

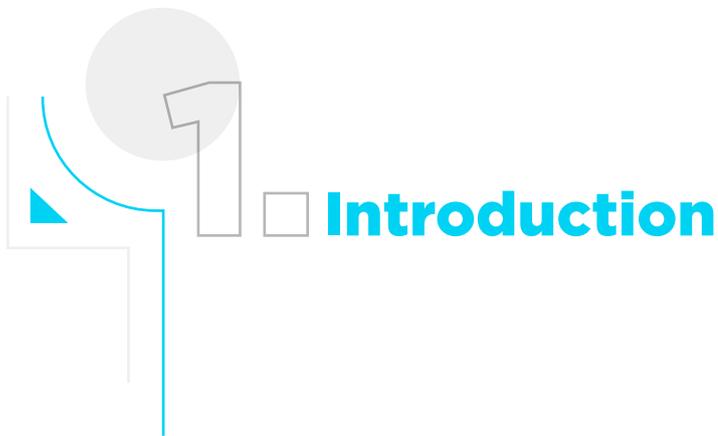
The impact of artificial intelligence tools: an analysis of the public sector in Colombia

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Abstract

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This article explores some of the legal, regulatory and ethical implications of artificial intelligence within the public sector in Colombia. It begins with a brief overview of the emerging technology that will become more prevalent and with an explanation of the reason why it is significant for lawyers and regulators to play an important role in its development. The objective is to identify the key legal and regulatory implications of three different systems that arrived in Colombia as AI tools in order to start a dialogue regarding the way in which the existing legal framework in Colombia is adapting to meet the demands of the 4th Industrial Revolution.



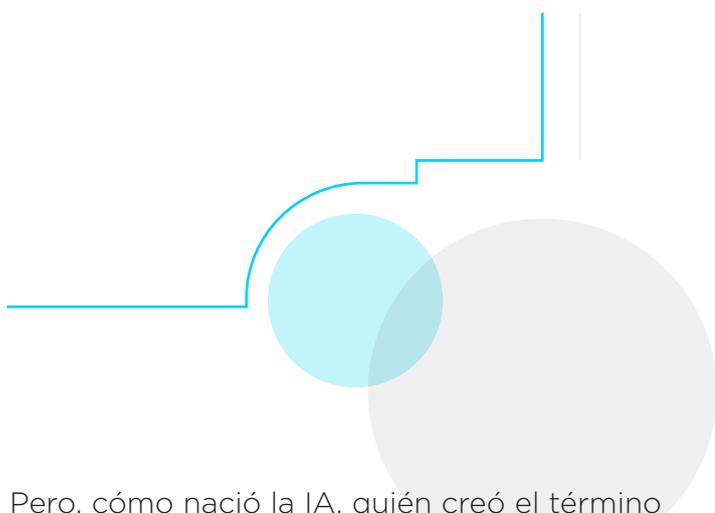
Introduction

Every day we receive news about the use of new technologies affecting the standard form or development of a certain job. Concepts such as artificial intelligence (AI), algorithms, and automated tools, among others, are becoming increasingly common (CEPS; Renda, Andrea, 2019). Experts in the field² consider that AI poses greater global risks and opportunities than even the risks posed by nuclear technology (IA LATAM, 2019). The use of artificial intelligence will be a defining characteristic of our markets and societies (WIPO, 2019): autonomous cars, home assistants, and robotic assistants in financial services can become the norm in a few years.

Nowadays, all citizens are surrounded by numerous devices connected to the Internet (WIPO, 2019). Intelligent machines and software with automatic learning systems will use the large amount of data generated by these devices to make decisions and, in the future, they will be able to carry out actions without human supervision (BDV, 2018). This will have important implications for the way in which citizens make decisions, the way in which they interact with private companies and the government, and the people who will be held accountable when things go wrong.

As an example, Xiaofa is a legal advisory robot found at the Beijing Intermediate People's Court (LegalRobot, 2019; Wen, 2017). This tool knows the answer to more than 40,000 litigation questions and can solve 30,000 legal problems. Furthermore, China already has more than 100 robots in courts across the country as it actively seeks a transition to "smart justice" (Wen, 2017). These robots can retrieve past cases and verdicts, reducing the officials' workload. An application called Intelligent Trial 1.0 is already reducing the judges' workload by helping to examine the material, produce electronic court records and case material (McLaughlin, 2018). However, despite these advances in data collection, use and processing, according to Zhou Qiang, head of the Supreme People's Court, "The artificial intelligence application can provide judges with splendid resources in the judicial sphere, but cannot replace the judges' experience" (Harris, 2018).

² For example, Stuart Russell, Daniel Dewey and Max Tegmark in their article 'Research Priorities for Robust and Beneficial Artificial Intelligence' established risks related to the change in the economic models of countries, in professions and in research. Likewise, the Future of Life Institute has created an international list to prioritize the short and long-term risks that research should focus on, such as biotechnology, impacts on nuclear energy and the environment. In the same way, research centers have focused on the impact of artificial intelligence on different professions. See: Marcus, 2008 and Sobowale, 2016.



Pero, cómo nació la IA, quién creó el término. But how AI was born, who created the term and how it is used are still ongoing questions, depending on the scope. Despite the fact that the term “artificial intelligence” was not coined until 1956, the roots of the field date back to the 1940s (McCulloch and Pitts, 2008) and the idea of AI was crystallized in Alan Turing’s famous article in 1950: “Computing Machinery and Intelligence”, in which this question was asked: “Can machines think?” (Turing, 1950). In this way, AI joins the many phenomena that have been recorded in human history. Although it is not something new, in recent years it has been on the agenda of some governments, industries, academia and various sectors of civil society (European Commission SWD 137, 2018; OECD, 2017; OECD, 2019). And it is no wonder, because this technology has a direct and indirect impact on various aspects of our society, while its future effects are unimaginable.

Since the 1970s, the United Nations Organization (UN, 1975) has stated that scientific and technological progress is welcome as long as it is respectful of human rights. At the time, the UN recognized that “scientific and technological progress is of great importance to accelerate the social and economic development of developing countries” (UN, 1975), but at the same time it demands “respect for human rights and freedoms and the dignity of the human person in conditions of scientific and technological progress” (UN, 1975).

AI technology combined with various techniques from robotic and computer engineering increasingly refine the imitation of intelligent human behavior (WIPO, 2019). Machine learning, Big Data analysis, cloud computing, and algorithmic profiling enable increasingly complex patterns to be identified in large data sets and, in some cases, to outperform humans in certain cognitive functions (BDV, 2018). However, AI technology has not only established itself as a promising tool, both for the private and public sectors, in relation to efficiency, resource allocation and, consequently, increased productivity, but in turn, this technology also promises to help face complex challenges in many areas such as health, transportation, security, finance, government, and even justice (OECD, 2017; WIPO, 2019).

The concepts for AI, machine learning, Big Data and algorithmic profiling could not be considered synonyms, but are complementary depending on the field of application. On the one hand, AI is a branch of computing that deals with the simulation of intelligent behavior in computers (Viola, 2018; WIPO, 2019; European Commission SWD 137, 2018), which is reflected in a machine’s capacity to imitate human behavior, such as visual perception, voice recognition, decision making, and translation into other languages. There are various methods to simulate human intelligence by using or not using machine learning systems or simply a database with the possibility of providing responses (European Commission, 2019). As an example, the intelligence that rules engines imitate could be that of an accountant with knowledge of tax codes, which takes the information that you provide, executes the information through a set of static rules and as a result gives you the amount of tax you owe.

On the other hand, machine learning is a method through which the machine is intended to learn by itself without being explicitly programmed (Hurwitz and Kirsch, 2018). It is an AI application that provides the system with the ability to automatically learn and improve from experience. Two major breakthroughs led to the emergence of machine learning as the vehicle that drives AI development with its current speed. The first advance is given with the concept of understanding, attributed to Arthur Samuel in 1959, which states that instead of teaching computers everything they need to know about the world and how to carry out tasks - prior programming - they could be taught to learn by themselves (Samuel, 1967; McCarthy and Feigenbaum, 1990). The second advance was the appearance of the Internet and the great increase in the amount of digital information that is generated, stored and made available for analysis. Once these innovations were implemented, machines began to be coded to think like human beings, and then they were connected to the Internet to give them access to all the information available in the digital world (BDV, 2018; WIPO, 2019).



Machine learning applications can read a text and determine if the person who wrote it is filing a complaint or offering congratulations (Hurwitz and Kirsch, 2018). They can also listen to a musical piece, decide whether it is likely to make someone happy or sad, and find other pieces of music that match this mood. The "learning" part of machine learning means that algorithms seek to optimize themselves along a certain dimension. That is, they generally try to minimize the error or maximize the probability that their predictions are true (Hurwitz and Kirsch, 2018).

The correct development of AI products will bring more benefits (Viola, 2018; Floridi, 2014; OECD, 2019), but an improper application, implementation and even a hasty response with AI technology without a correct assessment of social and economic risks may result in serious harm for both the citizen and the company or entity that is implementing it (Ballatore and Simone, 2017). Hence, we wonder if all the tools that have been positioned in Colombia as AI solutions are socially acceptable or desirable.

This article will focus on the description, analysis and suggestions on four different systems that were implemented in Colombia as AI tools in the public sector. Firstly, the article presents a description of public policy regarding the innovation and use of disruptive technologies in the public sector. Secondly, a technical-legal description

is presented of four tools that have been called AI in Colombia, and that have been implemented or are in the process of being implemented in the public sector in Colombia: Watson at the Attorney General's Office (Attorney General's Office); Prometea in the Constitutional Court; Océano in the General Comptroller of the Republic (Comptroller); and Sofia at the National Tax and Customs Directorate (DIAN). Thirdly, the legal, social and ethical implications that these tools have or may have in the country are pointed out. And, finally, some recommendations are proposed for developers and acquirers of AI products in Colombia for the correct implementation of this technology, taking into account all citizens while protecting their rights as well as seeking development for the country.



The so-called “artificial intelligence” in Colombia: projects in the public sector

The Colombian Online Government Strategy has focused its efforts on introducing ICT (Information and Communication Technologies) in the processes and procedures of State entities, with the aim of improving, automating and making them more efficient in order to improve public management and the relationship of the State with its citizens (MinTIC, 2019). This strategy is led by the Ministry of Information Technology and Communications (MinTIC) which, through the Digital Government Directorate, is in charge of issuing the standards, manuals, guides and the monitoring and assessment methodology for the implementation of Digital Government policy in public entities of the national and territorial order.

Thus, each state entity must adapt and modify its internal policies to guide itself within this national strategy. In order to do this, the MinTIC has prepared an Implementation Manual of Digital Government policy and Decree 1499 of 2017 on the Integrated Planning and Management Model, among other instruments (OECD, 2018). Within this strategy, laws, decrees and regulations converge to allow the various national entities to follow a roadmap for technology implementation in their various processes.

