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ADOPTION OF DISRUPTIVE TECHNOLOGIES IN BRAZILIAN PUBLIC ADMINISTRATION: DIAGNOSIS AND PROSPECTS

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1. INTRODUCTION

Disruptive innovations can be understood as substantial, unpredictable changes that occur irregularly, creating new products, manufacturing processes or business models. In addition, disruptive innovations generally reduce or even hijack the market share of established companies or create new markets. As argued in another paper[3], "Disruptive innovations disrupt, break and fracture the course of the hitherto existing economic process, [...] whether for the provision of a service or the supply of a good".

The adoption of new technologies in public administration is currently seen as an indispensable process for modernising government services and improving interaction with citizens. In January 2024, the Organisation for Economic Co-operation and Development

[3] A. SADDY, *Perspectivas do direito da infraestrutura com o surgimento das novas tecnologias (inovações) disruptivas,* in A. SADDY et al., *Aspectos Jurídicos das Novas Tecnologias (inovações) Disruptivas*, Rio de Janeiro, CEEJ, 2 ed., 2020, 61-62.

(OECD) published a study on the maturity of digital government[4]. According to this diagnosis, the digital transformation in Brazilian public administration has progressed at a moderate pace, performing close to the average of the OECD countries[5].

Another study, the ICT Electronic Government Survey 2023[6], carried out by the Brazilian Internet Steering Committee revealed significant advances in the adoption of emerging technologies by federal and state public bodies in the Executive, Legislative and Judiciary branches. Artificial Intelligence (AI) was the highlight among disruptive technologies, with growth from 24 per cent in 2021 to 30 per cent in 2023, being widely used by the Judiciary (68 per cent of agencies). In addition, the Internet of Things (IoT) saw an increase in adoption, from 18 per cent to 27 per cent, while the use of Blockchain remained stable, varying from 13 per cent to 15 per cent. Cloud services were also widely implemented, especially for corporate emails (81 per cent of federal agencies and 59 per cent of state agencies).

This data reflects the progress of digital transformation in the public sector, with a focus on automation, connectivity and greater interaction with society, although some technologies, such as Blockchain, still face challenges for wider adoption. In fact, Brazil has a relevant market and a society that is open to adopting innovations, despite not being a major

[4] The following points were taken into account in the evaluation: i) *Digital by Design*: The government is planned to be digital from the outset, with technologies integrated into its processes. ii) *Data-driven Public Sector*: Decisions and improvements in public services are based on the use of data. iii) *Government as a Platform*: The government provides platforms and resources for use by various sectors. iv) *Open by Default*: Transparency and access to information. v) *User-driven*: Services and policies prioritise users' needs and experiences. vi) *Proactiveness*: The government anticipates citizens' needs and offers solutions in advance. See OCDE 2023 OECD Digital Government Index.

[5] *Ibid.*

[6] Núcleo de informação e coordenação do ponto br. Pesquisa sobre o uso das Tecnologias de Informação e Comunicação no setor público brasileiro - TIC Governo Eletrônico 2023.

research and development centre. This is due, among other reasons, to the fact that the availability of private capital is lower than in developed countries, requiring greater state intervention to stimulate investment in new technologies.

However, in order to remain competitive and make significant progress, the country needs to invest more in emerging technologies such as AI and overcome structural challenges. Among these challenges[7] , we highlight the inequalities in access to technologies, which vary significantly between the different levels of government, regions of the country and age groups of the population, highlighting the urgency of public policies that promote digital inclusion and equity.

Against this backdrop, this article aims to present an overview of the authors' concerns about new disruptive technologies, AI and public administration. To this end, the article will be divided into two main topics.

The first topic will cover aspects relating to new disruptive technologies in general, with a focus on public economic promotion of technological innovation; repercussions on infrastructure law and the adoption of Blockchain and IoT in Public Administration.

The second topic deals with aspects relating to AI, in view of the special prominence that this technology has been gaining. In this way, a diagnosis of the adoption of AI by the Public Administration will be presented, with a special focus on the Brazilian Strategy for

[7] The ICT eGovernment Survey (2023) revealed important challenges faced by Brazil in implementing digital solutions in the public sector. Among the main obstacles are limitations in technical capacity and organisational adaptation, as well as inequalities in the provision of digital services between the different levels of government and regions, with a significant impact on smaller municipalities. There is also a prioritisation of technologies aimed at tax collection and the internal activities of administrations, to the detriment of the development of tools aimed directly at citizens. This technological imbalance particularly affects vulnerable populations, who face access difficulties made worse by the reduction in public service centres. In addition, the growth of monitoring centres, often without adequate regulation, raises concerns about privacy and data protection, highlighting the need for public policies that promote an inclusive and responsible digital transformation.

Artificial Intelligence (EBIA) and the AI Plan for the Good of All (PBIA). In addition, issues relating to the regulation and regulation of AI in public administration will be addressed and, finally, legal aspects relating to administrative decision-making using AI will be analysed.

In terms of methodology, bibliographical research was carried out, using doctrinal and legal sources, especially scientific articles, periodicals, books and legislation on the subject.

2. NEW DISRUPTIVE TECHNOLOGIES AND PUBLIC ADMINISTRATION

2.1 Public economic support for technological innovation

Rodrigo da Fonseca Chauvet[8], when dealing with public economic promotion of technological innovation, understood here as the adoption by the Public Administration of stimulating, inciting and inducing activities of an economic nature in the private sector, points out that in the case of developing countries such as Brazil, the state has a fundamental role in making direct investments in innovation development (RD&I).

