

Artificial Intelligence: Perception Of Control And Investigation Agents

Flaviano Nogueira da Fonseca 1 , Francisco de Assis Santos Filho 2 , Claudia Jordana Menezes de Souza 3 , Hugo Leonardo Menezes de Carvalho 4

1 (Ministério Público do Estado do Tocantins, Brazil)

2 (Ministério Público do Estado de Roraima, Brazil)

3 (Universidade Estadual do Maranhão, Brazil)

4 (Universidade Ceuma, Brazil)

ABSTRACT

The aim of this article is to analyze the perception of control and investigation agents about the use of artificial intelligence tools in their activities. This is because the processing of an extensive and complex amount of information related to public procurement processes by control and investigation bodies lacks tools that can enhance the work carried out by the agents involved in the analysis. In this sense, the presence of automated tools and artificial intelligence provides robustness and agility to the processing of existing data. A qualitative methodology was adopted using questionnaires. The main results show that, despite the importance and knowledge of users about the existence of these tools, the majority do not use them or do not know their functionalities, showing that the use of these tools in control and investigation activities is still in its infancy and that institutions still do not offer/use them adequately for their agents.

Keywords: perception; agents; artificial intelligence; control instruments; research

Date of Submission: 22-01-2024

Date of Acceptance: 02-02-2024

I. Introduction

Public organizations, regardless of their nature, are constantly looking for ways to improve their services and performance, always with the public interest in mind. Governments and public sector organizations have been using technology to improve internal and external collaboration (SCHNEIDER, 2021). The intensive use of technology in various sectors of society, including control and investigation work, is Artificial Intelligence (AI). AI is gaining more and more notoriety with the aim of improving performance, competitiveness and even financial returns in the private sector, as well as improving efficiency in the public sector (ANDRADE; NETO, 2022).

According to Vasaherlyi (2020), AI tends to bring changes to the economy, government and society. Its use tends to increase the speed of processes and, consequently, decision-making, improving efficiency in the public sector by offering new solution methods in various fields. It is one of the most promising technologies for improving the efficiency and quality of public services. In recent years, there has been a significant increase in the use of AI in public bodies, which has generated benefits for both citizens and institutions.

However, the challenges of adaptation, organizational culture, investments, implementation and legitimacy by users prevent automated tools and artificial intelligence from having full adherence and applicability by users in the context of external control and investigations (NEVES; DA SILVA, CARVALHO, 2019). For this reason, the research problem of this work is: What is the perception of control and investigation agents about artificial intelligence tools in their activities?

The aim was to analyze the perception of control and investigation agents about the use of artificial intelligence tools in their activities. To this end, the methodology used was qualitative, using questionnaires.

In this sense, this work is based on demonstrating the general aspects of the use of AI in control actions and investigations, exploring its use in public bodies and the challenges and opportunities associated with this trend.

II. Theoretical framework

Artificial Intelligence

The history of artificial intelligence began after the Second World War, involving various scientists such as Alan Turing and researchers Marvin Minsky, John McCarthy, Allen Newell and Herbert A, who, based

on scientific studies, wanted to develop a machine that had the human capacity to think and act like one, without imagining what it would be capable of, Kurzweil (2007).

For Russel and Norvig (2013), AI has, from the outset, had the idea of reproducing human faculties such as creativity, self-improvement and the use of language, standing out in a field that seeks to build machines that will function autonomously in complex and changing environments.

Considered a pioneer in AI, Turing proposed a test in which a human interrogator dialogued with a computer using natural language, ignoring whether he was talking to another human being or a machine. This approach inspired the concept of AI (COSTA, 2018).

Thus, according to Araújo (2022), AI is a grouping of various technologies, such as artificial neural networks, algorithms, learning systems, among others that can simulate human capabilities linked to intelligence, to carry out tasks and can iteratively improve based on the information they collect.

It is present in everyday life, changing the way society interacts and, above all, the way it works. Procedures that were once carried out exclusively by people are now developed by machines (ARAÚJO, 2022).

According to Araújo (2022), AI has expanded over this period and is already embedded in corporations, in the optimization of processes and in security systems, giving access to algorithms and based on them, machines develop, without human intervention, thoughts that are different from those of human beings.

There are differences between an automated tool and artificial intelligence. In this case, automated tools are programs that perform repeated tasks, following a predefined set of rules. They are useful for increasing efficiency and reducing errors in manual processes. They are ideal for repetitive and routine processes, such as customer service, stock management and accounting. However, these tools have no ability to learn or adapt and are limited to what has been programmed. What's more, they can't cope with unforeseen situations, which can lead to failures in complex processes.