Table 1. Regulations related to the Digital Government strategy



Source: compilation by the authors

³ Decree 1151 of 2008: "Whereby the general guidelines of the Online Government Strategy of the Republic of Colombia are established, Law 962 of 2005 is partially regulated, and other provisions are issued." The previous decree repealed by Decree 2693 of 2012: Whereby the general guidelines of the Online Government Strategy of the Republic of Colombia are established, Laws 1341 of 2009, 1450 of 2011 are partially regulated, and other provisions are issued. "Also the issuance of decree 1078 of 2015: Whereby the Single Regulatory Decree of the Information and Communications Technology Sector is issued", which was modified by decree 1008 of 2018: "Whereby the general guidelines of the Digital Government policy are established" and chapter 1 of title 9 of part 2 of book 2 of Decree 1078 of 2015 is subrogated: 'Single Regulatory Decree of the Information and Communications Technologies sector'.

Table 1 summarizes the various regulatory levels of the Online Government strategy. Each of them brings with it various laws and decrees to be adapted by state entities³. Decree 1151 of 2008 established as an objective of the Online Government Strategy "To contribute to the construction of a more efficient, more transparent and participative State by providing better services to citizens and companies through the use of Information and Communication Technologies". Within this approach, the key aspects of the strategy are based on: i) actions focused on government entities; ii) presence on the web by state entities; and iii) prioritization of online information. Subsequently, with the issuance of Decree 2693 of 2012, cross-cutting elements were introduced to this strategy to strengthen user identification, the characterization of technological infrastructures and to incorporate the information security policy. The aforementioned regulatory framework is the legal basis for transversal change in entities such as the Attorney General's Office, the Constitutional Court, the Comptroller and DIAN.

Despite all the possibilities that new technologies represent for the government-citizen relationship, especially AI use and development, the implementation and adaptation processes are still insufficient. On this point, some civil society organizations such as the Karisma Group and DataSketch have mentioned that the hasty use of these tools can cause harm or endanger citizens' rights, taking into account that not all the population in Colombia has access to the Internet or telecommunications networks in general (Karisma, 2019; Romero, 2019).

Within the implementation of the Online Government strategy, some entities of the national and regional order are implementing various disruptive technologies to improve processes and to make public management more efficient. These entities include the Attorney General's Office, the Comptroller General's Office, the Superintendency of Industry and Commerce, DIAN, and the Superintendency of Notaries and Registration, among others⁴. Next, the strategies implemented or in the process of being implemented in only three of these entities (the Attorney General's Office, the Constitutional Court and DIAN) will be studied in detail. The decision to analyze these three initiatives is based on three main arguments. First, these initiatives have a direct social impact on the population due to the possible impairment of citizens' fundamental rights. Second, these initiatives have generated media trends due to their social impact. Third, these three projects are based not only on process automation and information gathering, but also have decision-making and/or information analysis components to assist the operator.

2.1. Attorney General's Office-Watson

The Attorney General's Office of Colombia was created in 1991 with the promulgation of the new Political Constitution and began operations on July 1, 1992. It is an entity belonging to the judicial branch of public power, with full administrative and budgetary autonomy, whose function is aimed at providing citizens with a complete and effective administration of justice. In the 27 years the Attorney General's Office has existed, the penal system in Colombia has had various modifications, to such an extent that

⁴ 4 The Superintendency of Industry and Commerce is carrying out an institutional reformulation to adapt new technologies in consumer, competition, user service and intellectual property issues. More information at: https://www.sic.gov.co/sites/default/files/-files/Nuestra_Entidad/Transparencia_y_acceso_a_la_informacion_publica/11-9PETI-OTI-agos_to_2018_V6_2.pdf For the Superintendency of Notaries and Registration, their plan of action can be consulted at: https://www.supernotariado.gov.co/PortalSNR/ShowProperty.jsessionid=KrUDnOXesRsPPlgXl0D_JdsXqFIPnckn_wrfm-K1sygnC-qG3sL_xLj!-904494459?nodeId=%2FNSNR-Content%2FWLSWCCPORTALO-fi69864%2F%2FidcPn_maryFile&revision=latestreleased

nowadays the entity, in compliance with its investigative and judicial functions, must apply an extensive legal framework comprised of laws and decrees denoting the social and political changes⁵ in the country⁵.

These changes have affected the way the entity operates and, as a consequence, its various information systems. The Attorney General's Office had several missional information systems by 2018, which operate in a dispersed manner and with almost no communication between them. Thus, it was necessary to implement solutions that allowed the entity (i) to adequately manage criminal proceedings, (ii) apply vigorous criminal analysis tools and (iii) make managerial and strategic decisions based on solid empirical evidence (Attorney General's Office, 2018).

In the 2016-2017 Management Report, this entity presented a diagnosis in which the following problems were identified: (i) lack of project integration with the technological infrastructure and lack of a leading team to manage the usage and appropriation strategy; (ii) absence of a project governance body; (iii) obsolescence of the technological architecture, insufficient technological channels to access the services of the Prosecutor's Office and lack of integration between systems; and (iv) operations based on physical records, inadequate complaints reception processes, delays in process allocation and long attention and operation times (Attorney General's Office, 2019).

Once these problems were identified, the diagnosis proposed different strategies among which are the creation of an entity to be in charge of managing change, the restructuring of the attention and operation model, the authorization of self-management channels, the creation of dynamic forms supporting the complete compilation of the complaint, the implementation of digital files and an intelligent and automated process allocation (Attorney General's Office, 2019).

Additionally, in the 2017-2018 management report, the Attorney General's Office presented the Sub-Directorate of Information and Communication Technologies, which began the implementation of an infrastructure with state-of-the-art technology in order to facilitate process optimization and the improvement of computer services by means of a highly available technological platform (Attorney General's Office, 2019). This technological platform integrates different applications and information systems of the entity, which include: (i) missional systems such as the Oral Accusatory Criminal System (SPOA); (ii) administrative systems such as Kactus and Orfeo; (iii) external and transnational databases that are used for criminal investigation; (iv) modules developed for user service, such as assignment of appointments, reception of accusations and requests, complaints and claims (PQRS); and (v) systems based on Big Data tools such as Watson, among others (Attorney General's Office, 2019).

⁵ Some of the laws are: Law 600 of 2000 'Whereby the Code of Criminal Procedure is issued' repealed by Law 906 of 2004 'Whereby the Code of Criminal Procedure is issued' and which implemented the accusatory oral criminal system in Colombia; Law 975 of 2005 'Whereby provisions are made for the reinstatement of members of armed groups organized outside the law that effectively contribute to the achievement of national peace and other provisions for humanitarian agreements are laid down.' Law 1098 of 2006 'Whereby the Childhood and Adolescence Code is issued.' Law 1448 of 2010 'Whereby care, assistance and comprehensive reparation measures are issued to victims of the internal armed conflict and other provisions are laid down.' Law 1826 of 2017 'Whereby an abbreviated special criminal procedure is established and the figure of the private accuser is regulated.'

Thus, from the reports collected from the Attorney General's Office from 2016 to 2018, a series of needs were identified that made it difficult to exercise functions in the entity (Attorney General's Office, 2018). Five key points were found: **i)** lack of unification in attention models; **ii)** weaknesses in the current operating model; **iii)** deficiencies in government schemes; **iv)** information systems that do not facilitate operation; and **v)** lack of integrity of the ICT usage strategy (Attorney General's Office, 2018). As a result of these diagnostic reports, and combined with the Online Government strategy, the Attorney General's Office implemented a new system that seeks to align itself with the State's objectives and, in turn, to strengthen legal investigation in the entity (MinTIC, 2019; MinTIC, 2019).

It is evident from the management reports that the entity acquired several software packages for document management and information infrastructure between 2016 and 2018. In the reports and in the various research documents on Watson's software in the Attorney General's Office, neither an impact analysis was found for this tool, nor the reasons that led the Attorney General to acquire this software and not others. However, by the beginning of 2018, very few of the tools acquired had been implemented.

It was not until August 2018 that the Attorney General's Office began to manage the use of the Watson Machine Learning tool. This tool is used for case association and data analytics to predict the risk of recidivism and to apply for assurance measures in record time, which has been called "Prosecutor Watson" (Attorney General's Office, 2019).

Prosecutor Watson has been implemented thanks to IBM Watson software, which is the first cognitive AI system that materializes as a cloud service while analyzing large volumes of unstructured data: it understands complex questions and presents answers and solutions in natural language to expand knowledge and improve the decision-making of professionals in a wide variety of fields (IBM, 2018; Ferruci, 2012). This tool was developed by the IBM company and has currently developed a scheme of fifteen tools that fulfill different functions and that, as a whole, articulate Watson technology (IBM, 2018; Kohn, 2014).

Watson is a computerized question-and-answer system capable of answering in natural language (Ferrucci, Levas, Bagchi, Gondek, and Mueller, 2013). It is a cognitive system that uses natural language appreciation with AI technology to: **i)** understand people's natural language, **ii)**



analyze information from the Internet of Things, and ⁱⁱⁱ learn from the information the system continuously receives (Ferruci, 2012; IBM, 2018; Hurwitz and Kirsch, 2018). Natural language can be defined as the language spoken or written by humans for general communication purposes, unlike other languages such as a constructed language or programming languages, among others. This is how Watson becomes the main character of the IBM company and ushers in a new era in the history of computer science (IBM, 2018; Atkinson, 2014).

With this tool, the Attorney General's Office seeks to implement automation for complaints, as well as the interrelation of information systems, thus leveraging the entity's strategic objectives. Prosecutor Watson is used as a technology at the service of research and it is a software that allows the exploration of all the information residing in the SPOA databases, case association and context analysis. SPOA has had information on 13 million complaints since 2005. However, this information was distributed in the regional information systems in an unstructured manner, which hindered procedural unity and system efficiency. With the arrival of Prosecutor Watson, procedural information about a person, a crime, or a region can be associated and cases in different regions can be related. This system currently operates in Ibagué, Bogotá, Cali and Bucaramanga, locating criminal cases and modalities and preventing a prosecutor from manually searching a suspected criminal's background (Attorney General's Office, 2018).

