO and ALMEIDA, 2013).

But, what is innovation? Several concepts for innovation by different authors, such as Grizendi (2011), Bessant and Tidd (2009) and Tigre (2006) say that innovation is something new or can be something improved, with applicability for small or large number of people that adopt them, bringing some kind of economic, financial or social return.

For Schumpeter (1984, 1997) innovation is always something new, which must necessarily, effectively change the market. For Simantob and Lippi (2003) innovation is an initiative, which can be either simple or radical, which is born as a novelty for the organization and the market and which brings economic results to the merchant, innovation can be geared towards technology, management, processes or business model.

For the present study, the definition of innovation brought by the Oslo Manual (OECD, Oslo Manual, 2005, p. 55) is classic and covers the primary objective of talking about Innovation Policy: An innovation is the implementation of a new or significantly improved product (good or service), or a process, or a new marketing method, or a new organizational method in business practices, in the organization of the workplace or in external relations. Federal Innovation Law No. 10,973 of 11/2004, in its article 2, item IV, brought the definition for innovation as follows: innovation is the introduction of novelty or improvement in the productive and social environment that results in new products, services or processes or that includes the addition of new features or characteristics to an existing product, service or process that can result in improvements and effective quality gain or performance.

Thus, it is understood that Innovation is directly linked to the economic and social development / improvement / improvement of society with effective gain in quality or performance. However, for innovation to be effective in terms of quality and performance gains, it has become crucial for institutions that develop innovation to streamline their processes with a tendency to adhere to new interactive market formats. This requires institutions to develop their normative and guiding regulations for the actions of these institutions in relation to innovation, which the legislation determined as an Innovation Policy.

Thus, the legislation has been improved so that ICTs, as important promoters in the development of innovation and technology, develop their normative instruments that govern

their innovative action, which is the so-called Innovation Policy, as required by the New Legal Framework for Innovation.The definition of Innovation Policy is not in line with the literature (Edquist et al., 2015). The author Edquist et al. (2015, p. 6, our translation) presents a concept that was considered in harmony with the present study of this article, that Innovation Policy is "all public measures to induce innovations or to increase the diffusion of innovations through the growth of demand for innovations, defining new functional requirements for products and services ". Therefore, in this article, the concept of taking an innovation policy is broadly considered the action of taking measures, but also, strictly as the regulatory instrument with the organization of norms and rules aimed at innovation of a given institution.

Thus, for the construction of the Innovation Policy it is necessary for the institution to review the set of laws that govern innovation in Brazil. It begins with the Carta Maior with the provisions of Constitutional Amendment 85, of February 16, 2015, which changes and adds provisions in the Federal Constitution to update the treatment of science, technology and innovation activities; also the provisions of the Innovation Law, Law No. 10,973, of December 2, 2004, modified by Law No. 13,243, of January 11, 2016, which amended several other laws, regulated by Decree No. 9,283 of February 7, 2018, which establishes that every public Scientific and Technological Institution - ICT must have an Innovation Policy. Also, within the institution's internal scope there is the Internal Regulation and the Institutional Development Plan.

When analyzing all this legislative framework on innovation, it is clear that the new normative framework on innovation has brought several promising paths for ICTs to develop their technological, innovative and entrepreneurial potential. And, the Innovation Policy is the instrument provided for in the law, by which ICTs must use to govern all these rights and duties and that through this instrument the institution must make clear how it is positioned in relation to Science, Technology and Innovation - CT&I and Research and Development R&D.

The Innovation Policy is a mechanism that adds greater awareness and mobilization of institutional representatives from different sectors of the economy and society. As, for example, from the productive sector and companies, to act in the constant improvement of public policies to foster technological innovations, increasing the competitiveness of products, processes and services, generating jobs, distributing income, and promoting the sustainable growth of the state and region.

Another important factor is that the Innovation Policy can provide mechanisms to facilitate the insertion of the internal community (students, employees and collaborators) and the external community, active in regional, national and perhaps international trade, through public-public or public-partnerships. private.

The IFTO, site of the case under study, is a public ICT that aims to be a reference in teaching, research and extension, with an emphasis on technological innovation and services, and to provide sustainable regional development, to promote and carry out research activities . Founded for this purpose and throughout the legislative framework, the IFTO drew up its Innovation Policy in 2019. The IFTO's Innovation Policy Regulation proposes the promotion, incentive of technological development measures, plans and programs, as well as, RD&I projects, through the incorporation of technological innovations created, developed or adapted in the IFTO.

Therefore, the implementation of the Innovation Policy, in an ICT, aims to establish its objectives, principles, general guidelines, guidelines, organizations and normative bases to be observed within the entire ICT with respect to innovation.

IFTO CASE STUDY

The case study research method has been identified as an analysis tool used to minimize errors, as a successful case can serve as important guidelines for other subjects to build their paths when dealing with the same object and / or within variables similar. Robert K. Yin explains that the case study is a research method that has as its main objective the strategy of answering the questions "how?" it's because?" and that the support for responses is the real-life contexts of current cases (YIN, 2001. p. 11). Thus, this article's strategy is to study the real case of the construction of the document "Innovation Policy" of the Federal Institute of Tocantins - IFTO, in 2019.

The IFTO, with the intention of preparing its Innovation Policy, on February 18, 2019, started the process through the electronic platform Electronic System of Innovation - SEI and, on February 19, published the ordinance designating the members of the responsible committee for policy making. The committee was responsible for preparing, editing and revising the text, with an initial term of 90 (ninety) days. The composition of the commission was mixed, with representatives from the teaching, research, graduate and innovation pro-rectories, extension, the people directorate and the attorney general's office. Thus, the initial kick-off for preparation took place on February 21, 2019, with the first meeting of the committee where the work schedule was drawn up, delimited in a meeting once a week lasting up to 3 hours (three hours).