Artificial intelligence (AI) is a technology that allows machines to learn and adapt to new situations, just like human beings. It uses machine learning algorithms to analyze data and make decisions based on identified patterns. AI has a wide range of applications, from virtual assistants to medical diagnostic systems, and is suitable for complex processes involving large amounts of data, such as financial risk analysis and fraud detection. However, it still has limitations, such as the need for large amounts of data for training and the difficulty in dealing with non-standard situations.

Applications of technology in public bodies

The use of Data Analysis and Artificial Intelligence tools and techniques in External Control still has many possible applications and various impacts to be discussed and evaluated. AI is a multidisciplinary subject and there is no segment in which it cannot develop (ARAÚJO, 2022).

Along these lines, institutions such as the TCU have encouraged - internally and externally - the adoption of increasingly advanced techniques in the control of federal public policies, or, according to Costa and Bastos (2022), "[...] given the new world panorama in which the fourth phase of industrialization contemplates technological innovations, the adoption of tools based on artificial intelligence (AI), within the scope of external control, becomes essential".

Paiva (2017) raised some questions about the use of Information Technology tools in the Federal Court of Accounts, from the perspective of the binomial "speed x quality" in the perception of the Court's auditors. The use of AI tools is seen in this context as an important way of broadening the scope of the TCU's inspection in a scenario of budget and personnel reductions and an increase in the complexity of the objects being inspected.

Lima and Diniz (2019) point out some of the challenges facing the Courts of Auditors in the 21st century in terms of the "intensive use of information and communication technologies aimed at external control and a culture of innovation". On this front, they point to the use of AI as a way for auditors to anticipate possible fraud strategies and irregular practices. They bring up Stumpf's (2016) understanding that the court would have three main challenges: technical (especially regarding the quality of the data used); regulatory (legal and normative restrictions); and cultural (behavioral aspects).

The use of Artificial Intelligence techniques can also impact the fields of public auditing and investigations. According to Guedes (2019), the "continuous monitoring of transactions and the construction of indicators that can signal in real time the variations in risks relevant to auditing seem to be a path worth taking". TAPSCOTT & CASTON (1995) characterize the organizational and technological changes that organizations are experiencing as a paradigm shift. The use of AI in this context allows for a more precise and rapid analysis of information, making it possible to identify patterns and suspicious behavior more efficiently.

Proactivity is considered a concept that opposes passive and reactive behavior. Proactive behavior can bring beneficial results for both the individual and the organization (Bateman & Cran, 1993), in addition to altering the characteristics of the work environment with significant changes and engagement in results.

Proactive investigations are those carried out before a crime occurs, with the aim of preventing or anticipating possible criminal actions. These investigations involve gathering and analyzing information to identify probable threats and act preventively.

Advantages of using AI in controls and investigations

One of the main advantages of using AI in control actions and investigations is the ability to process large volumes of data in a short period of time. Nowadays, we are increasingly looking to evolve and improve neural networks through intelligent agents, which are very close to the reality of the brain. Coppin (2004) states that an agent is a tool that performs certain tasks on behalf of a human being.

Kurzweil (2007) says that the emergence of a new form of intelligence on earth that can significantly surpass man's intellect will be a major development and will have profound implications for all aspects of human endeavor, including the nature of work, human learning, government, the arts and even the concept of ourselves.

According to Araújo (2022), through *machine learning*, when data is provided to the system's algorithm, it analyzes the information and learns how to carry out the tasks on its own, without direct human intervention, taking into account only training and past experience, eliminating the need to create specific codes with specific instructions. This allows for a broader and more detailed analysis of the information, making it possible to identify suspicious patterns and behaviors that could go unnoticed in a manual analysis. In addition, AI can be programmed to learn from the data collected over time, becoming increasingly accurate in identifying threats and making decisions.

According to Maia (2013), robotics is considered to be the main driving force behind the growth and advancement of the means of production, due to its versatility. Robots have the ability to be reprogrammed and used in the most diverse fields of activity. Their easy versatility ensures that these intelligent agents can be effectively adapted to a production line by means of a suitable information processing system.

Finally, in fact, it can be agreed that AI, in this time of automation, still has a lot to present to us, its growth is imminent and, as it develops, it will be able to provide more meaningful experiences for our daily lives (ANGELI, Pedro; 2019).

Experiences with data analysis and artificial intelligence

LabContas - Control Information Laboratory

The Federal Court of Accounts has made a major institutional effort to disseminate Data Analysis and Artificial Intelligence tools in the daily lives of auditors. A paradigmatic instrument was the "Control Information Laboratory" - LabContas, an environment that allows the management of large databases with the possibility of cross-checking data and other data analysis techniques with agility and security.