This is because research, development and innovation activities generally require a large amount of long-term investment and no guarantee of success, since technological risk is inherent in the development of disruptive solutions. Consequently, the need for the state to

[8] R.F. CHAUVET, *Fomento público econômico à inovação tecnológica*, in A. SADDY et al., *Aspectos Jurídicos das Novas Tecnologias (inovações) Disruptivas*, cit., 92-123.

contribute resources to technological development will be greater, acting in a subsidiary way to private initiative[9].

In order to stimulate innovation and scientific and technological development in Brazil, Constitutional Amendment 85/2015 introduced into Article 218 of the Constitution the obligation for the state to promote and encourage scientific development, research, scientific and technological training and innovation. It is worth noting that, until then, there had been no mention of "innovation" in the constitutional text.

With the advent of Law No. 13,243/2016, identified as the Science, Technology and Innovation Framework, important changes were made to legislation on the subject, representing an important step towards stimulating scientific and technological development in the country.

Despite the constitutional and legal provisions relating to public support for innovation and technological development, Elisa Mara Coimbra[10] points out that in Brazil, political instability and a lack of resources end up affecting public support for innovation. Thus, despite the fact that art. 10 of Law 11.540/2007 establishes a series of revenues, such as the percentage of royalties on oil or gas production, to increase the resources of the National Fund for Scientific and Technological Development (FNDCT), the federal government has contingenced these resources to meet fiscal surplus targets, jeopardising the planning of strategic actions in science and technology. The contingency of the FNDCT is particularly damaging, as it affects not only the instruments directly, but also the equalisation of funding needed to make interest rates lower than those of the market.

[9] *Ibid*., 102.

[10] E.M. COIMBRA, *Desafios do fomento público à inovação: perspectivas e possibilidades*, in A. SADDY et al., *Aspectos Jurídicos das Novas Tecnologias (inovações) Disruptivas*, cit., 139-142.

One solution to mitigate this problem would be to transform the nature of the FNDCT from accounting to financial, transferring the resources from the National Treasury's Single Account to an official financial institution, such as Finep. It's important to note that Finep currently manages resources from various sectoral funds with specific purposes, but they all suffer from problems related to contingency[11].

2.2 Infrastructure law and new disruptive technologies

Many of the most recent disruptive innovations affect existing public infrastructures and infrastructure law, requiring infrastructural changes for subsistence, either for their evolution or for their implementation, forcing the market to behave differently from the way it had been behaving, forcing public authorities and private initiative to expand and, sometimes, to extinguish certain infrastructures. In this regard, we would emphasise what has already been said in another text[12]:

These new disruptive technologies (innovations) have revolutionised the world we live in and often require investment in infrastructure not by those who undertake these niches, but by the public authorities, so that the sharing, collaborative, green, creative, multi-currency economy and other existing technologies can be used to their full potential. If, historically, infrastructures were built by those who would later exploit the activities, or by society as a whole, today these economies point to a reality in which their creators use other people's infrastructure, without questioning whether or not the infrastructure owner needs to grant access to their networks because this is an essential facility.

[...]

[11] *Ibid*, 142.

[12] A. SADDY, *Perspectivas do direito da infraestrutura com o surgimento das novas tecnologias (inovações) disruptivas.* In A. SADDY et al., *Aspectos Jurídicos das Novas Tecnologias (inovações) Disruptivas*, cit., 64-67.

It can therefore be deduced from everything seen so far that the sharing, collaborative, green, creative and multi-currency economies, as well as other technologies, may not develop their own infrastructures. Their creators and administrators, as a rule, use existing public infrastructure to provide their services or dispose of their goods. Furthermore, there are situations in which the necessary infrastructure for these new technologies does not exist and, therefore, their creation will depend on the public authorities for the development of disruptive innovation.

To illustrate this situation[13], has already cited the case of platforms known as Over The Top (OTT), which use telecommunications infrastructure to offer services that often end up competing with the infrastructure operators themselves. This situation occurred when, in 2015, the WhatsApp application began offering voice calls without its own transmission infrastructure. Mobile operators claimed that this practice jeopardised their very existence, damaging the infrastructure needed for the telecommunications sector.

As is well known, public infrastructure is crucial to the country's economic recovery and progress. However, investments in public infrastructure are complex, and will become even more difficult with the emergence of disruptive innovations. Changes in the costs and externalities of network infrastructures will be inevitable, since financing and investment will no longer be carried out exclusively by the public authorities and other contributions will be necessary, such as charges for those who use the services.

In view of this, we have already had the opportunity to conclude[14] that the study of infrastructure law, which has traditionally been limited to aspects related to fixed, common and sunk costs, the idea of network externalities, the concept of public networks and natural monopolies, among other topics, will be affected by these new economies. As a result, some

[13] *Ibid.*, 65.

[14] *Ibid.*, 69.

aspects of infrastructure law will have to be reviewed, such as the idea of compulsory interconnection and free access to networks. In addition, new forms of public infrastructure management will have to be created to accommodate and share the most diverse interests of those who use these infrastructures either directly or indirectly.

The fact is that Brazil invests little in public infrastructure compared to other countries, despite the fact that the private sector has become more involved in building, financing and investing in this area. The challenge for infrastructure law at the moment is not only to prevent this, but to adopt mechanisms that encourage investments that coexist with disruptive innovations, with public authorities taking responsibility for the development of public infrastructure.

2.3 Use of Blockchain by the Public Administration

With regard to Blockchain, Anna Lucia Berardinelli and Tatiana S. Ribeiro Strauch[15] point out that this technology is used for decentralised data sharing and has been adopted by public and private entities. Blockchain provides reliability, authenticity, immutability and auditability, guaranteeing security in the storage and management of public data, but it also presents challenges for its implementation.