The methodology for preparing the document was also decided at the first meeting, and Google Docs was chosen. for readings, where each member of the commission added, without changing the draft, the suggestions in the "suggestions" tab (which is in the last icon to the right of the drive) and, subsequently, there were debates in the meetings, moments that changed the draft .

The committee deliberated as a parameter to be followed as a parameter the Regulation of Innovation Policy of the Federal Institute of Ceará - IFCE, as the Dean of Research, Graduate Studies and Innovation had already asked IFCE for authorization to use the document, the choice was made because it is a document, among all researched, more complete. At the first meeting there was a speech by the prosecutor, who explained to the group about the importance and legal need of the IFTO to have its Innovation Policy.

The initial schedule of the commission's work was decided as follows:

1 - Discussions by the committee for a period of 5 (five) weeks;

2 - Opening of a period for 15 (fifteen) days for the community,

3 - After this deadline, I return to the committee to analyze the suggestions and edit the post-community version;

4 - Sending to the attorney's office for a period of 15 (fifteen) days.

5 - After the return of the attorney general, committee meetings to edit the final version;

6 - Sending to the Cabinet and,

7 - Finally, I send it to Consup for voting.

The initial time of the ordinance of 90 (ninety) days for the commission to carry out the preparation of the document remained insufficient, during this period there were 12 (twelve) meetings of the commission, in which article by article was debated, with readings and discussions, some points remained for study and analysis, being later decided in the review.

Thus, on June 5, 2019, a new ordinance was published, with the same members, to continue the work. Another methodology was adopted by the committee to revise the document, from just reviewing the points raised in the individual review readings, that is, in the review meetings there was no reading of article by article of the document. This proved to be very useful in the meetings, since the members already brought doubts, analyzes and suggestions to the debate. After the review meetings, the final text was sent for the community to analyze and suggest, which was available for a period of 40 (forty) days, from July 5, 2019 to August 14, 2019. The method for making available for the community it was through the IFTO website (http://www.ifto.edu.br/centrais-de-conteudos/documentos-institucional/doc-colaboracao) with wide dissemination on institutional pages and emails. The draft of the Innovation Policy was also sent to all sectors for readings, and possible contributions through analyzes and suggestions for improving the document. It was decided that all contributions from the internal and external community should be sent to the e-mail of the Directorate of Innovation and Entrepreneurship, the sector responsible for the IFTI's Center for Technological Innovation - NIT, diem@ifto.edu.br, until August 15th, and that contributions should consider the following aspects: a) indicate the chapter and article, b) write the suggested wording and c) present justification for the change.

After this period available for the commission to receive contributions from the community, there was a meeting of the commission on August 30, 2019, at which time the debate on some points that may have arisen during the period that was open for suggestions from the community occurred, however, formally by e-mail there was no suggestion from the community. Thus, at this meeting it was decided to send the document to the Federal Prosecutor's Office for legal consultation with the IFTO to analyze and issue the opinion. It should be noted here that the prosecutor who was a member of the committee refrained from analyzing and issuing the opinion, and that document was made available to another prosecutor at the IFTO. On September 2, 2019, the Innovation Policy draft was sent to the attorney general's office, and after 10 (ten) days the document returned to the committee with the legal opinion, on September 12, 2019. The Federal Attorney's Office considered it legal and appropriate to the legal system, the implementation of the IFTO's Innovation Policy Regulation, but pointed out two recommendations:

1. The formal creation of the Innovation Council is recommended, through the amendment of the General Rules of the IFTO, in order to comply with item I, of the sole paragraph, of Decree No. 9,759 / 2019;

2. It is recommended, in what is pertinent, the observance of the amount determined in item I, of art. 6, of the same legal norm.

The recommendations contained in the opinion of the Federal Prosecutor's Office did not require a new committee meeting, which made it possible to send the document to the Cabinet

on September 16, 2019. The committee sent the draft of the Innovation Policy Regulation for the Dean to analyze and, later, send to the Superior Council - Consup to vote, both the Regulation of the Innovation Policy and the changes in the IFTO General Regulation, suggested in the recommendations of the Federal Attorney's Office.

The Rector forwarded the document, accepting the committee's suggestions and recommendations of the Prosecutor's Office in full, to the Consup secretary on September 19, 2019. Afterwards, the draft proposal was put to a vote in Consup, being approved unanimously and in full, through of Resolution No. 67/2019 / CONSUP / IFTO, of November 12, 2019.Thus, the work of the commission to prepare the IFTO's Innovation Policy Regulation took a total of 8 (eight) months and 23 (twenty-three) days to complete. This period included the entire work schedule of the commission, and other sectors, such as availability for the community, attorney's office, office and Consup for voting.

After the reconstruction of the entire history followed by the IFTO for the elaboration of the Innovation Policy Regulation, it is important to analyze whether the timeline and the method used to construct the document were effective in developing an Innovation Policy capable of responding to the critical points required by the legislation of the which determine which Innovation Policy should contribute to an innovative and entrepreneurial ICT. Thus, after reading the Regulation of the Innovation Policy, it was found that the document is composed of 101 (one hundred and one) articles, which permeate the important strategies defined by the Innovation Law: the training of human resources and the valorization of the server focused on technological innovation and entrepreneurship, public-private and public-public partnerships, national and international cooperation, and their respective legal instruments, intellectual property, service provision, acquisition, contracting, monitoring, evaluation and accountability and the role of the NIT. Thus, it is clear that the Innovation Policy in comparison with the legislation covers the main legal points determined by law.

The factor that contributed to the construction of a more complete and robust Policy was the question of the commission starting the elaboration based on the draft of the IFCE's Innovation Policy. When analyzing this, the question arose of the risk that ran from being based on a document built in another reality, the Federative State with different regional, social and economic contexts, however, it was understood that this risk was solved with the discussions article by article by the commission, which worked with the necessary and important adaptations to the reality of IFTO with its regional, social and economic context typical of Tocantins.