In this regard, the Deputy Attorney General at the time, María Paulina Riveros, explained that "the Watson system has made it possible to search these complaints, correlate them, make context analysis on similar elements such as modus operandi, physical characteristics, types of weapons and vehicles, among other things" (El Espectador, 2018). One of the most prominent examples of the use of Prosecutor Watson since it was implemented in the Attorney General's Office was the capture of Walter Matíz Ramírez, known as the "Encantador" [the "Enchanter"], who identified himself in front of his victims as a member of the National Army to gain their confidence and sexually abuse them (El Espectador, 2018). By means of this tool, the Attorney General's Office, through a comparative analysis, managed to associate nine cases of complaints in Honda, Ibagué and Bogotá in which the detainee could be involved. The software allowed the discovery of patterns that coincided, such as modus operandi, the suspect's morphological characteristics, the vehicles used, telephone numbers, and people who mentioned a sexual abuser in a certain municipality in the country (Attorney General's Office, 2018). Another of the most relevant cases that Prosecutor Watson identified was the "Los Sucios" ["The Dirty Ones"] case, in which seven cases from a criminal organization engaged in the theft of high-end trucks were identified. This software allowed the individualization and capture of three people by means of pattern correlation (El Espectador, 2018).

The use of the Prosecutor Watson tool in Colombia has been implemented mainly in the immediate allocation of cases and process association. Thus, from the work carried out by the judicial police analysts who are in the sections of Criminal Analysis and Big Data tools such as Watson, correlations are being achieved between cases as well as between the criminal news entering the entity and the historical database in SPOA (Attorney General's Office, 2019). Factors such as suspect's recidivism and the coordinates of the place of the events are central to these associations. Since its implementation in Cali, Bogotá and Ibagué, 17,875 cases have been associated by the coordinates of event occurrences, 868 cases by the suspect's identification number and 722 cases by the suspect's morphological data or modus operandi (Attorney General's Office, 2018; El Espectador, 2018). By 2019, this correlation tool has been implemented in 100% of the Criminal Analysis Section (SAC) units nationwide.

2.2. Constitutional Court-Prometea

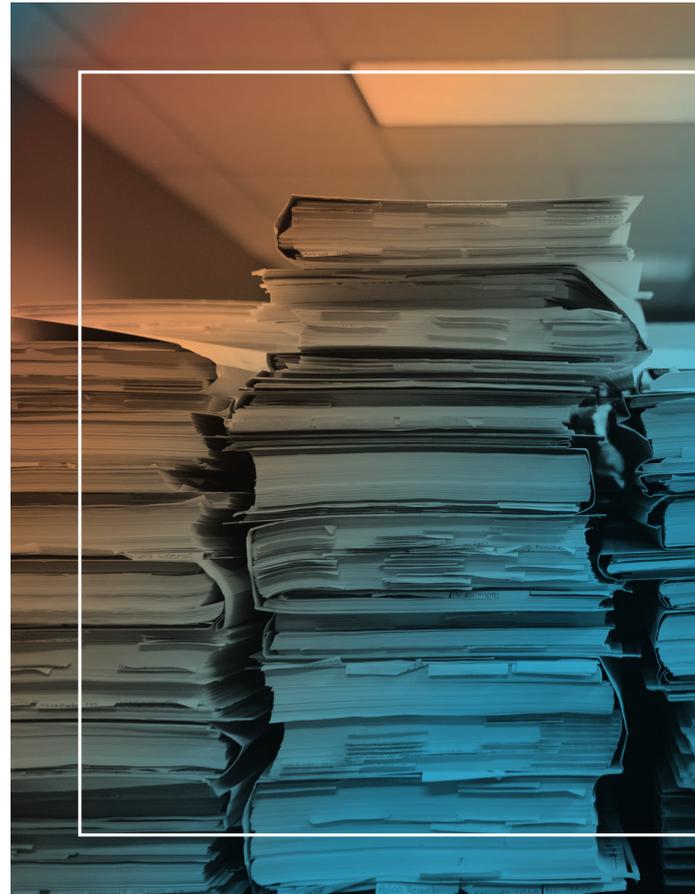
The Constitutional Court was created by the current Political Constitution, and has been in force since July 7, 1991. It is an organism belonging to the judicial branch of public power and is entrusted with guarding the integrity and supremacy of the Political Charter. Additionally, guardianship is the most used public action in Colombia to safeguard fundamental rights (Botero Marino, 2009; Silva, 2011).

According to the 2018-2019 Constitutional Court management report, the institution admitted having an internal daily processing capacity of a maximum of 2,700 files, a low number considering the statistics presented by the same Court in relation to guardianship actions per year: for example, according to this entity (Constitutional Court, 2019), 620,242 guardianships were studied in 2019. The Corporation's judges and practitioners review each file and pre-select the cases that could be subjected to a review in accordance with the criteria established in Article 52 of Agreement 2 of 2015 in the Constitutional Court. Each month, two offices study the shortlisted guardianship rulings in addition to associated files that month. In this way, finally, some files are selected for review by means of a hearing. Approximately 0.05% of the guardianship actions reaching the Constitutional Court are selected for review (Constitutional Court, 2019).

The problem at this point lies in the physical impossibility that a Court operator can read all the files in the time required to resolve this constitutional matter. This impossibility led to the Court signing a memorandum of understanding on November 14, 2018 with University of Rosario, with the Innovation and Artificial Intelligence Laboratory of the University of Buenos Aires and with the Public Prosecutor's Office of the Autonomous City of Buenos Aires. The purpose of this memorandum is to have access to an experimental trial of process automation in the General Secretariat of the Court and to

an AI proof of concept based on first and second instance guardianship rulings and the Corporation's review rulings (Constitutional Court, 2019).

This pilot project was built on the basis of a tool called "Prometea", which classifies and mechanically processes certain documents. This tool automates repetitive tasks such as the production of clerical work and can set correlation criteria through the use of data analytics to select cases and perform information filtering (Constitutional Court, 2019). In short, Prometea allows the automatic reading of sentences and documents, and the selection of priority cases in a very short time by means of intelligent detection that makes it possible to suggest cases urgently and as a priority.



Said memorandum of understanding ended on January 21, 2019 and on February 5 of the same year the results of the pilot test were presented. In general, the results were based on five important aspects: (i) problems in information capture and quality; (ii) natural language reading problems; (iii) challenges regarding intellectual property rights over data processing code and source; (iv) inclusion of variables that can create biases in the machine learning process; and (v) a need for interrelation between the different technology projects developed in the Court and in the Judicial Branch (Constitutional Court, 2019).

The Prometea tool, according to its promoters, can be considered as an AI system that collects information from the thousands of files reaching the Constitutional Court, systematizes said information and, according to the common characteristics shared by the guardianships, decides which ones should be reviewed by the High Court. This tool seeks to help the constitutional judge through the statistical management of databases and information and facilitate their decision-making without any conditioning. Thus, Prometea would be able to read, analyze, detect and suggest cases for immediate attention due to a possible rights violation. According to the implementation reports of this tool, it is evident that in a few minutes and without human intervention, it is capable of preparing detailed reports, detect and select a group of priority cases, and automatically extract the paragraphs from which people in a special situation of vulnerability are mentioned, segment those situations (disease, senior adults, girls, boys and adolescents, etc.) and, at the same time, takes into account the latest Court rulings, certain criteria of the World Health Organization, and other norms that are essential to analyze various cases (Constitutional Court, 2019).

Considering that AI tools seek to automate activities such as decision-making, problem solving, and learning through emulation of rational human logical thinking (IBM, 2020), Prometea cannot be considered as an AI system since it does not make decisions for guardianship selection, nor does it learn from constitutional provisions to generate objective selection criteria. On the contrary, Prometea can be classified as an automated document control system that is capable of generating various statistics by taking into account the information found in the Constitutional Court's repositories (Constitutional Court, 2019). As has already been explained in various academic forums and the media, Prometea does not seek to replace the judge but to provide statistics and figures so that it is the judge who decides, for example, to attend to certain cases with a higher priority than others.

That is, Prometea does not make decisions for the judge; on the contrary, it is the judge who, relying on this tool, makes the relevant decisions. This tool has the ability to read and summarize the guardianships presented and then, with the criteria provided by the judge, propose a group of guardianship selections that can be acknowledged by the constitutional judge (IALAB, 2019). Thus, according to the Artificial Intelligence Laboratory in Buenos Aires, Prometea simplifies, reduces errors, accelerates the comprehensive preparation of legal and administrative documents, and has a decisive impact on the effectiveness of rights in general (IALAB, 2019).

This tool has four main functions. Firstly, it presents an intuitive user interface based on a voice command or conversational agent. Secondly, it has a single, integrated display interface to reduce clicks and eliminate the opening of digital windows. Thirdly, it automates tasks to create documents and link them to stable or predictable decisions. Finally, it develops digital assistance functions, such as advanced search for laws, documents, reporting writing and statistics (IALAB, 2019).

Within the pilot process carried out in Colombia, the tool was applied only with respect to requests for review for cases related to the right to health (Constitutional Court, 2019). Prometea's intervention begins with a keyboarding or conversational agent tool that accompanies the judge throughout the selection process and, in turn, assists the General Secretariat in reducing internal procedures. Then, a semantic and grammatical analysis is carried out, in which the program detects the main causes and specific circumstances of each case, which determines whether or not the guardian is in a situation of manifest urgency, depending on how the right has been affected. Thus, based on the statistical analysis generated by the tool, according to its promoters, it was possible to train the system to select the most urgent guardianship actions for the protection of health that required priority treatment by the constitutional corporation (Sierra Cadena, 2019).

This tool cross-references various databases that have been previously incorporated to present reports related to cases involving people in a particularly vulnerable situation. For example, Prometea uses the Constitutional Court's database on previous guardianship rulings, the criteria of the World Health Organization (WHO) and various related laws to determine the priority for each case. In the words of the former president of the Constitutional Court, magistrate Alejandro Linares, "the tool introduces transparency elements so that citizens monitor the Corporation's management and, also, so that (...) they know the current status of their applications" (Rivadeneira, 2019).

In short, Prometea makes the process of file selection and their subsequent review more efficient. In this way, with the pilot plan and according to its promoters, it was proven that Prometea improves health guardianship management by 900%, which means that requests can be responded to in real time (Sierra Cadena, 2019). This figure has been recurring in various academic forums and the media, without an impact analysis being found and without support for this figure being provided in the Constitutional Court's management report. Consequently, this tool would allow the constitutional judges to have greater capacity for analysis, time and research in substantive decisions.