In the Public Administration, the adoption of Blockchain can provide many benefits, such as greater reliability in sharing information, optimising services and saving costs and time. In addition, the technology can optimise internal work and contribute to the fight against corruption, since the data chain structure increases transparency and links transactions[16].

[15] A.L. BERARDINELLI, T.S.R. STRAUCH, *O uso da blockchain pela administração pública*, in A. SADDY et al., *Inteligência Artificial e Direito Administrativo,* Rio de Janeiro, Centro para Estudos Empírico-Jurídicos CEEJ, 2022, 349-369.

[16] *Ibid*., 362.

The Federal Court of Auditors[17] carried out a study on the characteristics of Blockchain; the areas of application in the public sector; the main risks; the critical success factors; the control challenges and opportunities. Ruling 1.613/2020 points out that the technology has been used in various areas such as public records, digital identity, health, healthcare, foreign trade, social programmes, automation of contract management in the Brazilian natural gas marketing process; registration and transfer of land ownership and academic certificates; and information sharing between public bodies. *Smart contracts* and the creation of tokens are the types of transactions that stand out the most, since they have the advantage of making the violation of clauses prohibitive and reducing the risks of errors and fraud.

In bidding processes and administrative contracts, Blockchain, together with *smart contracts*, is an important tool for fighting corruption. On this subject, Ketlyn Gonçalves Fernandes[18] emphasises the existence of weaknesses in the internal, external and contractual inspection phases and highlights how the aforementioned technologies can act to mitigate the focal points of corruption.

With regard to the internal phase, which has historically been marked by a certain opacity, the author argues that the Blockchain network can improve public notice preparation and price research by allowing hyper transparency by requiring that all contacts with suppliers, studies carried out, justifications for defining the object and qualification requirements be included in a network with high traceability and auditability. In addition, the ability to create a hyper-connected government can improve price research, since the adhesion of various institutions and federative entities (as *nodes* in the Blockchain network)

[17] Brasil, Tribunal De Contas Da União. Acórdão nº 1.613/2020 – Relatório de Levantamento. Plenário, 24/06/2020.

[18] K.G. FERNANDES, *Blockchain e smarts contracts: instrumentos de combate à corrupção nas contratações públicas*, Rio de Janeiro, Centro para Estudos Empírico-Jurídicos CEEJ, 2023.

would create an immense database that is easy to reach, making it possible to identify estimated and settled values, non-performances, sanctions, discrepancies in values, etc[19].

It is also possible to reap the rewards of the technology in the external phase, since the main irregularity is document fraud, such as false signatures and backdated documents. These situations would be easily detected by the Blockchain network due to its traceability capacity and the need for an electronic access key to check authenticity, while also making it easier to hold agents accountable[20].

Specifically with regard to administrative contracts, *smart contracts* would help to verify the suitability of bidders and contractors, to ensure that the budget is appropriate and to guarantee efficiency. In addition, the occurrence of advance payments without receipt of the contracted object is avoided, since *smart contracts* confer self-execution on the contracts signed, i.e. they are only executed when certain conditions are met[21].

Another technology that can be seen as a spin-off is the token, which can be useful especially for tracking public money used to finance projects and for solving Treasury Direct issues[22].

Despite the advances cited by the TCU, Anna Lucia Berardinelli and Tatiana S. Ribeiro Strauch point out that "*the implementation of Blockchain in the public sector is still*

[19] *Ibid.*, 77

[20] *Ibid.*, 81

[21] *Ibid*., 84

[22] Brasil, Tribunal De Contas Da União. Acórdão nº 1.613/2020 – Relatório de Levantamento. Plenário, 24/06/2020.

counterintuitive, since centralisation by the public authorities is inherent from the government's *point of view*[23] *"*.

Blockchain projects are therefore still in their infancy. Another problem is that data is not yet interchangeable between platforms, which hinders the process of integration and collaboration between the organisations involved. Finally, an additional challenge is the lack of professionals who master this technology, affecting the expansion of its adoption.

Faced with these difficulties and challenges, the aforementioned authors present a questionnaire from the Secretariat for the Supervision of Information Technology (SEFTI) to be answered by managers to help them decide whether or not to adopt Blockchain[24]:

The assessment is supported by questions such as: (i) is there a need for multiple parties to store information in a shared database?; (ii) is it difficult to use a trusted third party online at all times?; (iii) is it difficult to decide who controls or where the database will be stored?(iv) network participants have conflicting interests or trust issues?; once the records are stored, the data will never be altered or deleted?; sensitive data will never be stored in the ledger?; and, (v) finally, there is a critical need to store the history of transactions in an immutable and inviolable form?

It can therefore be seen that Blockchain is recommended for situations in which there are several actors and data sources and for situations in which there are conflicts of interest or problems of trust in the storage of data. It is important to assess whether there is a reliable centralised system and whether there is a need to decentralise it and remove intermediaries. Before implementing it in a public organisation, it is also necessary to consider the impossibility of altering or deleting the information recorded in the software and

[23] A.L. BERARDINELLI, T.S.R. STRAUCH, *O uso da blockchain pela administração pública*, in *Inteligência Artificial e Direito Administrativo,* cit., 365.

[24] *Ibid.*, 365.

that the data is stored transparently throughout the network, which could compromise the secrecy and/or privacy of the data. Therefore, if the use of Blockchain is not necessary, it is more efficient to use conventional technology.