A relevant issue used in the method was the heterogeneity of the commission, which was formed by employees from the various provincial rectors and directors of the institution, which brought wealth for discussion. As for example, the presence of two members of the Dean of Education made it possible for the IFTO Innovation Policy to bring the terminology "Innovative Teaching-Learning", which makes the IFTO Innovation Policy the first in Brazil that expressly provides for "initiatives capable of generating changes and improvements in teaching and learning and pedagogical transformations at a qualitative level" (article 7, item XIV). Still on the composition of the commission, another important factor was the presence of the federal attorney who facilitated the understanding of the legal terms, yet, when necessary, took the discussion to his peers.

CONCLUSION

The need for ICT's to have their Innovation Policies is increasingly urgent. The urgency is due to the fact that the Institutions' actions have an expressive and gradual increase aimed at meeting the demands of the entrepreneurial market. This requires the ICT to have an instrument capable of guiding its performance in this complex that is the market, both in the sense of increasing profits and to fill technological gaps to improve the life of society.

Thus, this study shed light on these ICT's that have not yet developed their Innovation Policies. It was possible to review and describe the entire road traveled by the IFTO, and it was noticed that the organization of the schedule, in line with some factors, such as the heterogeneous composition of the commission, with the presence of representatives from the various sectors that go through the formalization of a process aimed at for innovation, including the presence of the attorney with the legal acumen, associated with the fact that the commission started drafting from a document widely debated by another ICT.

Thus, it is concluded that the method used by the IFTO can be used by other ICT's, but, it must always pay attention to the regional, social and economic reality, and always seek to align the Innovation Policy with the spirit of the Innovation Law, which it is to establish important mechanisms to encourage the connection between the various innovation actors, such as the university, companies / industries / markets, governments and international states.

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PROSPECTIVE STUDY OF TECHNOLOGIES FROM UFT AND OTHER INSTITUTIONS.

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INTRODUCTION

In recent years, intellectual property (IP) has gained notoriety mainly in the business and institutional field, which use IP as a strategy to protect inventions, launch new products, and also as a strategy of competitiveness in the globalized market.

The implementation of Law No. 9,279 (BRASIL, 1996), which regulates rights and obligations related to IP in Brazil, promoted greater dissemination among universities regarding the practices of using the benefits of IP and its applications in the business and institutional context. However, the issue of the use of IP is still not widespread in society. It is observed that the practices of using IP are limited to the research environment of universities, entities that work with the theme, and specialized companies and/or institutions that seek innovation as a form of competitiveness.

The Industrial Property Law covers the regulation of patents, industrial designs, trademarks, and geographical indications, presenting their definitions, guidelines, and limits of coverage. In Brazil, other forms of intellectual property such as copyright, software registration, and others are treated and regulated by specific legislation.

The implementation of IP and technological prospecting management activities is essential, especially when seeking innovation and business or institutional competitiveness. The realization of technological prospection and search for patents becomes relevant, especially when it is intended to launch a new product or service, protect the right of commercial exploitation of innovations, or even for the commercial impediment of third parties.

As its general objective, the present study attempts to map patents registered by the Federal University of Tocantins (UFT) and three other universities (Universidade Federal de Campina Grande (UFCG), Universidade Federal da Grande Dourados (UFGD) e Universidade Federal do Recôncavo da Bahia (UFRB)) listed in the INPI (Instituto Nacional da Propriedade Industrial) database. The specific objectives of this study are a) to identify the number of patents deposited, published, and granted, b) quantify the type of patents filed, c) identify the main classes of patents for available deposits, d) analyze information about institutional partners, and e) identify patents licensed or transferred to the private sector.

Institutions' patents are mapped using the data available in the INPI database, from the perspective of the applications of Law No. 9.279 / 1996 (Industrial Property), which addresses the

reference on the registration of patents. Law No. 13,243 / 2016, known as the Legal Framework for Technology, Science and Innovation in Brazil, which provides incentives for scientific development, research, scientific and technological training, and innovation in the country is also considered. These laws appear to contribute significantly to stimulating the development of innovation by stimulating the promotion of science, technology, and innovation (BRASIL, 2016).

The present work is relevant in that it presents information about the main technological productions of four Brazilian universities, UFT, UFCG, UFGD, and UFRB, aiming to contribute to the dissemination of knowledge about the importance of the use and application of IP.

TECHNOLOGICAL PROSPECTING AND PATENTS

Currently, with globalization, digital transformation, and the wide availability of data and information on a large scale, institutions, universities, and companies increasingly tend to seek new ways to carry out knowledge management processes and the search for innovation. One of the challenges for the academic environment is the transformation of science, technology, and innovation into practical results of technology transfer to generate new products, processes, services, and innovations with a focus on the demands of the global market and society.

Innovation is the specific instrument of modern companies and institutions that are concerned with generating transformations to meet the needs of the present and the future, generate results, and seek competitive factors. The Oslo Manual presents a reflection on competitiveness and disputes that are increasingly fierce in the current market in the business or academic environment:

> [...] It has also resulted in increased international competition and new forms of organization for dealing with global supply chains. Due to advantages in technologies and greater information flows, knowledge is increasingly perceived as a central driver of economic growth and innovation. (OCDE, 2005, p. 15).

In this context, knowledge management processes and technological prospecting studies seek alternatives to search for information, data, and generate research, inventions, and new technologies. In this sense, technology prospecting studies emerge as strategic planning and decision-making tools in terms of analysis of factors, data, and information that can determine trends and investments in innovations and emerging technologies.

Technological prospecting methods represent essential tools to guide prospective studies for the development of disruptive or significantly improved innovations. The general purpose of technological prospecting methods is to outline and test possible and desirable visions so that choices are made that will contribute to the construction of a desirable future. Therefore, there are several terms and definitions for technological prospecting studies with different approaches and methodologies such as *future research, future studies, prospective studies, forecasting, foresight*, and so on (MAYERHOFF, 2008).

Technological prospecting allows us to determine the value of a particular technology or market trend. Prospecting will provide a list of protected technologies, with patent protection being the most common. The technologies protected by patents can also be protected by a know-how contract, which guarantees the possibility of perfect implementation of the invention.