2.3. Directorate of National Taxes and Customs (DIAN) - SOFÍA

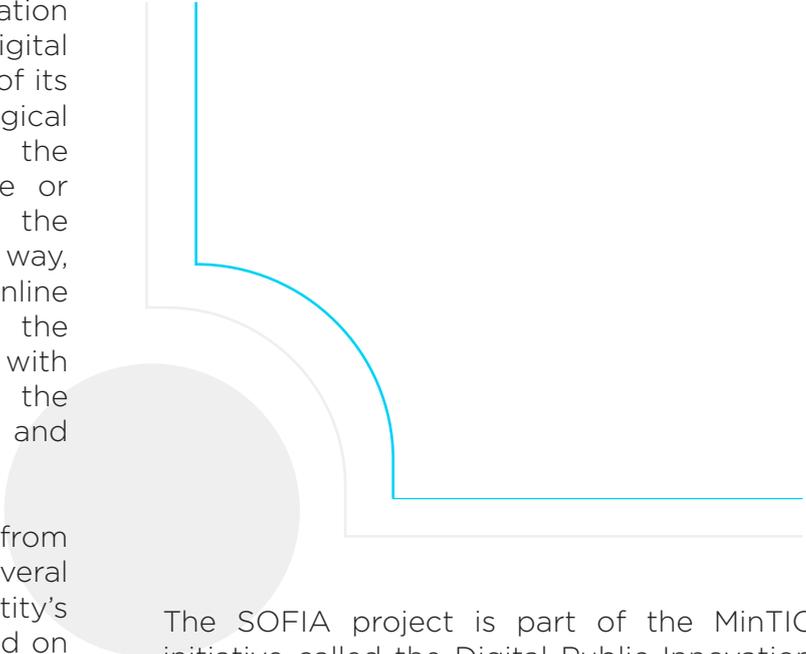
DIAN is an entity attached to the Ministry of Finance and Public Credit, which was established as a Special Administrative Unit by Decree 2117 of 1992, when the National Tax Office (DIN) was merged with the Office of National Customs (DAN) on June 1, 1993. By Decree 1071 of 1999, a new restructuring is implemented and the Special Administrative Unit Directorate of National Taxes and Customs (DIAN) is organized.

The current National Government proposed to bring forward a series of changes that would make the entity more modern and efficient, not only to guarantee the income required by the government to carry out social programs, but also to face tax evasion and the fight against contraband (DIAN, 2019). DIAN began the entity's transformation based on four institutional pillars: i) transformation of human talent, ii) technological transformation iii), proximity to citizens; and iv) legitimacy and sustainability (DIAN, 2019).

Within the technological transformation pillar, the intention is to change to a digital entity that has and makes efficient use of its data. Progress is being made in technological transformation so that DIAN has the traceability required by tax, exchange or customs operations, guaranteeing the transparency of these processes. In this way, DIAN expanded the offer of online proceedings and services, began the massification of electronic invoicing with technological improvements and the harmonization of customs formalities and services (DIAN, 2018).

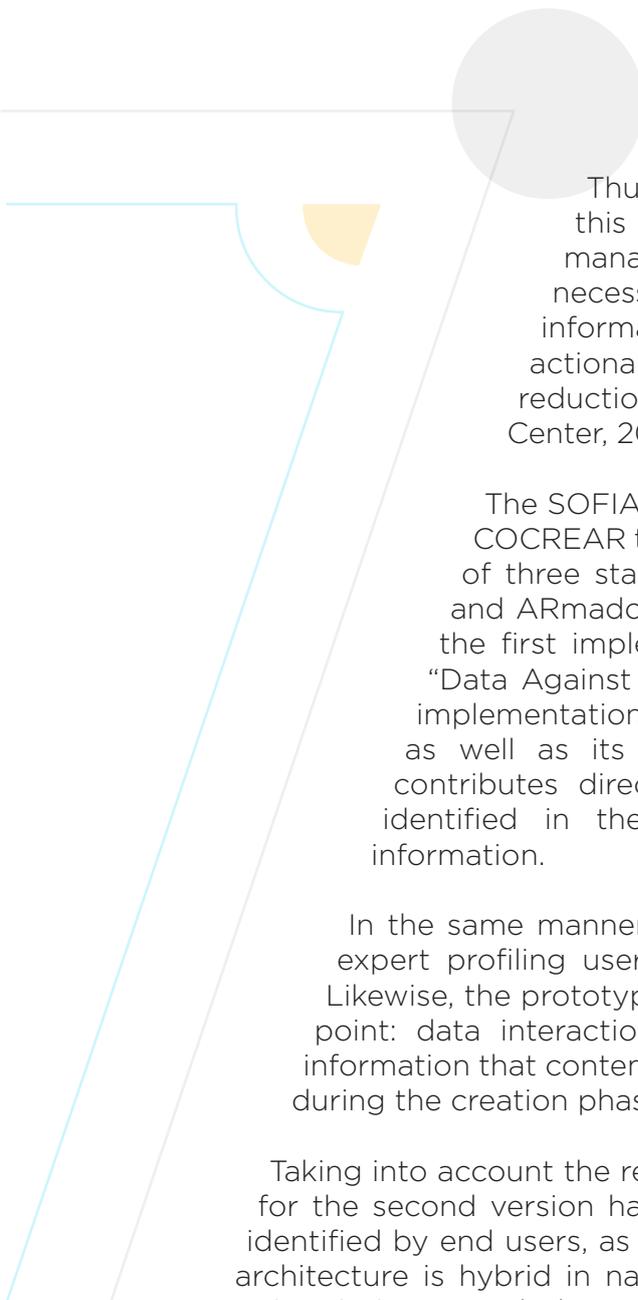
Within the entity's accountability report from January to December 2018, several challenges were established for the entity's transformation. Two of them are focused on the adoption of information technologies to improve efficiency in certain processes. The first of these is to include Chatbot and AI tools for citizen services (DIAN, 2018). The second challenge, related to AI implementation, consists in modifying the audit model that will be supported by technology. On the one hand, the increase in control coverage will be expanded through the creation of the Electronic Inspection System that will increase digital inspection in coverage and effectiveness. On the other hand, the reduction of evasion and avoidance gaps, supported by risk management models and intelligent inspection (artificial intelligence, Big Data, geo-referenced data, among other technologies) that directly affect results in the fight against evasion, avoidance, contraband and the illegal economy (Portafolio, 2019).

Taking into account the entity's various needs and problems, the Strategic Plan for Information Technologies 2019-2022 (PETI) is launched. The projects currently being developed in the entity are described within this plan. The first of these is the use of a tool called SOFIA, which is established as an AI tool to support decision-making in the generation of customs risks (DIAN, 2019). SOFIA is the initial project with which DIAN intends to modernize process management in customs and contraband control issues.



The SOFIA project is part of the MinTIC initiative called the Digital Public Innovation Center that works with innovative methods to stimulate the use of digital technologies and thus promote the State's digital transformation. The Center acts as a laboratory, as a knowledge agency, as an academy and as a catalyst for the innovation ecosystem (MinTIC, 2019). The objective of the project is to support DIAN in strengthening the customs profiling process of the cargo entering the country through the development of a digital solution that allows the generation of actionable intelligence from the analysis of large volumes of information (MinTIC, 2018).

According to DIAN, one of the main strategies to combat contraband is the profiling of the cargo entering the country. This work is led by a specialized group of professionals who, on the basis of information from the DIAN missional systems and prior intelligence such as complaints, blacklists, and alerts, among others, examine the available information related to the cargo entering the country during the entire import process. The result of this analysis generates alerts about possible findings of suspicious merchandise and triggers verification actions at customs (DIAN, 2018). However, this process nowadays is carried out manually, which reveals the absence of technology in the entity.



Thus, the Digital Public Innovation Center decides to support this ICT modernization project to build a digital solution that manages to incorporate the algorithms and interactivity necessary to analyze various sources with large volumes of information and that triggers, at the end of the process, a timely actionable intelligence, allowing the identification and subsequent reduction of the contraband phenomenon (Digital Public Innovation Center, 2019)

The SOFIA digital solution is implemented from a methodology called COCREAR that is based on Design Thinking. This methodology consists of three stages: COmprensión (Comprehension), CREación (Creation) and ARmado (Assembly) (Digital Public Innovation Center, 2019). From the first implementation of this methodology, the first iteration of the “Data Against Contraband” project was completed, which describes the implementation process of the first prototype of the SOFIA digital solution, as well as its functionalities and pending challenges. This prototype contributes directly to the solution of one of the three critical points identified in the comprehension process: the opportunity to consult information.

In the same manner, the prototype allows queries of historical information to expert profiling users in far less time than the baseline (hours vs. minutes). Likewise, the prototype allows a first approach to be made to the critical second point: data interaction. The tool constitutes a first query interface with the information that contemplates what was found in the user design study carried out during the creation phase (Digital Public Innovation Center, 2019).

Taking into account the results of the first prototype version, the architecture design for the second version has already begun. This architecture responds to the needs identified by end users, as well as the technological limitations faced by analysts. The architecture is hybrid in nature by considering on premise and cloud elements. This project in its second phase seeks to: i) build learning data, ii) outline structures about people, and iii) delve into the artificial intelligence component (Digital Public Innovation Center, 2019).

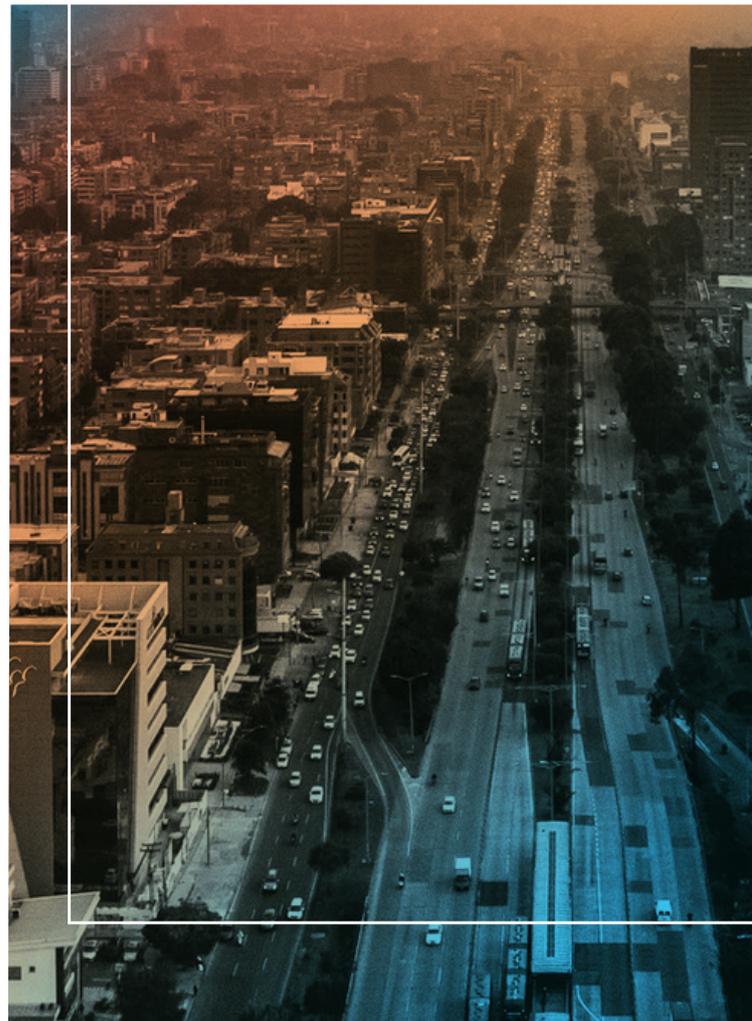
Finally, it is expected that the other phases of the project will be completed throughout 2019 in order to begin its implementation in DIAN. For the time being, some objectives have been proposed to be fulfilled within the design phase, such as: i) saving between 2 to 24 hours on average to analyze data and ii) systematizing information and determining the objective criteria through the profilers’ experience. This was the first in a series of prototypes that continued to be tested in 2019.