2.4 IoT and Public Administration

The IoT is one of the most significant phenomena in terms of technological and paradigmatic leaps forward, and it could bring about significant social changes. The IoT is becoming more and more present in our daily lives, offering benefits for both the private sector and public administrations. The public sector is aware of the benefits of IoT, which can generate more effective solutions to public management problems and productive efficiency. Alexandre Magno Antunes de Souza points out that the Japanese government, in its 5th Science and Technology Basic Plan, emphasises the importance of IoT in connecting information and is already talking about the Internet of Everything (IoE) in which all the data collected is connected.

In the case of *Smart Cities*, the implementation of IoT combined with 5G technology can bring a series of benefits, including improvements in energy efficiency, urban mobility, air quality and public safety. These innovative solutions enable more efficient, sustainable, proactive and real-time urban management, as well as providing connectivity between the administered and the administration and improving the quality of life of the population[25].

Smart Cities use IoT technology and intelligent sensors to collect real-time data in areas such as urban traffic, air quality, public safety and energy consumption. This data is processed by AI systems, which detect problems and trends, providing public managers with accurate information for decision-making and implementing solutions. For example, traffic sensors can help regulate traffic lights and guide drivers in real time, improving traffic and

[25] C. RATTI, M. CLAUDEL, *The City of Tomorrow: Sensors, Networks, Hackers, and the Future of Urban Life*, Yale University Press, 2016.

reducing congestion. In Brazil, the National IoT Plan establishes that health, cities, industry and rural areas should be prioritised in the implementation of IoT policy[26] in order to provide more efficient, connected and sustainable cities.

However, it is important to emphasise that this technology can pose risks to the privacy and security of data generated by interconnected devices. In this regard, Alexandre Magno Antunes de Souza[27] recalls the OECD's warning that IoT and *Big Data* could threaten citizens' right to privacy. If AI is added to these technologies, the challenges for the processing and security of data by the state are even greater.

Eduardo Magrani[28] emphasises that data governance and security are fundamental factors to consider when weighing up the benefits and risks of the IoT. The law has an important role to play in regulating these practices and protecting existing constitutional rights. In addition, planning on the part of the state is essential to channel the transformations in this area in the interests of citizens and national development, taking into account the country's characteristics and technical and regulatory heritage.

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[26] Brasil, Decreto nº 9.854, de 25 de junho de 2019. Dispõe sobre a Política Nacional de Segurança da Informação e sobre a governança da segurança da informação em entidades da administração pública federal. Diário Oficial da União, seção 1, Brasília, DF, p. 2, 26 jun. 2019.

[27] A.M.A. SOUZA, *Administração pública 4.0 - a mudança por meio da blockchain e da inteligência artificial*, in A. SADDY et al., *Inteligência Artificial e Direito Administrativo*, Rio de Janeiro, Centro para Estudos Empírico-Jurídicos CEEJ, 2022, 74.

[28] E. MAGRANI, *A internet das coisas*, Rio de Janeiro, FGV, 2018.

3.1 Public policies and investment plans in AI

The main public policy on AI currently in force is the Brazilian Strategy for Artificial Intelligence (EBIA), instituted by the federal government through MCTI Ordinance No. 4,617/2021, later amended by MCTI Ordinance No. 4,979/2021[29] . This initiative reflects a global race among nations to become leaders in the use of synthetic intelligence.

EBIA[30] defines its main strategic objectives as: (i) contributing to the development of ethical principles for the responsible development and use of AI; (ii) promoting sustained investment in AI research and development; (iii) removing barriers to AI innovation; (iv) training and educating professionals for the AI ecosystem; (v) stimulating innovation and the development of Brazilian AI in an international environment; and (vi) promoting an environment of cooperation between public and private entities, industry and research centres for the development of Artificial Intelligence.

The Federal Court of Auditors (TCU) carried out an evaluation of the EBIA[31] as a public policy of the Federal Public Administration to adopt and stimulate public and private investments in AI, pointing out, in summary, that the objectives and strategic actions defined do not have clear indicators for government action, as required by the SMART methodology (*Specific, Measurable, Achievable, Relevant and Time*), i.e. they are not specific, measurable, realistic (achievable) and delimited in a time frame. Only the property of being appropriate (relevant) is realised[32].

[29] Brasil, Ministério da Ciência, Tecnologia e Inovações/Gabinete do Ministro. Portaria GM Nº 4.617, DE 6 de Abril de 2021. Institui a Estratégia Brasileira de Inteligência Artificial e seus eixos temáticos. [S. l.], 12 abr. 2021.

[30] *Ibid.*

[31] Brasil. Tribunal De Contas Da União. Acórdão nº 1.139/2022 – Relatório de Levantamento. Plenário, 25/05/2022.

[32] *Ibid.*, paragraph 116 et seq.

The Control Body indicates that EBIA does not have a mapping of the initial reference stage (milestone zero, initial situation[33]) . The TCU also finds formal flaws in the presentation of the logic model and how EBIA addresses the problems/opportunities, projecting its long-term results and impacts[34]; the governance and management structures needed to implement the policy are not formally institutionalised[35]; and EBIA's monitoring and evaluation structure is not formally defined in a standard [36].

As a result, the TCU concludes that, due to these flaws, in practice the objectives presented in the EBIA correspond more to strategic guidelines that guide the actions derived from it. It also criticises the fact that it is not feasible or acceptable for the objectives defined in a public policy not to be expressed in terms of results, since it is essential to define quantitative targets in order to assess the effectiveness, efficiency and effectiveness of the policy. It also points out that the use of appropriate quantitative and/or qualitative indicators should be part of the policy's design.