For technologies that cannot or are not protected by patents, there is the possibility of protection only by a know-how contract (industrial secret) (TIGRE, 2006).

Public or private databases (free or not) can searched for data and information about patents. The main free search bases are INPI, *Space Net, Patent Scope, USPTO, JPO, SIPO, KIPO, Patent Lens, Chem Spider,* and *Patent Inspiration*. Among the fee-based databases, the , the following stand out: *Questel Orbit, Derwent, Lexis Nexis, STN, Pat Base, Wips Global,* and Thomson Reuters.

Created in December 1970, the Instituto Nacional de Propriedade Industrial (INPI) is the entity responsible for carrying out the evaluation and registration of patents in Brazil. INPI currently lists more than 800 thousand registered patent applications in Brazil.

A patent can be defined as a temporary title to an invention or utility model, granted by the State to inventors and holders of rights over creation. This right guarantees the patent holder the following: to prevent (or not) third parties from producing, using, offering for sale, selling, or even importing products that are the object of their patent (INPI, 2020). This security is also associated with processes that are protected by patents and not just objects.

In Brazil, patents can be classified into two types with different protection times (BRASIL, 1996):

a) Invention Patent: Protection for products or processes that are new, not yet created, that represent the solution to a preexisting problem and are applied in an industrial way. It is valid for 20 years from the date of deposit.

b) Utility Model: Protection for object of practical use, or its parts, provided that they have an industrial application and some inventive act, reflected in a new form or disposition, implying a functional improvement in its use or in its manufacture. It is valid for 15 years from the date of deposit.

In the age of information and knowledge, the search for patents in research bases can be a strategic tool for conducting technological prospecting processes. These searches can contribute to obtaining knowledge, statistical data, and information for research on trends and factors relevant to the search for institutional, academic, and business competitiveness.

The realization of technological prospecting and strategic analysis of information makes it possible to identify relevant technologies and the development of new products, services, and business generation. (COELHO, 2003).

Among the possibilities for technological prospecting using a patent database, the following stand out: information for the development of projects, data for the development of innovations and research, analysis of innovative and technological routes, monitoring of competing companies and markets, searching for opportunities investment in businesses using products that have entered the public domain, in addition to exploring trends and emerging innovations.

METHODOLOGY

This study covers a prospective analysis of patents deposited and registered by the UFT, UFCG, UFGD, and UFRB, within the scope of the INPI Patent database. The institutions were selected at random from among those that were created from 2000 onwards, year of creation of UFT.

The data were collected from the INPI database between May 10 and September 3, 2020, which can be accessed from the INPI home page (https://www.gov.br/inpi), by clicking sequentially on the item "BuscaWeb," "Patente," and "Pesquisa Avançada." In the advanced search window, we only used the item "Depositante/Titular/Inventor" and searched for (a) universidade AND federal AND Tocantins, for UFT record data, (b) Universidade AND federal AND Campina AND Grande for UFCG record data, (c) Universidade AND federal AND Grande AND Dourados for UFGD record data, (d) Universidade AND federal AND Reconcavo AND Bahia, for UFRB record data. To maximize the results, the search was based on the names of the institutions using the "AND" operator between the main terms since different names or CNPJ may have been used to register patent applications.

RESULTS AND DISCUSSION

Innovation can be considered as doing something new and having acceptance by a specific target audience, that is, generating a positive impact/value (CHRISTENSES, 2012); it is not enough to just invent. Several indicators are used to measure companies' degree of innovation including the financial amount that these companies invest in the development of new products and the number of patents deposited. Generally, the number of patents is considered an indicator of innovation as it directly or indirectly reflects how concerned the company is in terms of developing and offering new products to the market. Therefore, the number of patents deposited by the institutions evaluated herein was counted, as shown in Table 1.

Table 1. Quantity of patents deposited in Brazilian national territory, until December 31, 2019.

Institution	Number of patent proposals	Number of valid patents *
UFT	38	32
UFCG	281	212
UFGD	52	42
UFRB	44	37

* Number of deposits at INPI, considering patents in secrecy, published or granted, with the exception of canceled orders, or filed.

The data in Table 1 show a similarity in the number of valid patents (ranging from 32 to 42 patents) between UFT, UFGD, and UFRB. However, UFCG stands out with 212 valid patents (approximately 5 times that of other universities) until the end of 2019. It is important to note that all four institutions were created between the 2000 and 2006, which may or may not have been due to the division of other institutions.

The calculation of the ratio between the number of valid patents and the number of patent proposals shows an index of use of public resources. A patent can cost thousands of reais from deposit to grant analysis (this index may fluctuate according to the change in the number of patents submitted in secrecy, patents filed or canceled), in addition to bringing all institutions closer together, since UFCG has a much higher number of patents. Thus, it is clear that UFT and UFRB are the institutions that best manage resources for deposit and maintaining patents at the INPI, with an index equal to 0.84, that is, the lowest percentage of patents annulled or filed. UFGD has an index of 0.81, and UFCG has the worst index at only 0.76, reflecting a higher percentage of patents annulled or filed due to nonpayment of annuities or failure to meet the requirements of the evaluation for concession.

When patents are deposited, they remain confidential for 18 months and are then published, becoming documents with public access. The number of valid patents shown in Table 1 patents subject to a secrecy order; however; however, it is not possible to identify the type (utility model or invention patent) of these patents. Excluding these patents reveals that most documents (if not all) refer to an invention patent. The UFRB does not present any utility model patents until the end of 2019, while the UFGD has only one document, the UFCG has three documents, and the UFT has five utility model patents.

The refinement of the analysis indicates that UFGD was the first institution to deposit a patent at INPI, in 2006, the year following its creation, followed by UFRB, which made its first deposit in 2008, UFCG in 2009, and UFT only in 2013. The first patent deposited by all institutions, with the exception of UFT, is filed after analysis without concession. UFT's first patent application, carried out in 2013, is still awaiting analysis to determine whether the patent will be granted.