2.4. Office of the Comptroller General of the Republic - OCÉANO⁶

The Comptroller General of the Republic (CGR) is the highest authority of State fiscal control in Colombia. It was created on July 19, 1923 through Law 42 during the commission of experts led by the economist Edwin Walter Kemmerer, who made a series of recommendations to reorganize the public finances of the Colombian State, including the creation of the Bank of the Republic. This entity has the mission of procuring the proper use of public resources and goods and contributing to the modernization of the State by means of ongoing improvement actions in the different public entities (Comptroller General of the Republic, 2019).

Within the Government and IT Management objectives of the entity, the institutional strengthening program has been developed since 2014, which contemplates the need to carry out a governance and management model of information technologies, based on the reference frameworks of COBIT6 and ITILCOBIT⁷ and ITIL⁸ (Comptroller General of the Republic, 2018). One of the core areas that the CGR seeks to strengthen and modernize is the frontal fight against corruption. In this way, the CGR proposes in the 2018-2022 strategic plan the creation and/or acquisition of a “unique technological tool as a repository and information manager (reports, studies, data, formats, etc.) that allows capturing, organizing and tabulating micro and macro information for decision-making” (Comptroller General of the Republic, 2015).

In the same report, it is mentioned that the CGR seeks the implementation of technological tools that facilitate interoperability for the exchange of information with various entities in real time and in a secure manner throughout the organization (Comptroller General of the Republic, 2015). To fulfill this objective, an “Integrated Information Center (evaluating the use of disruptive technologies such as Big Data, artificial intelligence, machine learning, x-road, among others, according to the needs raised)” is proposed as a product. From this report it can be extracted that the entity has been evaluating the possibility of implementing disruptive technologies to capture information since 2015, but even more so to create



⁶ Through Decree 2037 of 2019 and Resolution 0731 of 30 December 2019 creates the DIARI (Directorate of Information, Analysis and Reaction Immediate) which works at through systems intelligence and big data OCÉANO

⁷ COBIT: Control Objectives for Information and Related Technologies is a reference framework incorporating best practices aimed at the control and supervision of information technologies

⁸ ITIL: Information Technology Infrastructure Library is a reference framework incorporating definitions and good practices for the management of information technology services, the development of information technologies and operations.

correlations with the different databases of each state entity and thus find critical points in relation to the use of public resources and their fiscal management.

This is how at the end of 2018 the OCÉANO technological platform emerged as a tool for the control and monitoring of fiscal management (Comptroller General of the Republic, 2019). This platform is fed by public information sources, which establishes relationships between contracts concluded at the national level and analyzes them to detect possible cases of corruption. It uses internal⁹ and external contractual sources such as SIRECI¹⁰ and SECOP¹¹, among others, to cross this information with external sources such as SIC¹² with respect to natural and legal persons sanctioned by the entity, as well as with the registration of sanctions and causes of SIRI disability of the Attorney General's Office, among other sources (Comptroller General of the Republic, 2019).

In this way, OCÉANO becomes the information center of the CGR, which starts from the data analysis arriving from external and internal sources and uses technological mining tools, data analytics and artificial intelligence, so far having analyzed more than 30 million data (Comptroller General of the Republic, 2019). Once all the information is cross-referenced, the records supplied by the various sources of information are added, integrated, cleansed, crossed and stored. Finally, a methodology is used to move from the algorithm to the mesh, which quantifies the frequency or the number of times a node acts as a bridge along the way, analyzing the number of links and their proximity.

With the information collected and processed, the so-called "business meshes" are created, comprised of one or several groups with a reduced number of contractors who have been awarded a significant volume of contracts by means of legal concepts, such as Temporary Unions¹³ and Consortia¹⁴ (Comptroller General of the Republic, 2019). Additionally, to establish the connection between these concepts and the different contracts within the information sources, a conglomerate or cluster analysis is used as a statistical technique that allows the division of a set of objects into different groups, so that a profiling of each object is performed and said objects are located in the same group but separate from objects belonging to different clusters (Comptroller General of the Republic, 2019). According to the CGR, thanks to these meshes it was possible to detect that one of the largest has a connector between contractors that totals 112.5 trillion pesos distributed in 229,680 contracts that have been awarded to similar Temporary Unions and Consortia, either

⁹ Internal contractual sources: SIRECI; external: SECOP, SIA, OBSERVA, SIMICOF. External sources: SIC, SIRI of the Attorney General's Office, DIAN with the disaggregation of consortiums and temporary unions, Registry of canceled certificates of the National Registry of Civil Status and canceled registrations of CONFECÁMARAS boards of directors.

¹⁰ SIRECI: National contracting information. Tax agent newsletter.

¹¹ SECOP: national and territorial contracting information.

¹² SIC: Superintendency of Industry, Commerce and Tourism

¹³ Law 80 of 1993, whereby the General Statute of Public Administration Contracting was issued, defines the Temporary Union in article 7 as "when two or more people together present the same proposal for the award, conclusion and execution of a contract, jointly and severally responding for full compliance with the proposal and the contracted object, but penalties for non-compliance with the obligations derived from the proposal and the contract will be imposed according to the participation in the execution of each of the members of the temporary union".

¹⁴ Law 80 of 1993, whereby the General Statute for Public Administration Contracting was issued, defines consortia in article 7 as: "When two or more people together present the same proposal for the award, conclusion and execution of a contract, jointly and severally responding to each and every one of the obligations derived from the proposal and the contract. Consequently, the actions, facts and omissions that are presented in the development of the proposal and the contract will affect all the members that comprise it."

with similarities in the legal representative, in the fiscal auditor or among other correlations (General Comptroller of the Republic, 2019).

A final phase of this tool, which is in development, will allow to go from findings in contracting that is already underway to predictions before contracting (Comptroller General of the Republic, 2019). Thus, with the unification of monitoring and search criteria, OCEANO aims to reduce the subjective level of audits to generate early alerts of a possible patrimonial damage (Comptroller General of the Republic, 2019). For example, one of the findings was the establishment of “multipurpose” companies that can generate patrimonial detriment by allowing them to continue contracting. This is the case of a company whose corporate purpose is dedicated to the sale of laying hens and at the same time builds public roads, or there is also the case of a pharmacy in the Amazon that ended up making social housing (El Tiempo, 2019).

Finally, within the CGR's 2018-2019 management report, it is evident that the OCEANO tool is in the process of signing cooperation agreements (Comptroller General of the Republic, 2019). These agreements are arranged for the exchange of information with various entities at the national level such as the Accounting Office, the National Digital Agency and the Administrator of the resources of the General System of Social Security in Health - Adres (Comptroller General of the Republic, 2019). Thus, this tool seeks to become an integrated information system beyond public contracting and generate valuable information for various state entities (Comptroller General of the Republic, 2019).



3

Analysis of the ethical and legal problems of the use of AI in the public sector in Colombia

3.1. Myths about the AI scope

The concept of AI can often be misinterpreted by civil society, government, and even entrepreneurs seeking to innovate in this field. There are five myths surrounding the use of AI technology (Leitch, 1992; Ballatore and Simone, 2017). The first myth claims that AI technology works in the same way as the human brain. However, AI involves the use of techniques to replicate some capacities and abilities of human beings such as learning, reasoning, planning, perceiving or processing natural language (Internet Society, 2017). In this way, one must be cautious enough to understand if a certain project or tool acquired by some public or private entity is actually AI or if, on the contrary, the organization is acquiring another type of tool such as document digitization or data visualization, without making real use of AI technology.

The second myth claims that intelligent machines learn on their own, without the need for human intervention (Moor, 1978; Fox, 1990; Laurent, 2018). However, to develop an AI-based machine or system, some human intervention is strictly required. For example, participation may come from experienced human data scientists who are performing tasks such as problem framing, preparing data, determining appropriate data sets, eliminating potential biases in training data, and most importantly, continually updating software to allow the integration of new knowledge and data in the next learning cycle (Laurent, 2018). In this way, any AI system or tool that is mentioned or promoted as a system that will eliminate human intervention should be questioned, since AI and machine learning experts agree on the concept of audit or joint work with humans

to avoid biases and to represent a mature AI system (Internet Society, 2017; Nooijen, 2019). The third myth is that AI can be free from bias (Leitch, 1992; Laurent, 2018). However, any type of AI technology is based on data, rules and other types of input from human experts. Thus, just like humans, AI technology is also intrinsically biased in one way or another (Internet Society, 2017; Nooijen, 2019). For this reason, any AI system or tool to be implemented in an organization must, in its impact study, relate what types of information sources it intends to have access to and what the selection process of relevant information and junk information will be like (Nooijen, 2019).

The fourth myth points out that AI technology will only replace repetitive jobs that do not require advanced degrees (Laurent, 2018; Fox, 1990). Although this technology enables companies to make more accurate decisions through predictions, classifications, and clustering, allowing AI-based solutions to replace everyday tasks, it has also increased the speed for completing complex tasks. Thus, for example, an AI-based chest x-ray application can detect diseases faster than radiologists. Just as in the financial and insurance industry, where robotic assistants are used for wealth management or fraud detection. Nevertheless, the use and implementation of AI technology does not completely eliminate human participation in these tasks, but it will make humans deal with unusual or particular cases (Leitch, 1992; Laurent, 2018).

Finally, the fifth myth points out that all companies need to implement AI in their processes to be in tune with the digital economy (Canellopoulou-Bottis, Panagopoulou, Michailaki and Nikita, 2019; Renda, 2019). However, it is necessary for each organization to consider the potential impact of AI and research the way in which this technology can be applied to certain problems or needs of the organization (European Commission SWD 137, 2018;

European Commission, 2019). In many cases, the hasty jump to the implementation of solutions based on AI technology does not necessarily solve the entity's primary need or problem. On the contrary, this hasty jump without an impact analysis, methodology or implementation can lead the organization to an investment with no return or even losses. For example, a Dimensional Research report states that 8 out of 10 AI projects had failed, while 96% had problems with data quality, data labeling, and building confidence in the model (Dimensional Research, 2019). Some of the reasons for the failure of these projects would be: i) communication failure; ii) failure before starting; iii) complicated projects (Dimensional Research, 2019). For all the reasons stated above, when AI technology is adopted by any organization, it is crucial that companies and technology leaders understand how AI can create added value for their business and what its limitations are (Nooijen, 2019).