Another important initiative of the federal government is the IA Plan for the Good of All (PBIA[37]), an initiative that aims to accelerate the process of technological transformation in Brazil, with a total investment forecast of R$23.03 billion between 2024 and 2028. This amount will be financed by various sources, such as the FNDCT/FINEP, the BNDES, the private sector and state-owned companies, signalling the joint efforts of various economic and social players. The proposal is guided by Brazil's quest for technological

[33] *Ibid.*, paragraph 127 et seq.

[34] *Ibid.*, paragraph 139 et seq.

[35] *Ibid.*, paragraph 151 et seq.

[36] *Ibid.*, paragraph 158 et seq.

[37] Brasil, Plano Brasileiro de IA terá supercomputador e investimento de R$ 23 bilhões em quatro anos. Ministério da Ciência, Tecnologia e Inovação, 2024.

sovereignty and global leadership in the field of AI, as well as prioritising sustainable innovations, powered by renewable and inclusive energies. The PBIA also emphasises the large-scale training and retraining of professionals in the field of AI and the strengthening of the national technological infrastructure, positioning Brazil as a benchmark in the sector.

However, despite the PBIA's transformative potential, the updating of the EBIA should precede the plan, ensuring a more cohesive integration between the long-term objectives and the proposed actions. In addition, the sustainability component, although relevant, could be bolder in order to respond to the global challenges of climate change. Another concern raised concerns the development of AI models of its own, as this would be akin to "reinventing the wheel", since there are AI models and codes that are open and publicly accessible, such as Meta's Llama[38]. In this context, it is suggested that Brazil prioritise progress in machine learning, exploiting partnerships and technologies already consolidated in the global market. The PBIA's success will therefore depend on its ability to articulate strategic investments, integrated public policies and a sustainable and inclusive vision of the future.

3.2 Regulation and regulation of AI in public administration

It has been noted that the current legal system, although applicable to digital technologies, is insufficient, and even obsolete, in terms of its ability to provide adequate responses to the new challenges arising from the accelerated digital transformation of current times. The question is to what extent this law, which is largely related to the conditions of the "*analogue world*", is sufficient to meet the demands of the digital transformation,

[38] META, Open source AI is the path forward. 2024.

especially in terms of dealing with synthetic intelligence, or whether it needs to be modified and supplemented[39].

Currently, Brazil does not have a specific law that supports planned actions, defines principles or regulates the adoption of AI[40]. It should be noted that there are several bills under discussion in the National Congress, and a commission of jurists was appointed to propose a *"regulatory"* framework for Artificial Intelligence, which was later converted into Bill of Law (PL) No. 2338/2023[41] . The President of the Senate then appointed a Temporary Commission on Artificial Intelligence in Brazil (CTIA) which approved the Final Report and sent it to the Senate plenary for a vote. The Senate then approved a substitute bill based on Bill 2.338/2023[42]. The text went on to be analysed by the Chamber of Deputies.

As we saw above, EBIA is the result of weak regulation, expressed through indicative actions. More than a public policy, it establishes strategic guidelines with

[39] W. HOFFMANN-RIEM, *Inteligência Artificial como oportunidade para a regulação jurídica*, in *Direito Público*, 2019, 11-38.

[40] It should be noted that the Brazilian Strategy for Digital Transformation (E-Digital), approved in March 2018 by Decree No. 9,319/2018 and MCTIC Ordinance No. 1,556/2018, already signalled the importance of prioritising AI due to its cross-cutting impacts on the country. The Ministry of Science, Technology, Innovation and Communications (MCTIC), through MCTIC Ordinance No. 1,122/2020, prioritised the area of AI in terms of research projects, technology development and innovation for the period 2020 to 2023. With this in mind, the Brazilian Artificial Intelligence Strategy - EBIA, the only document on the subject in existence, was drawn up by Ministerial Order GM No. 4.617/2021.

[41] Cfr. Commission of Jurists Responsible for Subsidising the Drafting of a Substitute on Artificial Intelligence in Brazil. Final Report: Commission of Jurists established by Act of the President of the Senate No. 4 of 2022, to subsidise the drafting of a substitute to instruct the assessment of Bills Nos. 5.051 of 2019, 21 of 2020 and 872 of 2021, which aim to establish principles, rules, guidelines and foundations to regulate the development and application of artificial intelligence in Brazil. Brasília, 2002.

[42] Senado Federal, Marco da inteligência artificial é aprovado em plenário e vai à Câmara.

recommendations and incentives for people's behaviour, in order to consensually achieve the instrument's objectives.

At the current stage of development of AI, and taking into account the fact that there is still no legal framework approved by Congress, as well as the urgent need to give swift, concrete and adequate legal treatment to the ethical and legal questions[43] arising from the adoption of intelligent machines, it seems advisable that there should be greater deconcentration and decentralisation of the regulation of intelligent systems within the Public Administration.

The concept of regulation is used as an institute that encompasses any intentional public interference in someone's choices, be they their own or those of third parties. Regulation is one of the instruments for this, perhaps the main one, but regulation and regulation are not synonymous[44].

We have already had the opportunity to teach[45] that regulation can be carried out by someone outside the subject (heteroregulation) or by the interested party themselves (self-regulation), as well as being public, carried out by a public entity or body, or private, carried out by private initiative. Applying these concepts to the regulation of AI within the scope of the Public Administration, it can be said that there are three (3) most common forms that have been used in different legal systems:

[43] On the subject, see: M. ZOCKUN, C. Z. ZOCKUN, *Limites éticos e jurídicos à produção do ato jurídico estatal com base em inteligência Artificial: o ato jurídico produzido sem consciência ou vontade*. in *Cadernos de Dereito Actual*, Santiago de Compostela, núm. Extraordinário, 2023, 40-57.