The number of patents deposited started or grew at an accelerated rate in all the institutions after the creation of their Technological Innovation Center, which occurred between 2008 and 2011, based on Law 10,973 of 2004. This is possibly due to greater disclosure among its researchers, information associated with innovation, and the potential links to the commercial protection of research results, previously only published as scientific articles (BRASIL, 2004). Figure 1 shows the distribution of patent deposits by universities up to 2019.

Figure 1. Evolution of patent applications until 2019.

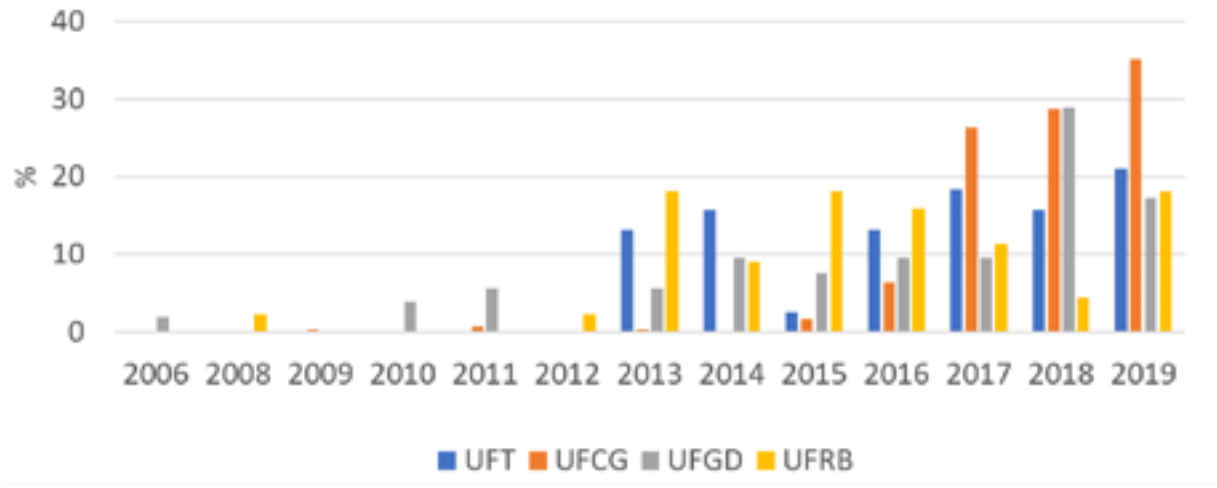

Figure 1 shows the evolution of patent applications since the creation of universities, until the end of 2019, with emphasis on 2013 to 2019, a period in which deposits were concentrated. The graph shows the percentage of deposits per year in relation to the total orders of each university. Since 2012, the Folha de São Paulo newspaper has published the Ranking de Universidades Folha (RUF), which lists the annual number of patents by Brazilian universities and how many universities have patents (GARCIA, 2019). Between 2012 and 2019, there was a significant increase among institutions, increasing from 95 to 152 (among the 197 universities evaluated). Over the years, the RUF has shown that to develop applied research, in quantity and quality, a university does not necessarily have to have existed for several decades. For example, in 2019, the UFCG was among the 30 universities in terms of patent deposits. In 2018, UFCG registered 80 patent applications, second only to the Federal University of Paraíba, which submitted 94 patent applications in the same year. It is important to highlight that of the 20 largest patent depositors at the Brazil, in 2018, 18 were teaching and research institutions, and only two companies stood out, Petrobras and CNH Industrial Ltda. (subsidiary of New Holland tractors) (INPI, 2019).

The number of annual patent applications or the total number of patents does not reflect greater innovation potential of one institution over the other, although these numbers are used as indicators of innovation. Having patents granted and the most desired, licensing, or technology transfer is more important than depositing patents at the INPI. It was possible to identify the number of patents that have already been granted to each institution. UFGD has two patents granted, the highest number of patents granted, UFRB has one patent granted, while UFT and UFCG have not yet been granted a patent as of the end of August 2020. Among the two patents granted to UFGD, one was cancelled due to nonpayment of annuity, without appeal. The granting of the patent guarantees that the invention is really new, which can be of significant importance in the act of licensing or transferring the technology. The granting of a patent by the INPI can take more than 10 years after the patent application (for invention patent), depending on the technology sector. This long period between depositing and granting a patent may be even longer than the time when the technological advancement of the competition overcomes the invention. Fortunately, the time for analyzing a patent's grant depends only on the technological sector and not on who the patent holder is.

Only one transfer of patent ownership was identified, which was carried out by UFRB, although it does not necessarily represent a commercial technology transfer transaction since the patent ownership was transferred to another educational institution. Each of the institutions was contacted and questioned about patents licensed or transferred to the private sector. Those responsible for the Technological Innovation Center at UFT, UFCG, UFGD and UFRB stated that there are no patents licensed or transferred to the private sector for the time being. When registering a patent at the INPI, the researcher is placed as an inventor and the university is placed as the author or Holder of the Patent. The latter can negotiate or make decisions about the public title that is the patent. The ownership of the patent then belongs to the institution to which the researcher is linked, whether by employment or study. However, a co-ownership can occur if research involves groups from more than one institution, in addition to research financed by companies or funding agencies. Then, all patents from UFT, UFCG, UFGD, and UFRB were analyzed to verify the cases of patents with co-ownership.

UFT shares ownership in seven documents; there is co-ownership with companies in two patents, one public and one private, and in the other five, the partnership is with other

teaching and/or research institutions. UFCG shares ownership in eleven documents; with a private company for one patent and with other educational and/or research institutions for the rest, mainly Universidade Federal da Paraíba (eight documents). UFGD shares ownership in seven patents; UFPR (1 patent) and UFMS (6 patents). UFRB shares ownership in six different patents, two of which are shared with Embrapa, ou Petrobras. In addition, it shares ownership with a private teaching and research institution. These results reveal that most applied research that results in patents is carried out by a team of researchers from the institution itself or with the help of those from other educational and/or research institutions, without (or small) financial collaboration from companies.