This description of the myths of AI usage is essential to analyze each of the projects that public entities in Colombia have decided to acquire or implement. In this way, as will be detailed below, various technical, legal and ethical factors are described that organizations should take into account when deciding to use AI, so that an analysis of these factors can be performed against the implementation of AI tools in entities of the public sector in Colombia.

3.2. Legal and ethical analysis of the Prosecutor Watson, Prometea, SOFÍA and OCÉANO technologies in Colombia

All the tools being implemented in Colombia that were described above are based on the development of algorithms that call themselves AI in their description, so it is imperative that the social, ethical and legal impact of these algorithms be examined in a context as particular as the Colombian context. The excessive use - or misuse - of the term AI at this time is especially rampant, which causes a boom in the acquisition of these technologies without understanding if the tools offered by some companies go beyond basic data analysis (Nooijen, 2019; Janmohamed, 2018). Thus, AI has incorrectly become a code phrase for everything related to data usage or workflow. The "algorithm" concept is also usually loosely mentioned, a word which is often associated with AI. But the fact that a system has algorithms that lead to certain results does not necessarily mean that it is an AI system (Janmohamed, 2018; Internet Society, 2017).

GoDataDriven¹⁵, Internet Society¹⁶, the European Commission¹⁷ and the Government of the United Kingdom have developed, from each of their fields - industry, civil society organization and government - the main factors that organizations must follow when implementing or investing in IA (Internet Society, 2017; Nooijen, 2019). On the one hand, for GoDataDriven the AI implementation process is divided into four stages: i) initialization; ii) continuous experimentation; iii) business empowerment; and iv) AI democratization. On the other hand, for the Internet Society and the European Commission, the implementation of this technology must be accompanied by an impact assessment for both entities of the public and private sectors, and both are based on factors such as: i) human action and supervision; ii) technical robustness and security; iii) privacy and data governance; iv) transparency; v) diversity, non-discrimination and equity; vi) social and environmental well-being; and vii) responsibility (European Commission, 2019; Internet Society, 2017). Finally, the United Kingdom has developed a series of specific guides for AI implementation in the public sector that are divided into: i) understanding the concept of artificial intelligence; ii) evaluation of whether artificial intelligence is the right solution; iii) planning and preparing for the implementation of artificial intelligence; and iv) management of the artificial intelligence project (United Kingdom, 2019).

¹⁵ Dutch company that describes itself as the country's leading expert in open source Big Data technologies, and as the company that provides world-class data engineering services and analytical translators that work with the company in order to point out and develop AI use cases in applications that are a pleasure to use and add value to your results.

¹⁶ The Internet Society is an American non-profit organization founded in 1992 to provide leadership in Internet-related standards, education, access, and policies. Its mission is 'to promote the open development, evolution and use of the Internet for the benefit of all people around the world'.

¹⁷ The European Union is a political and economic union of 27 member states that are mainly located in Europe. Its main function is to look after the general interests of the EU by proposing and verifying compliance with legislation and applying EU policies and budget.

Given these international benchmarks, as well as the different myths revolving around AI, the analysis on AI tools being implemented in Colombia will focus on various risks that exist throughout the implementation of an AI system: i) risk of technofascination; ii) risk of shadowy decisions; iii) risk of inconclusive evidence; and iv) risk of automation without audit.

3.2.1. Risk of technofascination

The assessment phase of any implementation of an AI system is the most complex and possibly the longest phase, since it requires joint work with the entire organization to determine the different needs, choose one or systematize several in the same problem and identify whether AI is the right solution (United Kingdom, 2019). The design of any service begins with the identification of user needs (Hagan, 2017). Thus, consideration should be given to whether the organization has the necessary data, whether it has access to databases, whether it performs ethical and safe data collection, and whether it has a large amount of data for the model to learn the task on a large scale and whether it is repetitive enough for a human to have a hard time doing it (United Kingdom, 2019).

In other words, the main factor will be the collection and agglomeration of the data that the future AI system will use (United Kingdom, 2019; Nooijen, 2019). It is important to highlight that the senseless accumulation of data is not only inefficient but costly, which is why a data assessment is recommended to identify if it is quality data¹⁸. It is evident that, within the management reports and the relevant information of the analyzed entities, the Prosecutor Watson and Prometea tools did not follow this phase of identifying needs in the entity, but instead embraced a global development in ICT that is part of the National Government. Due to insufficient information on the acquisition process and memoranda of understanding in the Attorney General's Office and in the Constitutional Court, it is not possible to identify the assessment process of the various needs and the problem that is intended to be solved with the tool.

On the other hand, within the documentation and information of the SOFIA and OCEANO systems, it is evident that both arise from the Design Thinking methodology where each entity first identified various needs, not only technological but also related to personnel, to systematize a problem that could be solved with an AI system (Comptroller General of the Republic, 2019; DIAN, 2019). Based on information and research, it was evident that both projects have clear implementation stages and, within their evaluation stage, they have been cautious in adjusting to a need in order to provide a better service in their field.

Thus, it is possible to claim that the use of AI technology for the public sector in Colombia must be cautious regarding the definition of a true need or problem that can be intervened by means of a technological solution. In the event that one of these steps is omitted, a solution would be adopted without really understanding the need either from the same entity or from the citizen, causing a detriment to the public patrimony due to the acquisition of technology that may not be applicable or will not have the potential to resolve specific needs.

¹⁸ According to the recommendations of the United Kingdom, quality data is data that is exact, complete, timely, valid, sufficient, pertinent, representative and consistent.

Additionally, once the entity has decided what need(s) should be solved through AI systems or tools, it must decide whether to build or buy the technology (United Kingdom, 2019; European Commission, 2019; IBM, 2020). It is important for entities to assess whether the needs they are trying to meet are unique to their organization or whether they can meet user needs with generic components or whether, on the contrary, the team within the entity can build or adapt AI models ready to be used or open source algorithms internally.

It is important to highlight that within the risk analysis of AI systems implementation, the aim is to avoid the transposition bias of the “blank” algorithm that is developed in another jurisdiction but is applied in Colombia (Hickey, 2018). In other words, Colombia needs algorithms specifically designed for the Colombian context when deciding freedoms for human beings, not a clean code ready to make any prediction that the end user desires. Thus, both Prosecutor Watson and Prometea are technological developments that were created in other jurisdictions under other circumstances - the United States and Argentina - which, when transferred to Colombia, must seek to address the country’s social context (IALAB, 2019; IBM, 2018), whereas SOFÍA and OCÉANO are specially adapted systems for the specific needs of each entity, that is, for contraband and the fight against corruption in state contracting, which can be described as their own development. Therefore, purchasing AI technology may not always be appropriate, as the details pertaining to its data and needs could mean that the provider would have to build from scratch or significantly customize an existing model.

3.2.2. Risk of shadowy decisions

Algorithms use inferential statistics and create knowledge that may be uncertain for the end user. Likewise, the conclusions reached by the algorithm can only be as reliable as the data on which it is based (Viola, 2018). In this way, the neutrality of the algorithm will depend on the neutrality of the information collected, as well as on the rules that have been established manually (European Commission, 2019).

Now, even if collection and decision-making are a “neutral” procedure, an action can be discriminatory for the sole effect it has on a given group even when the algorithm has been based on conclusive and scrutinizable

evidence (Mittelstadt, Allo, Taddeo, Wachter and Floridi, 2016). For example, in the COMPAS¹⁹ case in the United States, the organization ProPublica found evidence that the algorithm used racial criteria to determine a greater or lesser risk of recidivism, which resulted in discriminatory decisions (ProPublica, 2016). Propublica based its research on various studies conducted on possible biases in the American system, one of which was conducted in 2006 by Kevin Whiteacre of the Salvation Army Correctional Services Program. This study revealed “a tendency to classification errors for African Americans” (Larson, Mattu and Kirchner, 2016). In this way, the COMPAS example helps to demonstrate that the result provided by an algorithm can be flawed by biases to the extent that the databases used intrinsically have this systematic bias within the justice system and distort the measurement of recidivism.

Thus, relying entirely on AI tool data processing can entail a high risk of algorithms making biased decisions. According to Friedman and Nissenbaum, bias can arise from: (i) pre-existing biases, (ii) technological biases; and (iii) emerging biases (Friedman and Nissenbaum, 1996). Firstly, pre-existing biases can originate in social institutions, in the practices and attitudes from which technology arises. This type of bias can enter a system through the explicit and conscious efforts of individuals or institutions, or implicitly and unconsciously, even despite the best intentions. For example, an expert loan application system, which negatively assesses applicants who live in certain parts of the city rated as “undesirable” or “dangerous”.

In this way, it can be asserted that in the case of Prometea, this risk can manifest itself in a more latent way as it uses the database of the Constitutional Court to select the cases that the guardianship judge may access to review. However, constitutional precedents may have biases from the same magistrates that are not identifiable, which the algorithm can adopt with correlation elements and thus continue with this bias. It is important to clarify that the Internal Regulations of the Constitutional Court in article 52 presents several criteria that serve as a guide for the selection of guardianships, such as: (i) a novel issue; (ii) the need to rule on a specific jurisprudential line; (iii) the requirement to clarify the content and scope of a right; (iv) the need to examine pronouncements of international judicial or quasi-judicial instances; (v) serious damage to public patrimony, among other criteria (Constitutional Court, 2015). However, these criteria are merely illustrative, that is, they are not a barrier for the judge to decide to select another criterion depending on the reasonableness of each case.

¹⁹ COMPAS: POffender Correctional Management Profile for Alternative Sanctions by Northpointe, Inc.

Thus, Prometea would have the ability to select guardianship cases that meet any of the criteria mentioned. However, judges work increasingly in the midst of a changing social world, so blindly relying on this tool carries the risk that these automated decisions will shape the way the Court applies the selection criteria and, furthermore, stop attending to the social and political changes that may arise in the future. The Constitutional Court has consolidated several jurisprudential lines that it follows when analyzing facts that are part of it. However, there are cases with singularities that must be constitutionally analyzed, even if they do not strictly meet one of the criteria described above. When this possibility arises, the judge should have sufficient freedom to decide whether to select the case or to follow the criteria developed in Prometea's design and operation.

In the case of Prosecutor Watson, SOFÍA and OCÉANO, these three tools use correlation features to create coincidence maps in the same system using various sources of information to present a result. In other words, this risk, although it remains latent, can be reduced by using information from the databases to generate matches in names, processes, certificates, among others, but not to make a judicial decision.

Secondly, technical bias arises from problem solving in technical design. Various sources of this bias can be found in several aspects of the design process, including limitations in terms of hardware, software, and peripherals (Friedman and Nissenbaum, 1996). In this regard, technical difficulties in platform design in Colombia were mentioned in the section "Risk of technofascination". However, the need is reiterated for the algorithms used in Colombia to be based on the country's social needs and to move from being consumers of foreign technologies to creators of national AI systems.