[44] A. SADDY, *Curso de direito administrativo brasileiro*, Rio de Janeiro, CEEJ, 2023, 560.

[45] *Ibid.*, 563-564.

(i) holistic or global public heteroregulation, based on rights and/or risks, in which the legislator would cover legal treatment in general, encompassing the public and private sectors and regardless of the specific application for which computer intelligence is intended. As already mentioned, our legal system does not yet have legislation on AI. This seems to be the path adopted by Bill 2338/2023.

(ii) principled public heteroregulation, where the law stipulates the principles that should govern the adoption of AI, without going into case-by-case or sectoral treatment. This is the path that was adopted in Bill 21/2020, which was approved in the Chamber of Deputies, but which was severely criticised because it was a premature text, without a broad discussion with society and experts [46].

(iii) public self-regulation, where the standardisation of AI is assigned to different entities or public bodies depending on the nature of the activity carried out. One example is CNJ Resolution 332/2020[47] , in which the Judiciary adopted public self-regulation to define rules and principles relating to ethics, transparency and governance in the production and use of AI in the Judiciary.

Of the three (3) forms mentioned above, it is also possible to combine them, giving rise to a fourth hypothesis specifically concerning the regulation of AI within the Public Administration:

(iv) regulated self-regulation, or rather public self-regulation heteroregulated by the state itself. This will occur when the state regulates public self-regulation through administrative

[46] Senado Federal, Para especialistas, PL sobre inteligência artificial precisa de mais debates.

[47] Conselho Nacional De Justiça (CNJ), Resolução Nº 332 de 21/08/2020.

tutelage, i.e. when an entity or body other than the Public Administration regulates public self-regulation, and can be broken down into three models[48].

Public heteroregulation that is general and detailed would run the risk of falling into rapid obsolescence, given that the technology in question is constantly and rapidly evolving, with innovations, functionalities and solutions not even imagined by the legislator. Furthermore, it is impossible to give legal treatment on a case-by-case basis to all the situations in which the Administration may be faced with the need to adopt or regulate automated mechanisms, such as regulating the activities of private individuals, the internal use of the Administration, the provision of public services or the implementation of public policies.

On the other hand, principiological public heteroregulation would not give due treatment to concrete cases related to the daily lives of those who develop and use AI, with the risk of becoming innocuous and ineffective. We must therefore avoid hasty legal regulation that could hinder all the positive potential of this technology, on the one hand, or be ineffective, on the other.

Therefore, as has already been argued[49], in the current circumstances, the solution lies in public self-regulation by the different bodies and entities of the Administration, heteroregulated by the state itself, not only to curb misuse or diversion for ulterior motives,

[48] As already argued in A. SADDY, *Curso de direito administrativo brasileiro*, 572, cit. There are at least 3 (three) models when correlating private heteroregulation or self-regulation and state regulation: (i) a model of complementary or supplementary regulated heteroregulation or self-regulation, (ii) a model of subsidiary or supplementary regulated heteroregulation or self-regulation; and (iii) a model of pure regulated heteroregulation or self-regulation. These hypotheses can also be applied when faced with public self-regulation and state regulation.

[49] Cfr. R.L.C.J. TEIXEIRA, *Regulação ético-jurídica de inteligência artificial na administração pública*, Rio de Janeiro, Lumen Juris, 2023.

but also to encourage the adoption of technology in an excellent way and aimed at the common good, respecting fundamental rights and guarantees.

Public heteroregulation must establish a system of governance in the Public Administration as a whole, with the function of coordination and general supervision between the different bodies and entities that will self-regulate. It could be instituted by means of a Decree from the heads of the Executive Powers, stipulating a general governance of AI, to be observed by lower or subordinate bodies and entities. The Decree has the advantage of greater flexibility to promote the changes, modifications and updates that are so necessary to meet the challenges, novelties and ethical questions that arise on a daily basis, so it is not subject to the natural vicissitudes of the legislative process, which is more rigid, lengthy and uncertain.

As the proposed model is characterised by public self-regulation that is heteroregulated by the state itself, the aforementioned public heteroregulation will have to be complemented by the sectoral public self-regulation of the different entities or bodies of the Public Administration, through the issuing of normative acts (regulations), codes of conduct, good practices and deontics, in order to take into account the specific peculiarities and idiosyncrasies of each administrative reality.

It is worth pointing out that the model proposed here is perfectly compatible with the substitute for Bill 2338/2023, which is currently before the Chamber of Deputies. This is because the bill adopts a co-regulatory model, which encourages collaborative regulation between the state and interested sectors, which will be able to establish governance standards, codes of conduct and guides to good practices[50], with self-regulation even being considered an indication of good faith[51]. Of course, if a law is passed regulating the issue, the appropriate

[50] Brasil, Senado Federal, Documento legislativo, arts 40 and 41.

[51] *Ibid.*, 3 of art. 40.

adjustments will have to be made to decrees and administrative rules to bring them into line with the law.

3.3 Administrative decision-making using AI

According to the principle of maximum objectivity, the Administration, whenever possible, should objectify its behaviour[52]. In this sense, the adoption of AI systems will be a great way to ensure compliance with this principle, since this technology is capable of processing and analysing massive amounts of data, detecting problems, patterns, trends and making recommendations, thus providing public managers with a more accurate analysis to aid decision-making and implementing data-based solutions.

On the other hand, Justice Gilmar Mendes[53], in the ADI 6389 MC-REF/DF judgement, warned that critical state decisions are being replaced by automated mechanisms: "We live in the age of automated Sophia's choices".