When submitted to INPI, patent documents are classified according to the International Patent Classification (IPC). Created from the Strasbourg agreement (1971), the IPC represents an international classification system in which the technologies are divided into classes from A to H. Within each class, there are subdivisions that allow for the best classification. This system is used worldwide, grouping similar patents in each classification, regardless of the place of deposit. The same patent document can receive more than one classification in the IPC system.

In this work, the classifications of all patents were identified from the four institutions evaluated, highlighting the classifications A01N and A23L for UFT, each occurring in 17% of the documents. For the UFCG, the most common classification was A23L, present in approximately 30% of patents. A01K was the most common for UFGD, in 12.5% of the documents and A23L was the most frequent classification in UFRB patents, being present in 39% of patents. In view of these results, the vocation of each institution is perceived when it comes to technological protection. The descriptions of each of these classifications are presented in Table 2.

Table 2. Most common classifications between university patents.

Classification	Description
A01N	Conservation of human or animal bodies or plants or parts thereof. Biocides, such as disinfectants, pesticides, or herbicides; repellents or pest attractants; plant growth regulators.
A01K	Livestock; poultry farming; beekeeping; pisciculture; fishing; breeding or breeding animals; new animal creations.
A23L	Food, food products, or non-alcoholic drinks, their preparation or treatment, such as cooking, changing nutritional qualities, physical treatment; preservation of food or food products in general.

FINAL CONSIDERATIONS

Considering these institutions are universities that have existed for up to two decades and started to register their technologies in the last decade, they present an appreciable number of patent deposits, mainly invention patents. Founded in 2002, UFCG is noteworthy as it already has 212 valid patents (including confidential documents). UFCG is already considered one of the main universities in the country in terms of the number of patent applications per year. However, UFT and UFRB are the institutions that work best with resources for patent deposits, with the lowest rate of filing or canceling orders.

Prospecting revealed the importance of the Technological Innovation Center for each of the institutions as the protection of technologies was accentuated after the creation of each center.

As most of the patents were registered during the last decade, it is normal for the number of concessions to be low compared to the number of published patents, with emphasis on UFGD, which has two concessions, whereas UFT and UFCG had no concessions until August 31, 2020. It was also possible to identify that, to date, no institution has patent licensing or technology transfer to companies.

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INNOVATIONS ON TRANSFERENCE OF TECHNOLOGY IN DAIRY ACTIVITIES: *INOVAZÃO* APP AND ITS BENEFITS TO FARMERS

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OVERVIEW

Growth of the world's population, expected to surpass 9 billion people by 2050, brings in the challenge food security and the need of development and diffusion of new technologies that are essential for improvement of agricultural productivity. Brazil highlights as one of the countries with potential of leadership among food producers. Called as "the world's farm" by FAO in 2010, predictions of a 40% increase in its productivity revealed upcoming scenario of the next 30 years.

Brazil also figures among the world's five largest dairy producers, with a volume of 34 billion liters per year provided by more than 1 million farmers that adopt diversified production systems – from extensive to confined (SEA/RN, 2018). It is estimated that 58% of the brazilian dairy production originates from family farming, that has been fomented by strong political and socioeconomic appeals. In numbers, the dairy industry occupied the second position in the annual billing ranking of the main food sectors in Brazil in 2018, reporting revenues of nearly R$ 70 billion (ANUÁRIO LEITE, 2018).

From that perspective, the state of Tocantins is one of the largest dairy producers in Brazil's North region, ranking in the third position and accounting for nearly 21% of the herd of milked cows and nearly 16% of milk production. Like the rest of the country, dairy activity at state of Tocantins is characteristic of family farming, representing almost 76% of the farmers owing areas smaller than 200 hectares (SANTOS et al., 2014).

In this scenario of reaffirmation as the world's farm, Brazilian cattle ranchers can prospect themselves as protagonists, as the country have left the position of food importer in the 1970s to be one of the largest players in the world's agribusiness game. Thus, bovine-dairy production can take advantage of the on-going demand that is being explored and foment innovation and technological melioration.

THE PROCESS OF TECHNOLOGY AND INNOVATION TRANSFERENCE

Technology is understood as the ability to perceive, create, produce and understand products, services and inputs – a concept that goes beyond technical, experimental and laboratorial research boundaries. Dereti (2009) mentions the need of adding economic applicability to scientific or "technical" knowledge so that it reaches the level of technology and becomes more than a scientific product but a social construction. Castro (2005) suggests that an appropriate meaning for technology would be the link between the society's chain of needs and the society itself.

Technology transfer processes are considered a synonym for technology diffusion, which refers to the processes of inserting variables of a scientific-instrumental nature within the scope of primary sector (DERETI, 2009). These are two concepts that, according to Rogers (1995) and Narayanan (2001), go far beyond the semantic panorama – diffusion of technology is seen as the innovation process communicated by media channels in a given space and time, among members of the social system capable of change when conceived, disseminated, adopted or rejected.

Regarding technology transfer, Song (2008) and corroborated by Prysthon and Schmidt (2002) refer to the process in which knowledge, costs, risks and benefits are shared between modern socioeconomic entities and then absorbed for practice of innovation. It happens when the user/client masters the knowledge involved in the intention to overcome barriers and gaining the ability to create new knowledge or technology from that one previously absorbed.

Something that must be understood, according to Gibson and Smilor (1991), is that although the concepts of technology diffusion and technology transfer are explained in different ways, both usually agree on two common points: (i) the transfer needs significant effort and human collaboration, and (ii) both knowledge and technology are not "things" (simple and tangible). This is an important point within the context of technology transfer / diffusion within the Brazilian agricultural sector, discussed next.