Thirdly, the emerging bias arises only in a usage context. This bias generally arises sometime after completing a design, as a result of changing social knowledge, population, or cultural values (Friedman and Nissenbaum, 1996). This bias hints that the AI system must be flexible enough to be modified by taking into account social changes. For example, supposing that the system will not only work for a regional area in a certain city, but that it will be implemented at the national or even international level. In this sense, in the case of Prometea, it cannot be inferred with the collected evidence that this tool may be or is being used by another of the high courts in Colombia, whereby its use is limited solely and exclusively to the Constitutional Court. However, this tool is limited to the particular "health" issue and it is expected that, according to the results obtained, it will be implemented for other issues. On the contrary, Prosecutor Watson, SOFÍA and OCÉANO have begun their initial phases in some capital cities to be later entered into a national analysis that allows them to have not only more information but better predictions. For example, Prosecutor Watson started in Bogotá, Cali, Bucaramanga and Ibagué and it is expected that, by the end of 2020, it will be operating throughout the country.



3.2.3. Riesgo de evidencia inconclusa

Although Prometea, Prosecutor Watson, SOFÍA and OCÉANO aim to have a precise compilation and interrelation of databases for constitutional, criminal, administrative and disciplinary processes respectively, the use of these tools as assistants in Colombia brings with it new challenges for the public sector. Thus, the effectiveness and objectivity of the information produced will depend on the databases of the various information systems that these corporations have.

Technological innovations create opportunities for error in the treatment of information, and those errors could lead to detrimental results on a broader scale than what could have happened without the new technology (Jacobson, 2004). As a hypothetical example, Prosecutor Watson could associate a process with a certain subject, ignoring that there are homonyms, thus causing the Prosecutor's Office to issue an order against an innocent person due to the legal operator's assumption that Watson had evaluated the information. In the same sense, in the event that Prometea was applied to other issues, this tool could omit flagging the so-called complex cases as relevant and timely. These cases, in general, do not have records of rulings within the Constitutional Court or in another database as they are context-specific issues, for example, in terms of freedom of speech on social networks and the use of digital tools to violate copyright rules.

This risk may not be as prominent in the case of OCÉANO, since the system creates a mesh around a contractor or State contract that allows the system to identify the flow of funds from State agents and establish relationships between the various sectors and activities. For example, the tool was able to detect that contractors who are allied with Odebrecht nowadays maintain contracts with the State, which can be an early warning for audit and control issues (Comptroller General of the Republic, 2019). Finally, in the case of SOFÍA, it is not possible to have any kind of inference yet since the system is in its second design phase and has not been implemented in its pilot phase to determine whether, for example, the correlation factors in contraband issues may affect some right or other.

While it can be expected that advances in technologies like Prometea and Prosecutor Watson can improve results for the public sector, there is also an inconsistency called the "black box" problem. This problem is based on a system whose internal workings are not visible. It is a metaphor to describe a system in which input data and results are known, but the process that leads from one to the other is not visible (Atkinson, 2014; European Commission SWD 137, 2018; Kohn, 2016; Romero, 2019).

For example, Prosecutor Watson's machine learning algorithms can lead to conclusions that are not consistent with the subject or the offense. However, the reason why they led to particular solutions might not be obvious. Similarly, in the case of Prometea, this system uses certain objective and subjective criteria to determine in each case whether a case is accepted for guardianship review or not. In this regard, it is relevant to clarify that the Internal Regulations of the Constitutional Court in section I of chapter XIV, present the guiding principles and criteria for the guardianship selection process. Article 51 lists a series of principles such as transparency, morality, rationality, effectiveness, publicity, judicial autonomy, procedural economy, among others. While article 52 mentions a series of objective criteria, mentioned above, subjective criteria²⁰, such as the urgency of protecting a fundamental right; and complementary criteria²¹, such as the fight against corruption. However, these selection criteria are illustrative and not exhaustive, so the constitutional judge has a margin of freedom focused on principles which are not necessarily framed in the objective criteria of article 52.

However, it is not known to the public what criteria were used by the Prometea pilot, nor if these criteria are modifiable depending on the country's historical and social context, as well as the election of new magistrates of the high court. This lack of information directly affects one of the main core areas of AI implementation, which is AI transparency and democratization (United Kingdom, 2019; Nooijen, 2019). Transparency is paramount to ensure that AI is not biased. Therefore, any tool and related human decisions are subject to the related principle of explicability, according to which it should be possible for them to be understood and tracked by humans (European Commission SWD 137, 2018; European Commission, 2019; European Commission, 2018). Consequently, both Prosecutor Watson and Prometea are capable of generating results from data, but the internal process may not be known to either the entity itself or the citizen, who is the most affected by these decisions.

²⁰ Subjective criteria: the urgency to protect a fundamental right or the need to materialize a differential approach.

²¹ Complementary criteria: the fight against corruption, examination of pronouncements of international judicial or quasi-judicial instances, protection against judicial decisions in the terms of constitutional jurisprudence; preservation of the general interest and serious damage to public patrimony.

In the case of OCÉANO, there is a lower risk since the system seeks to prioritize and order the data found in various sources so that they are categorized in files by subject or sector as they are acquired, and are then purified depending on the scope of the functions of the Comptroller. That is to say that, based on the meshes created by the system, certain inconsistencies are detected in contractual relations with the State, but in any case, the Comptroller must request clarification and additional documentation to determine whether or not a conduct exists that is susceptible of a deeper audit by the entity or if the information obtained will be sufficient to initiate a disciplinary process.

3.2.4. Risk of automation without audit

It is essential that any system that intends to use AI technology in Colombia maintains an external audit system throughout its implementation and evolution with a minimum level of detail to describe the decision process. This additional phase could be a way to address the "black box" problem and help ensure public confidence in these systems. Thus, according to the European Commission and the various guides on AI implementation, one of the cross-cutting principles of this process should be transparency, which is embodied in the various mechanisms of explanation and responsibility that any AI tool must have (European Commission, 2019; BDV, 2018; Friedman and Nissenbaum, 1996; IBM, 2020; OECD, 2019; United Kingdom, 2019).

In this way, any AI system in the market that makes determinations or recommendations with potential impacts for different individuals must be able to explain and contextualize how and why it reached a conclusion (IBM, 2020). In order to achieve this, organizations need to maintain auditable evidence of the process on input and training data from the same system. Explicability is crucial to build and maintain user confidence in AI systems.

Any intervention to create or adapt an AI system or tool must be transparent, open and, as far as possible, directly and indirectly explainable to those affected (European Commission, 2019). However, it is not always possible to explain why a model has generated a particular output or decision — risk of inconclusive evidence and shadowy decisions. In these circumstances, other explanatory measures may be required, such as traceability, auditability and transparent communication on system capabilities. Thus, the degree to which explicability is required depends largely on the context and the severity of the consequences if that result is wrong or inaccurate (European Commission, 2019; Government of Canada, 2018).

First of all, traceability refers to the set of data and processes that lead to the decision made by the AI system, including data collection and labeling as well as the algorithms used.

This allows the identification of the reasons why an AI decision was wrong, which, in turn, could help prevent future mistakes (European Commission, 2019; IBM, 2020). Thus, it can be inferred that for the Prometea and Watson projects, it is not evident nor is the public aware of the way in which the compilation of the different databases has been made nor what the criteria that the system uses to generate a decision are. We know that each process must have this traceability report; however, it is not known to the user who is directly affected. On the contrary, in the SOFÍA and OCÉANO systems, an audit phase is identified in which the citizen can have access to the reports produced by these systems. For example, in the case of OCÉANO, reports can be requested by regulatory agencies, by citizens, overseers, and journalists, among others, who request the information from the entity (Comptroller General of the Republic, 2019).