Governed by TCU Ordinance 102, of June 29, 2020, LabContas is an initiative that dates back to a project carried out between 2013 and 2014, and today is defined as "a platform composed of databases [...] for processing and analyzing data for the exercise of external control activities".

Alice - Tender and Public Notice Analysis System

From this platform, a myriad of initiatives have been possible, such as, for example, the Tender and Bid Analysis System (Alice), an automated system to support the work of auditors in the inspection of tenders and bids (TCU, 2019a). Alice was created by the Comptroller General of the Union (CGU) and expanded by the TCU between 2015 and 2016 (creation of National Alice), and has been evolving ever since to add more databases and typologies to assist in the analysis of the various bodies.

Alice is capable of accessing large masses of data, sorting them, classifying them, sending alerts and pointing out priorities for human analysis. It is a robot that scans the Diário Oficial da União and Comprasnet on a daily basis for any signs of irregularity (usually by applying predetermined algorithms). Through the robot's automatic analysis, 202 bidding notices, 28 auction minutes and 12 direct contracts were researched, totaling resources in the order of R\$5.9 billion.

During the Covid-19 crisis, Alice was used to file representations and complaints regarding the purchase of more than R\$220 million in Covid-19 acquisitions (TCU, 2020a), with several indications of irregularities.

Sofia - Guidance System on Facts and Evidence for the Auditor

An Artificial Intelligence application developed centrally is the Guidance System on Facts and Evidence for the Auditor (Sofia). This robot goes through a current inspection document in real time, bringing additional information to elements mentioned in the text, such as CPFs, CNPJs, names and TCU decisions.

Like a Word autocorrect tool, the robot provides comments and additional information easily and without the need for in-depth knowledge of programming or data analysis (CONJUR, 2019).

Sofia allows quick and simple access to databases with additional information on CPFs, CNPJs and case numbers under analysis or already being investigated.

Monica - Integrated Monitoring for Procurement Control

The Integrated Monitoring for Procurement Control (Monica) is a panel with information on public purchases, direct contracts or contracts with no bidding requirements (when a service or product has only one supplier) (GOMES. 2018). Mônica (or Mônica panel) is accessed by any TCU server on the homepage of the Court's internal portal.

As it is an information panel, it is presented as an automated tool and has limitations in terms of the tool's power of detection and customization, since the processing and filters take place automatically and prior to the user's query.

Ágata - Textual Analysis Generator Application with Learning

Another tool applied to Comprasnet is the Textual Analysis Generator with Learning (Ágata) tool, which allows users who do not have a "data analyst" profile to build textual searches with the possibility of feedback to the system (thus allowing modeling and improvement of the results) (TCU, 2020b). This is an application that falls under the heading of "Natural Language Processing" (NLP), as well as Text Mining, techniques that seek to bring Artificial Intelligence algorithms closer to everyday natural language.

To increase the algorithm's detection power, the Active Learning technique was used, in which learning begins when the user is still designing the problem, with high interaction between user and algorithm (DAVID et al, 1995)¹. In Ágata, machine learning is used to solve problems of using regular expressions in systems such as Alice and DGI Queries.

Adele - Electronic Bidding Dispute Analysis

In 2018, the Federal Court of Auditors awarded the Electronic Bidding Dispute Analysis system (Adele) with the Reconhe-Ser outstanding award (TCU, 2018a). Adele is an automated tool that uses data from Comprasnet to classify and group information and prepare it for analysis. The information processed is made available in monitoring panels, showing graphs of the competition in the auctions, according to the parameters provided by the users.

Carina - National Press Records Crawler and Analyzer

Another solution that provides auditors with information on contracts, tenders, amendments and direct contracts is the Crawler and Records Analyzer of the National Press (Carina). Through daily extractions, the information published in the Federal Official Gazette is extracted and processed, complementing the work carried out by the Alice robot (COSTA and BASTOS, 2020).

Pandora

A tool developed by the Paraíba Public Prosecutor's Office's Knowledge Management and Institutional Security Center (NGCSI/MPPB), it is characterized by being a data repository with intelligence layers used by investigative bodies to support the user in decision-making.

The tool can cross-reference thousands of pieces of information to help solve crimes ranging from embezzlement of public funds to issues such as tax evasion and criminal proceedings, among others.

III. Methodology

In order to achieve the aim of the study, we decided to use a qualitative methodology that would allow us to gain an understanding of the object of study without focusing on measurements and statistical analysis (Vilelas, 2009). This is because in qualitative research, the aim is to explain the reasons for certain actions, without worrying about submitting them to some kind of test. "Qualitative research is therefore concerned with aspects of reality that cannot be quantified, focusing on understanding and explaining the dynamics of social relations" (GERHARDT; SILVEIRA, 2009, p. 32).