TECHNOLOGY DIFFUSION IN THE BRAZILIAN AGRICULTURE

Between 1950 and 1960, first signs of rural extension dynamization in Brazil were observed as a consequence of the agreement called *Ponto IV*, a collaboration between the US International Cooperation Administration and the Brazilian Rural Extension System, in which communication was prioritized massively it order to reach the largest number of rural producers (BARROS and CARRIERI, 2013).

Associated with the scarcity of investments, had haven't a critical niche of researchers sufficient to maintain an acceptable flow of production of technical and scientific knowledge, with the capacity to insert itself in the rural reality and to go against the barriers imposed by the social process of generating technology, or even, the participation of extension workers and rural producers (PORTILHO, 1999).

It was from 1970s ahead that a new period of development in Brazil began, characterized by the accelerated growth of urbanization and the generation of non-agricultural jobs, which consolidated the integration of the countryside with the urban environment called currently as the "Brazilian agroindustrial complex". This alliance was based on three crucial factors: (a) increasing integration of agriculture with industrial sector, producing inputs and capital goods also being responsible for processing products from the field; (b) endeavoring to close agricultural borders in urbanized areas; and (c) the creation of the National Rural Credit System in 1965 (SOUSA, 1987).

Among the three points mentioned, creation of the Rural Credit System was the force that most propelled Brazilian development in this sector. It replaced commercial capital – a traditional method of credit for producers at the time, more advantageous and flexible. It was from the creation of this system that the need to implementing technologies in this sector was noticed, mostly banking networks that were able to provide credit to farmers (BANCO do BRASIL, 2004). In 1972, in line with this context of new government policies to increase agricultural productivity and adopting repasses of rural credit and the guarantee of minimum prices as modernization instruments, the Brazilian Agricultural Research Corporation (Embrapa) was created (BRASIL, 2020).

The emergence of this public research company brought in a structure of technical-scientific knowledge still unknown in Brazilian agricultural sector. Among the achievements arising from the emergence of Embrapa, that worth mentioning are:

1. Administrative flexibility in the search and use of financial and human resources,

2. Freedom to expand competitive salary policies and, above all, and

3. Technical training and scientific.

This was an important moment for Brazilian agricultural modernization, since farmers quitted being only an object in the technology transfer process becoming an active and conscious subject, as indicated in the document entitled "Operational Guidelines for the Technical Assistance Program and Rural Extension" by EMATER (SOUSA, 1987). From this document, the educational process of farmers cannot be seen only as a simple transfer of information, but rather as an exchange between the educator and the student for the growth of both, respecting culture, values and liberation of the student to think and make decisions independently. Thus, regarding this exchange between the student and educator, Portilho (1999) points out that informal education in the scope of rural extension is closely linked to the process of integration and disintegration of social relations of production. It is capable of introducing "new values" or "new knowledge" or other knowledges as a constant attempt to bring modernization to rural people and benefit of Brazilian agriculture.

THE *BALDE CHEIO* PROJECT

Given the issues and challenges experienced by small and medium milk farmers, there was an initiative by *Embrapa Pecuária Sudeste* to create the project called *Balde Cheio* in September 1998. This project, as says Borges (2014), is responsible for:

- Promote a sustainable development within the scope of dairy farming;

- Disseminate innovations that increase profitability regardless of agricultural land size;
- Adoption of methods that transfer technology to technicians and extension workers from public or private entities in the region of interest;
- Provide with transferring of technology to farmers as in programmed and articulated set of techniques of intensive production, such as: (1) recovery of soil fertility with usage of organic fertilizers, (2) soil conservation and the intensive management of fertilized tropical pastures, (3) replacement and preservation of riparian forests, and (4) process of irrigation;

Among all techniques, learning about the process of irrigation is a fundamental step in the *Balde Cheio* project because it allows for increases in productivity and animal stocking (number of bovines per land area), as well as stable growing of roughage (food with significant fiber content quality such as pastures) during all year seasons. Dairy activities within the methodology of the *Balde Cheio* project provides with an evolution of economic profitability based on the enhancement of available natural resources. Increase in productivity, recovery of degraded areas, respect to nature and restoring of farmers' self-esteem are ways to become the activity viable economically, environmentally and socially (MORAES, 2004).

With increases in demand, it is urgent to adopt actions and techniques that improves productivity. By that, not well-prepared farmers face the need to intensify production of pastures and animal stocking, which sometimes require the use of technologies – especially those related to irrigation. A basic step to be accomplished before implementing systems of irrigation of agricultural lands is to know the availability of water and how to use properly. As says Mendonça el al. (2007), prior to planning irrigation systems, farmers must take into consideration: the minimum available water flow, costs related to energy consumption and the type of managing that will be practiced in the farm. From that perspective, in view of the need for a technological tool that support this vital planning stage in the decision-making process of implementing irrigation systems, this chapter discusses about an app for smartphones named *INOVAZÃO* developed for Android systems using C# language.

CONCEPTUALIZATION OF THE *INOVAZÃO* APP

Research related to development of the *INOVAZÃO* app (Figure 1) was characterized as exploratory and descriptive. The methodological approach for was a qualitative perspective considering the aim to collect, systematize and analyze field data from farms and thus adapt the app to knowledge extension of farmers (BECKER, 1997).