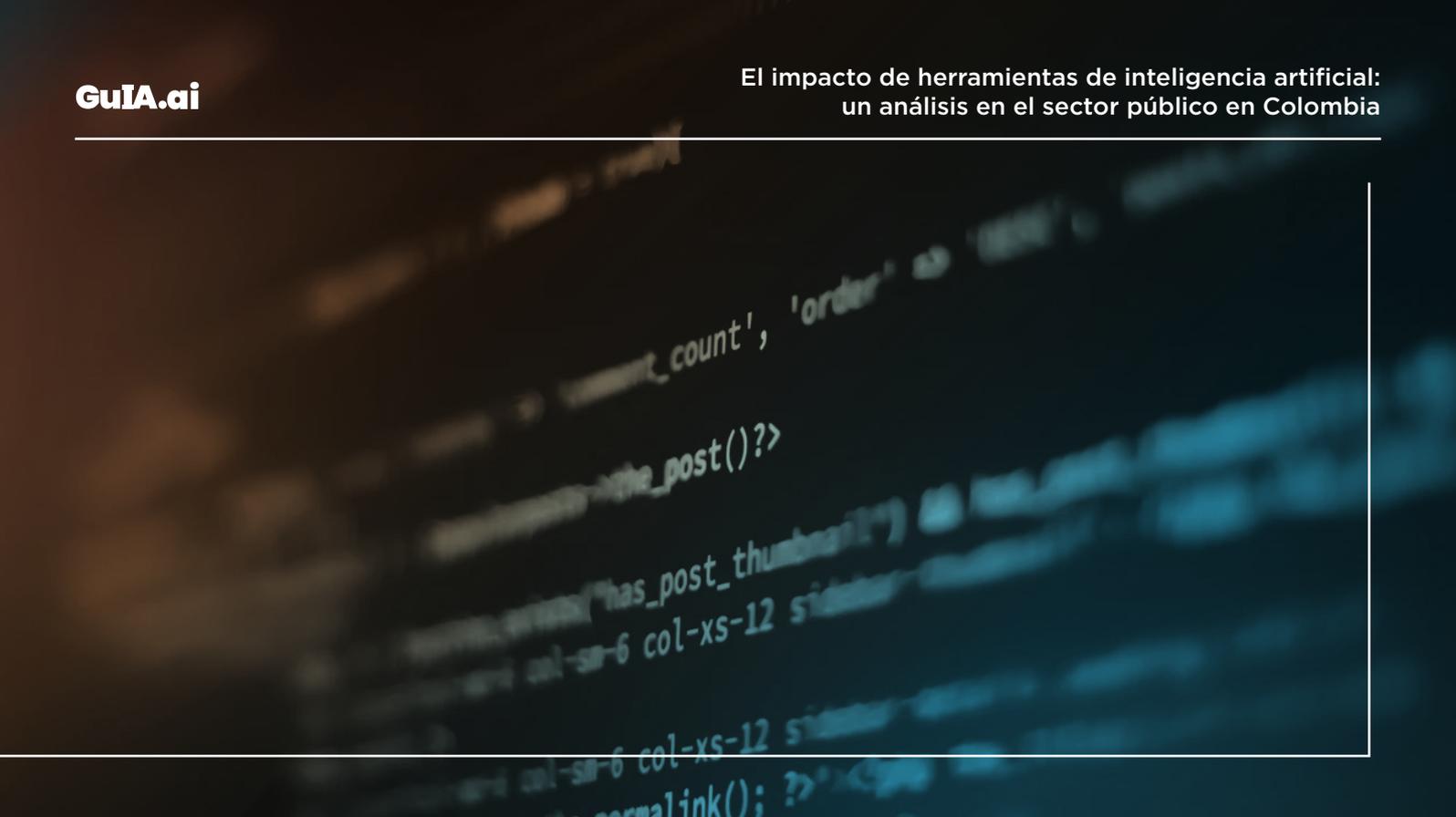


Secondly, explicability refers to the ability to reveal both the technical processes of an AI system and its related human decisions (European Commission, 2019). Explicability requires that decisions made by an AI system can be understood and tracked by humans. However, this explanation must be prompt and adapted to the experience of the interested party involved. For example, it will not be the same to present explanations to a citizen than to a regulator, since they are different users and, therefore, seek a different specificity (OECD, 2019; Ministry of Internal Affairs and Communications of Japan, 2017). Thus, it was evident that the process of acquisition, implementation and testing of the different AI tools in the public sector in Colombia has not been publicized by the entity to make citizens aware of the manner and reasons why this technology is being implemented. Through the various management reports of each entity, it is evident that, on the one hand, DIAN and the Comptroller's Office follow a comprehensive design model for their tools and that they are in the testing and implementation phases, respectively. Publications and documents of a public nature were obtained on these processes, which make them more transparent. However, in the case of the Constitutional Court and the Attorney General's Office, the public documents based on this investigation do not reflect how the acquisition of these tools was analyzed or if there was any detailed bidding or contest process to determine if the AI tool would be the right mechanism for a certain need.

Thirdly, for an explainable and transparent AI system to exist, it needs to be auditable. In this way, mechanisms must be established to guarantee the responsibility of AI systems and their results, both before and after their development, implementation and use (European Commission, 2019). Thus, auditability involves enabling the assessment of algorithms, data, and design processes. It is important to note that auditability does not necessarily imply that information on AI-related business models and intellectual property is disclosed, but that the system and the tool must be openly available to generate an external assessment (European Commission, 2019; United Kingdom, 2019). Assessment by internal and external auditors, and the availability of such assessment reports, can contribute to reliability on this technology.



AI systems or tools that affect fundamental rights must be independently auditable. On the one hand, entities must establish a continuous chain of responsibility for all the roles involved in the project design and implementation life cycle, as well as implement activity monitoring to allow supervision and review throughout the project (United Kingdom, 2019; Government of Canada, 2018). Without such information, a decision made by any AI tool cannot be properly challenged.



Thus, in the case of Prometea and Prosecutor Watson, there is no information on some audit processes that rule on the decisions made by these tools. On the one hand, the Prometea promoters have stated that the tool is only one of many that the constitutional judge will take into account for the selection of guardianships. However, it is not clear what the internal procedure is like when the tool has processed priority cases in terms of infringement of the law, since there would be no place to duplicate the work of presiding magistrates to define whether the selection made by Prometea was adequate or wrong. That is to say that, in a certain way, the constitutional judge will start from the base of cases that Prometea presents as priority and will not take into account the others.

On the other hand, regarding Prosecutor Watson, as it is in an implementation phase aiming to order the data of the various sectional and regional prosecutor offices, there is no knowledge of its audit process. However, this tool has so far served to correlate various data across different sources of information. For the time being, there is no evidence that this tool decides, for example, whether or not charges are made against a certain person, but, on the contrary, the tool uses data from the charges to check if the same subject is immersed in another process for the same deeds in another city.

In the same sense, in the case of OCÉANO, the correlations through the contractual meshes that the system produces do not automatically trigger disciplinary or criminal proceedings, but once knowledge is acquired of any business or personal mesh of contracting concentration, an in-depth investigation into the specificity of the contractor may be initiated and additional documentation may be required in order to certify copies to the entity in charge of the investigation.

4

Recommendations for the use of AI-based tools for Colombia

Throughout this research, the work that some entities of the public sector in Colombia have done to implement AI technologies in the search to improve their processes and/or information was revealed.

It is important to recognize the positive impact that AI systems already have and will continue to have, both commercially and socially. However, it is equally relevant that these AI systems are able to ensure that the risks and other adverse impacts associated with these technologies are managed appropriately and proportionally. Thus, the study of these four tools is only the beginning of AI permeability in Colombia, since these systems will continue to have an impact on society and on citizens in ways that we cannot yet imagine. In this context, it is important that Colombia first starts by adopting guidelines on the ethical implementation and design of these systems in public entities. In this way, the Colombian government must strive to build AI systems that are reliable and auditable, so that citizens' rights are safeguarded throughout the process. On this basis, some recommendations of a particular nature will be pointed out below for each of the tools analyzed and for the implementation of AI systems in general.

Generally, first of all, it is essential that both public and private entities adopt a Design Thinking methodology to understand that technology can be the vehicle to modify and improve user experience with the entity, but technology on its own does not generate any impact on the entity's transformation processes or objectives. In other words, the purchase or acquisition of these technologies must be preceded by a rigorous study of the entity's need and the impact of each of the technological solutions. Thus, each entity must have an impact assessment of the technology in question to define whether or not its implementation puts fundamental rights at risk and what the mitigation mechanisms for those risks would be like.

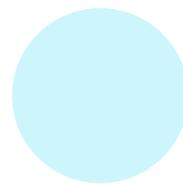
Secondly, once it has been determined that the solution to a specific need results in the creation or adoption of an AI system, an algorithmic impact assessment should be performed (Government of Canada, 2018; United Kingdom, 2019; European Commission, 2019). This assessment must comply with transparency, traceability and auditing guidelines so that each entity may test their AI tool and correct the possible risks said implementation entails.

Finally, all public entities that have the intention of implementing AI systems must provide a repository of public information, where the citizen receives a simple explanation of why, how and when the system is implemented, in which cases it may affect citizens' rights and the manner in which citizens may request more information about the system. By guaranteeing access to this information by all citizens, the AI system itself reveals having the element of transparency that is essential to generate self-confidence (European Commission, 2018).

In particular, the Constitutional Court, with the Prometea tool, must provide all the base selection documents used to determine that the necessary project for the high court is materialized with the implementation of this system, and the rejected proposals from other proponents must be provided as well. Similarly, it is essential that the Court provide the objective criteria the system is using for the prior selection of guardianships and the sort of audit mechanisms it is implementing to avoid the risk of automated decisions without auditing. Additionally, it is recommended to the Constitutional Court that, in its contact portals with citizens, such as their website, the results, samples and statistics produced by Prometea are published. But everything should be transparent, mentioning that said results, samples and statistics were obtained through an algorithmic process based on various sources of information, and there should be mention of what the sources are and what the process is like. Finally, the Constitutional Court is recommended to adopt a body within the entity to be in charge of presenting the scope of this project to citizens. During 2019, when Prometea was in its pilot phase, it was mentioned in various media that this system had a blockchain application. However, it was not reported that this was one of the final products of the system and that it has not yet been implemented, which sparked strong criticism of the project by academia and civil organizations (Karisma, 2019; Romero, 2019).

On the other hand, the Attorney General's Office could modify the complaint format in Colombia so that it has a clear language, a digital format and is accessible to vulnerable populations, as well as being translated into various languages. The unification of this form may decrease the risks related to poor quality data that could be fed into the Prosecutor Watson's system. For that purpose, it would then be expected that AI technology, in combination with the machine learning method, could identify inconsistencies such as those caused by a human input error and that a human could overlook. This automation would have the potential to reduce uncertainty and improve the data feeding the system through an inconsistency alert plan.

Finally, in the case of OCEÁNO, one of the objectives set by the entity is that this Contractual Information Center is made to work in real time and that it is fed by all the necessary sources so that finally, in the future, it will be able to achieve a sort of “predictive corruption” by timely indicating contracts and modalities in which irregularities that affect the public patrimony can occur. In this regard, it is important that the entity reports on the interested and affected parties, on the manner and reasons of a model’s performance, as well as the justification for ethical permissibility, non-discrimination and public reliability for its results and the processes behind its design and use.



5

Conclusions

It is a fact that technology can be an ally in the growth of the efficiency and effectiveness of decisions made in the judicial, administrative and legislative bodies, but it should not be forgotten that reference is being made to organizations whose decisions affect all citizens. In this way, every technological solution must have a study of the design, the implementation and a justification for the latter. We should not get carried away by the technological boom but consciously analyze the problem that needs solving, the possible solutions and thus determine if the implementation of an AI system is really necessary or if the digitization of institutional processes can be started in order to structurally change the needs of these corporations.

It seems that within the modernization and technological impact plans that have been advanced by several public sector entities in Colombia, the need to digitize information, processes and entities has been determined. However, before carrying out an AI project, the databases that will feed the system must first be considered in order to avoid the above mentioned risks. It is not intended to

claim that States should solve everything before starting a project with AI technology, but simply that these projects cover a huge amount of citizen data so States should be cautious when presenting and implementing them.

In this sense, AI tools are latent not only in the private field of relationships, but, in turn, they are increasingly implemented in the public sector, especially in the administration of justice. The social and technological reality of the country is increasingly aimed at automating processes that in one way or another are classified as mechanical, which could be developed by a machine or by an intelligent system. However, not only biases related to the “black box” should be avoided, but the transposition bias of the “blank” algorithm that is developed in another jurisdiction (but being applied in Colombia) should be avoided as well. In other words, Colombia needs algorithms designed for the purpose when deciding the liberties of human beings, not a clean code ready to make any prediction that the end user desires.

In this sense, the implementation of AI systems must not only have audit and control mechanisms, but must also be implemented through assessment stages. In this way, it is possible to assess operation and determine, for example, in the case of Prometea, if the cases filtered by this system would be the same as without the intervention of this tool. As an example, the IBM company recently launched an initiative for the problems that arise in algorithm development. It was proposed that prior to the sale of an algorithm by developers, a Supplier Declaration of Conformity (SDoC) be published. This statement would be like a user manual, demonstrating how well the algorithm performed on standardized tests of performance, fairness, risk factors, and security measures (IBM, 2020).

Thus, despite the fact that technology is coming by leaps and bounds, we cannot become blindly fascinated by it. We must carry out a critical assessment from an interdisciplinary perspective to mitigate the aforementioned risks and start thinking about a technology available to the user and not a technology driven by fascination.

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