From González Rey's (2002) perspective, the qualitative approach is applied when the researcher and the researched develop a constant dialogue, creating "climates of security, intellectual tension, interest, trust, which favor levels of conceptualization of experience that rarely occur spontaneously in everyday life" (GONZÁVEZ REY, 2002, p. 56).

¹ An active learning problem is one where the learner has the ability or need to influence or select its own training data.

In addition, the bibliographic-documentary method was used, by consulting bibliographic works, reading scientific articles and various documents in order to gather data and build up a chronology capable of helping the authors to understand the development of the field of knowledge under investigation.

Data collection and processing

Yin (2001) suggests using at least two sources of evidence when collecting data. In this work, reading articles and interviews were used as sources of evidence. Creswell (2007) advises between three and five interviews per case for case study strategies.

The study used a self-authored form entitled 'How to use Artificial Intelligence in Proactive Investigations?', which was made available through the Platform https://docs.google.com/forms/d/1ePMWFOE7a0RoyfdyI_3B7pFR0isCku54cAM-qfnONJQ/edit from 18/10/2022 to 18/03/2023. The form contained twenty-five questions and was made available to civil servants from public bodies, including members of the Rede-LAB, via social networks. The answers collected were processed by tabulating the information in an electronic spreadsheet.

IV. Discussion and Analysis of Results

The survey's target audience is agents working in control and investigation institutions. Twenty-six responses were obtained. The form was sent to civil servants in all regions of the country, and the percentage responses were as follows: SOUTH (53.8%); NORTH (26.9%); NORTHEAST (15.4%); CENTRAL-WEST (3.8%); and SOUTHEAST (0%).

The units/agencies where the civil servants sent in their replies were: DECCOR - Goiânia Anti-Corruption Police Station; LAB-LD/GIE/PCRS; MPCE; MPETO; MPPE; MPRS; MPRR; MPPR; PC/PI; Federal Police; and LAB-LD/MPAC.

The academic backgrounds of the civil servants who responded were: Accounting Sciences; Administration; Bachelor of Laws; Economist; Mathematician; and Information Science. The civil servants who sent in their replies fall into the following age groups: over 47 years old (38.5%); 42 to 47 years old (26.9%); 36 to 41 years old (23.1%); and 30 to 35 years old (11.5%).

The amount of time worked by the civil servants who filled in the form in Auditing, Forensics and/or Investigation corresponded to:

| WORKING TIME | |
|-------------------------|-------|
| over 20 years old | 23,1% |
| from 11 to 15 years old | 23,1% |
| from 6 to 10 years old | 23,1% |
| from 1 to 5 years | 19,2% |
| 16 to 20 years old | 11,5% |

According to the survey, only 38.5% of respondents make use of tools, whether automated or AI, to the detriment of 42.3% who said they did not have any kind of help in carrying out their analysis work. Of those who answered NO (42.3%) to using tools in their analysis, the overwhelming majority (82.4%) believe that the use of an automated or AI tool would improve the results of the Unit/Organization.

Therefore, it appears that the majority do not use or do not know their functionalities, showing that the use of these tools in control and investigation activities is still in its infancy and that the institutions still do not offer/use them adequately for their agents.

With regard to civil servants who use automated and/or AI tools, 63.2% said that the use of these tools had improved the results of the Unit/Organization. The automated tools most used by respondents were spreadsheets (Excel), followed by I2 and Power BI. This shows that the use of technology in control and investigation institutions is still basic compared to the potential of AI that currently exists.

On the other hand, the AI tools that the civil servants have access to and find difficult to use are: PANDORA; AJUNTA; SADRI; SADEP; and ALICE. According to the survey, the AI tools that the interviewees are familiar with are: ALICE; SOFIA and MÔNICA. The respondents pointed out that the tools contribute to checking for bid-rigging, in line with studies that have shown that there has been an increase in the effectiveness of inspection work with the use of data analysis techniques.

V. Final considerations

The aim of this article is to analyze the perception of control and investigation agents about the use of artificial intelligence tools in their activities. This is because the handling of an extensive and complex amount of information related to public procurement processes by control and investigation bodies lacks tools that can enhance the work carried out by the agents involved in the analysis.

The use of artificial intelligence in control actions and investigations has significant advantages, such as the ability to process large volumes of data and identify suspicious patterns more efficiently. However, it is important that the challenges related to privacy and the training of professionals are adequately addressed.