Figure 1. *INOVAZÃO* **app logo marketing purposes**

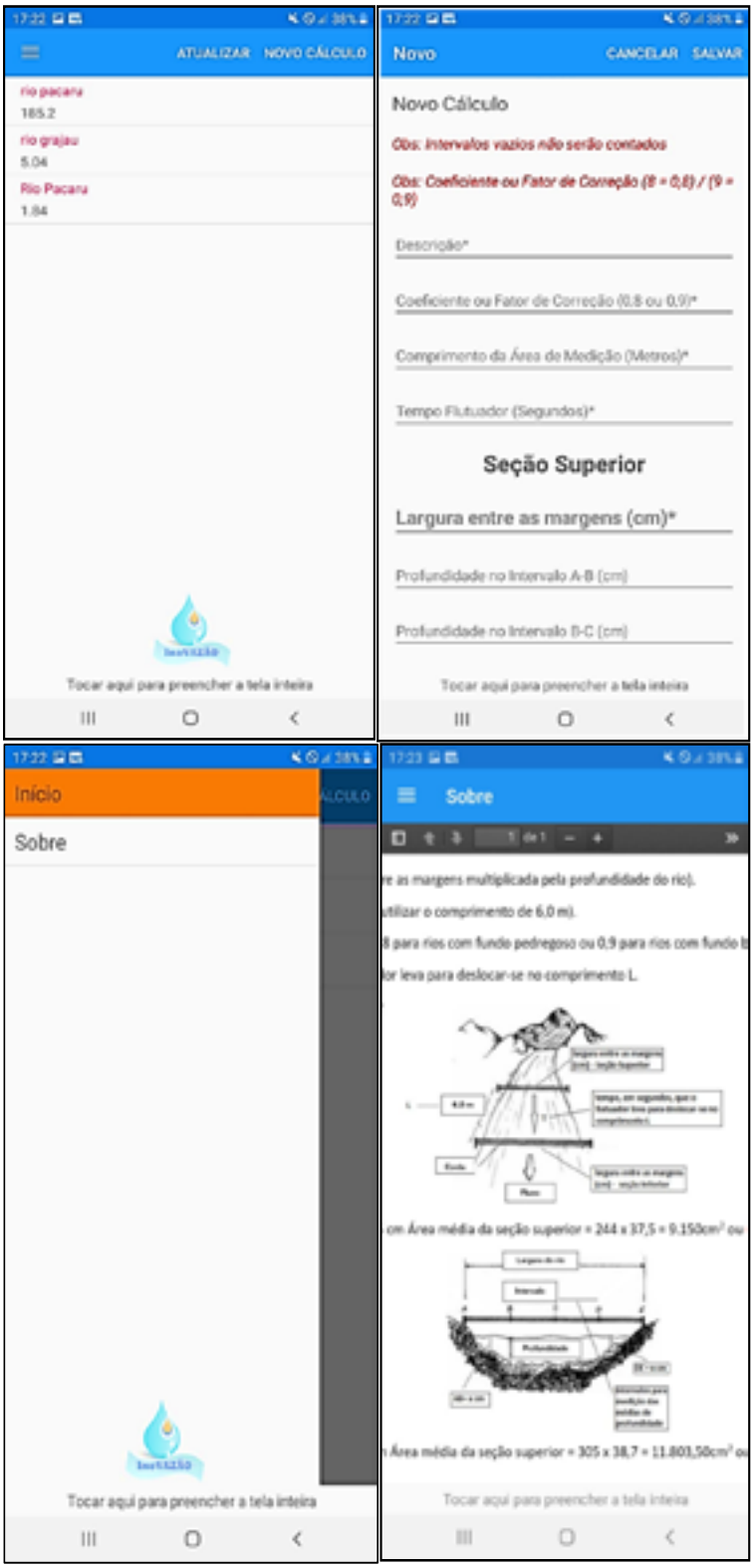
The main idea for this app is to measure flowrate of streams or rivers based on the float method, thus giving a notion about the hydric potential of lands where farmers need to supply water for animals and irrigate pastures. It is also based on the need of making rational use of water by following the rules of environment regulatory agencies. Thus, the concept is based on the acquisition and insertion of field data that are easy for farmers to get, allowing farmers to use a very self-explanatory and easy cellphone interface. Other than that, the app also provides with knowledge of vital technical/environmental information on management of water resources and can also be used by extension technicians or public agencies for monitoring of water resources.

Extra benefits of *INOVAZÃO* app are: (1) availability of data for to fill in legal the water grant forms and legal requirements from environmental agencies, (2) supporting information for acquisition of documentation to perceive exclusive benefits to farmers, such as lower energy tariffs (established by the National Agency of Electricity – ANEEL), and (3) the possibility of farms doing legal work without the need of a technician;

FUNCTIONING OF THE *INOVAZÃO* APP

Figure 2 shows some prints from the app usage. Results provided by the application are presented in m^3/s, a common measure unit for flowrates.

Figure 2. Functioning of the INOVAZÃO app



In order to equate the data, average area size of the river (m^2), length of the measurement area (m), coefficient or factor of correction (dimensionless) and time that the float takes to travel the section (in seconds) are variables taken into account. The correction coefficient is a factor that allows more precision in the results, based on the type of soil present under the river or stream, being: 0.8 for stony soils and 0.9 for rivers with muddy or sandy soil (EPA, 1997). A pet bottle with 70% of its volume filled with water can be used as floating object.

After clicking on "NEW CALCULATION", the user will already have the slides (tabs) on hand for filling in with data, such as name of the river or stream, correction coefficient, length of the measurement area, time traveled by the floating object and others. After filling in the data, the user must click on "SAVE" to register the information provided and the results will appear immediately. The user can also click on "CANCEL" to ignore the addition of a new information.

In case of any doubts about the data to be inserted or about the variables that constitute the tool's algorithm, the user can click on "ABOUT" which is located in the main menu on the left side of the screen. The "ABOUT" section provides with a practical, illustrated and exemplified manual on how to use the app and get the best out of it.

CONCLUSIONS

The history of Brazilian agricultural activity, especially in terms of milk production, shows the need to modernize field activities in order to meet the increasing demands. Transfer and diffusion of technology to farmers is, today, an essential practice to keep the business active and competitive. Initiatives such as the *Balde Cheio* project and the *INOVAZÃO* app guarantee the rescue of the farmers' self-esteem, changing their condition of subsistence or sometimes even extreme poverty. These are actions that also allow for reduction of operational costs and increase profits for farmers. It is known that it is not an easy and fast process because of barriers such as cultural and educational backgrounds of farmers, thus it must be dealt in a gradual and constructive way.

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