The great risk for the rule of law is the complete replacement of the manager's subjectivity with the subjectivity of the machine, under the pretence of avoiding particularisms in a decision. The use of AI could be especially damaging in cases of conflict between material equality and formal equality, where the adoption of standardised and repetitive decisions could lead to injustice being committed due to the peculiarities of the

[52] A. SADDY, *Curso de direito administrativo brasileiro*, cit., 406.

[53] Brasil, Supremo Tribunal Federalì, Ação Direta de Inconstitucionalidade nº 6387. Ementa. Precautionary Measure in Direct Action of Unconstitutionality. Referendum. Provisional Measure No. 954/2020. Public Health Emergency of International Concern Due to the New Coronavirus (covid-19). Sharing of data on users of the fixed switched telephone service and the personal mobile service, by the providers, with the Brazilian Institute of Geography and Statistics. Fumus Boni Juris. Periculum in Mora. Granted. Appellant: Federal Council of the Brazilian Bar Association - CFOAB. Subpoenaed: President of the Republic. Rapporteur: Minister Rosa Weber. Judgement on 6 and 7 May 2020. DJE no. 137, released on 02/06/2020.

specific case. On this point, we would emphasise what has already been argued by another author, João Victor Tavares Galil[54]:

With this technique, it is undeniable that the possibility prevails that cases will be decided in a uniform way, based on the same characteristics, which will become the reality of the world for the machine, and will often not reach the best level of justice individually considered. This is a conflict of principles that is, and always will be, the backdrop to administrative activity in the abstract and which, in the scenario of artificial intelligence, is even more striking: the confrontation, based on weighting, between legal certainty, which is characteristic of formal equality, and material equality, [...].

The civil servant would have an even greater argumentative burden in the event of deciding in a way that is contrary - even if fair - to what the AI recommends. There is therefore a clear reduction (with the risk of total elimination) in administrative discretion, due to the automation bias, the natural accommodation to the automatism produced by the system, as well as the insecurity of changing or going against an algorithmic recommendation, which could cause accountability for the decision.

This situation is especially alarming in the case of automated decision-making mechanisms that affect fundamental rights, since there are limitations and mathematical computational problems that make it completely impossible for an algorithm to realise that it

[54] A. SADDY, J.V.T. GALIL, *O processo de tomada de decisão administrativa e o uso da inteligência artificial*. in *Inteligência Artificial e Direito Administrativo*, cit., 119.

is making a mistake or could make a mistake[55]. It should be noted that João Victor Tavares Galil has previously published a position on this subject[56]:

Bringing this into the context of law, it seems clear that the realisation of a fair decision, which must be based on the notion of material equality, must be the guiding principle pursued by the human agent who, exercising their competence, has decided to act through the use of artificial intelligence. As such, it will be the human agent's duty to constantly monitor the system's performance, even if it needs to be remodelled, whenever the parameters of the technology employed no longer meet the expectations of the competent agent or of society which, by submitting to treatment by the machine, sees itself in a legal relationship with the state body or entity.

For these reasons, in cases where there is a zone of uncertainty or conceptual halo[57], a conflict between material and formal equality and in judgements of fairness, it is recommended that more rigorous mechanisms be provided for the adoption of AI, such as mandatory human review of automated decisions.

Another aspect to be taken into account in relation to administrative decisions using AI is that there are algorithms that work as a closed system (known as a black box), where it is not possible to explain how the specific result or decision was reached. The lack of reasoning behind automated decisions violates the need to motivate administrative decisions[58] and undermines the exercise of the right to a fair hearing and a full defence, since

[55]Cfr. R.L.C.J. TEIXEIRA, *Regulação ético-jurídica de inteligência artificial na administração pública*, cit. 18.

[56] Cfr. A. SADDY, J.V.T. GALIL, *O processo de tomada de decisão administrativa e o uso da inteligência artificial*, in *Inteligência Artificial e Direito Administrativo*, cit., 125.

[57] Cfr. A. SADDY, *Apreciatividade e discricionariedade administrativa*, Rio de Janeiro, CEEJ, 2020, 396.

[58] Cfr. art. 50 of Law no. 9.784/1999.

the person affected does not clearly see the reasons for the administration's decision, making it impossible to challenge the decision by means of an appeal.

The following comments have already been made on the subject[59].

Nowadays, any and all administrative acts, whether they are the result of a manifestation of will without or with freedom, in other words, binding or with some kind of subjectivity or public autonomy, must be motivated, with the exception of a few situations. The disagreement over the need to motivate "discretionary" acts will be dealt with in Chapter XXII - Unilateral Administrative Acts, but, as of now, we take the above position and even agree with those who say that the obligation to motivate is directly proportional to the margin of action that the rule grants the Administration or, in other words, the greater the margin of freedom, the intensity or depth of the act's motivation increases.

Consequently, administrative decisions that affect the rights and interests of the administered must be substantiated in a humanly intelligible way, i.e. they must be capable of human interpretation and understanding. When using an automated system, the obligation to give reasons must be proportional not only to the margin of freedom granted to the Administration, but also taking into account, in particular, the risks and impacts on fundamental rights and guarantees.

In addition, explainability is a sine qua non condition for decisions to be challenged and reviewed, guaranteeing the exercise of the right to a fair hearing and a broad defence, rights constitutionally guaranteed in administrative proceedings[60], thus allowing

[59] Cfr. A. SADDY, *Curso de direito administrativo brasileiro*, Rio de Janeiro, CEEJ, 2023, v.1, 384.