With the advancement of technology and the increase in threats to public safety, it is likely that the use of AI in control actions and investigations will become increasingly common around the world, requiring careful reflection on its impacts and limitations.

The aim of this study was to provide a picture, albeit minimal, of the reality of the units/agencies that were willing to answer the survey, whether they were aware of the existence of AI, especially whether they were using it in their control and investigation activities, and whether this knowledge could be shared and in what way, with a view to enabling forces to unite against the practice of corruption.

The main results show that, despite the importance and knowledge of users about the existence of these tools, the majority don't use them or don't know their functionalities, showing that the use of these tools in control and investigation activities is still in its infancy and that institutions still don't offer them/use them adequately for their agents.

One of the limitations was the low number of responses sent in - only twenty-six people responded to the interview. It should also be pointed out that this work is a project in the making, and that new and broader studies are needed to confirm the results with a larger sample. We therefore suggest that REDE-LAB or another body should spearhead a broader awareness-raising campaign and bring together the necessary conditions so that civil servants working in the investigative field can have access to AI tools and that these can be mutually shared.

References

- [1]. Angeli, Pedro Henrique; Colodett, Leonardo. The Evolution Of Artificial Intelligence And The Replacement Of Human Labor. Academic Environment Magazine, 2019.
- [2]. Alves, M. C. S. De O. The Importance Of Oral History As A Research Methodology. In: Pontal History Week, 4; History Teaching Meeting, 3, 2016, Ituiutaba. Proceedings [...]. Ituiutaba: Ufu, 2016.
- [3]. Bateman, T. S., & Crant, J. M. (1999, Ma/June). Proactive Behavior: Meaning, Impact, Recommendations. *Business Horizons*, 42(3), 63-70.
- [4]. Comité, Marcelo. Artificial Intelligence And The Police Of The Future. *Crypto*, 2022.
- [5]. Costa, Pedro Carvalho Ferreira; Conversations With Eliza On Gender And Artificial Intelligence. University Of Lisbon, 2018.
- [6]. Creswell, J. W. (2007). *Qualitative Inquiry And Research Design: Choosing Among Five Approaches* (2nd Ed.; T. Oaks, Ed.). London: Sage.
- [7]. Gerhardt, T. E.; Silveira, D. T. *Métodos De Pesquisa*. Porto Alegre: Editora Da Ufrgs, 2009.
- [8]. Given, L. M. (Ed. 2008). *The Sage Encyclopedia Of Qualitative Research Methods*. Sage Publications.
- [9]. González Rey, Fernando Luis. *Qualitative Research In Psychology - Paths And Challenges*. São Paulo: Pioneira Thomson Learning, 2002.
- [10]. Kurzweil, Ray. *The Age Of Spiritual Machines*. Translated By Fábio Fernandes 2nd Reprint. São Paulo: Aleph. 2007.
- [11]. Maia, Deborah V. D. *Industrial Automation And Robotics*. Pucgoias.Edu, 2013.
- [12]. Neves, F. R.; Da Silva, P. B.; Carvalho, H. L. M. De. Artificial Women Against Corruption: In Search Of Legitimacy In The Federal Court Of Accounts. *Revista De Contabilidade E Organizações*, [S. L.], V. 13, P. 31-50, 2019.
- [13]. Paes, V. F. Do Inquérito Ao Processo: Análise Comparativa Das Relações Entre Polícia E Ministério Público No Brasil E Na França. *Dilemas - Revista De Estudos De Conflito E Controle Social*, V. 3, P. 111-141, Jan./Mar. 2010.
- [14]. Piteira, M., Aparício, M. & Costa, C. J. (2019). Ethics In Artificial Intelligence: Challenges. In Rocha, A., Pedrosa, I., Costa, M. P. And Gonçalves, R. (Ed.), *2019 14th Iberian Conference On Information Systems And Technologies (Cisti)*. Coimbra: Ieee.
- [15]. Russell, Stuart; Norvig, Peter. *Artificial Intelligence. Translation Of The Third Edition*. Rio De Janeiro: Elsevier, 2013.
- [16]. Schneider, Leandro Rodrigo. *Opportunities And Challenges Of Artificial Intelligence In The Public Sector: The Case Of The Portuguese Court Of Auditors*. Iscte, 2021.
- [17]. Tapscott, D. & Caston, A. *Paradigm Shift*. São Paulo, Makron Books, 1995.
- [18]. Vilelas, J. (2009). *Research: The Process Of Building Knowledge*. Lisbon: Sílabo.
- [19]. Yin, R. K. (2001). *Case Study: Planning And Methods* (2. Ed.). Porto Alegre: Bookman.