[60] Art. 5, inc. LV: "*Litigants, in judicial or administrative proceedings, and the accused in general, are guaranteed the right to an adversarial proceeding and a full defence, with the means and resources inherent to it*". Brasil, Constituição da República Federativa do Brasil de 1988.

administrators to understand and eventually challenge these decisions in the competent instances.

With regard to the need to substantiate decisions made with the help of intelligent systems, João Sérgio dos Santos Soares Pereira61 believes that:

It is necessary to consider that predictions do not involve legal knowledge and serve as an aid. The correlation of words and the meeting of events does not equal the due contemporary normative foundation that is expected of decision-making acts that involve people, sensitivities and not just processes or material acts of life that await a solution from the state. Responses from the government interfere in the lives of citizens who will be affected by the use of any of the stages of technological implementation in the executive branch.

Therefore, in cases where opacity is inherent to the AI technology adopted, it is not recommended that administrative decisions that affect the rights of the administered or have a relevant impact on the public interest be completely replaced by intelligent systems, since these decisions must be duly substantiated, thus guaranteeing their explainability and revisability.

4. CONCLUSIONS

Constitutional Amendment No. 85/2015 introduced the obligation for the state to promote and incentivise innovation, while Law No. 13,243/2016, known as the Science, Technology and Innovation Framework, represented an important step towards stimulating scientific and technological development in the country. However, public promotion of

[61] J. S. PEREIRA, *As decisões administrativas robóticas: das possibilidades aos limites*. in *Inteligência Artificial e Direito Administrativo*, Rio de Janeiro, Centro para Estudos Empírico-Jurídicos CEEJ, 2022.

innovation in Brazil has been hampered by political instability and a lack of funds, with the federal government having cut the FNDCT's resources. One proposed solution would be to transform the nature of the FNDCT from accounting to financial, transferring the resources to an official financial institution, such as Finep.

Disruptive innovations affect infrastructure law, requiring changes to evolve and implement these innovations. The sharing, collaborative, green, creative and multi-currency economies and other technologies often use other people's infrastructures, whether they belong to private companies or public authorities. Investments in public infrastructure are complex and become even more difficult with the emergence of disruptive innovations. The challenge for infrastructure law is to stimulate investments that coexist with disruptive innovations, and it is essential to review them, such as the inevitable changes in the costs and externalities of network infrastructures, in order to accommodate and share the most diverse interests of those who use these infrastructures. In any case, the state has a responsibility to invest in public infrastructures so that these new technologies can be fully utilised.

The adoption of Blockchain in public administration has the potential to generate numerous benefits, such as greater reliability in sharing information, optimising services and contributing to the fight against corruption. However, the implementation of technology in the public sector is still in its infancy and presents challenges such as the lack of professionals who master the technology, the lack of data exchange between platforms and the inherent centralisation of the public sector.

The implementation of the Internet of Things (IoT) combined with 5G technology can bring a number of benefits to Smart Cities, including improvements in energy efficiency, urban mobility, air quality and public safety. However, IoT poses risks to the privacy and security of the data generated by interconnected devices. For this reason, governance and data security are key factors to consider when weighing up the benefits and risks of IoT. Planning on the part of the state will be essential to channel the transformations in this area in the interests of citizens and national development.

Despite the growing adoption of AI in the Brazilian Public Administration, its use is still in the early stages, reflecting the untapped potential of this technology in transforming public policies and services. Furthermore, the country faces the challenge of balancing stimulus and investment in the development of AI with the implementation of robust and ethical regulation that ensures the protection of fundamental rights and public trust in the technological solutions adopted by the government.

The current Brazilian legal system is insufficient to deal with the challenges of AI. Faced with the urgent need to give adequate legal treatment to the ethical and legal issues surrounding the adoption of AI, the proposed solution is public self-regulation, heteroregulated by the state itself. Centralised heteroregulation is recommended, establishing a system of governance within the Public Administration, complemented by sectoral self-regulation by each body or entity. The model proposed here is compatible with the substitute for Bill 2338/2023, which adopts a co-regulatory model.

Regarding the use of AI in administrative decisions, this technology can be useful for processing and analysing large amounts of data, detecting problems and making recommendations for public managers to make more informed, data-based decisions. However, excessive use of AI can lead to the manager's subjectivity being replaced by the machine's subjectivity, which can result in unfair decisions and a reduction in administrative discretion. In addition, the explainability of automated decisions is crucial so that they can be challenged and reviewed, if necessary, guaranteeing the exercise of the adversarial process and a full defence for those being administered. It is therefore important to find a balance between the use of AI and human supervision to ensure that administrative decisions are fair and equitable.

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Abstract. *This article examines the adoption of disruptive technologies in Brazilian public administration, with a focus on current developments, legal and institutional challenges, and future prospects. Disruptive innovations such as Artificial Intelligence (AI), Blockchain, and the Internet of Things (IoT) are increasingly integrated into public services to promote efficiency, transparency, and citizen engagement. The study highlights the uneven pace of digital transformation across government levels and regions, emphasizing the need for inclusive public policies and infrastructure investment. Special attention is given to AI, analyzing national strategies like the Brazilian Strategy for Artificial Intelligence (EBIA) and the AI Plan for the Good of All (PBIA), along with issues of regulation, ethical governance, and administrative decision-making. Through a bibliographic review, the article concludes that while Brazil has advanced in adopting emerging technologies, significant structural, regulatory, and financial barriers remain. To fully harness the benefits of these innovations, coordinated public policies, legal frameworks, and balanced governance models—combining state regulation with sectoral self-regulation—are essential.*