Summary of the Brazilian Artificial Intelligence Strategy
-EBIA-

2021

INTRODUCTION

EBIA was established with the aim of guiding the actions of the Brazilian government in favor of the development of actions, in its various aspects, that stimulate research, innovation and development of AI solutions, as well as, their conscious and ethical use. The concept of AI adopted is that presented by the OECD: "an AI system is a machine-based system that can, for a given set of objectives defined by human, make predictions, recommendations or decisions that influence real or virtual environments. AI systems are designed to operate with varying levels of autonomy". Also, according to the OECD, an AI system consists of three main elements: sensors, operational logic and actuators. The sensors collect raw data from the environment, processed by operational logic to provide outputs to the actuators, which in turn act to change the state of the environment. This cycle is repeated countless times, and as the environment is changed by the AI system, each cycle the operational logic can be improved.

1. INTERNATIONAL REFERENCES

Still referring to these OECD recommendations on AI, the document cites the following points as key issues to be addressed by EBIA:

• AI must benefit people and the planet, driving inclusive growth, sustainable development and well-being.

• AI systems must be designed in a manner that respects the rule of law, human rights, democratic values and diversity, and must include appropriate safeguards - for example, enabling human intervention whenever necessary - to ensure a fair society.

• Organizations and individuals who play an active role in the AI lifecycle must commit to transparency and responsible disclosure in relation to AI systems, providing relevant and state of the art information that will (i) promote the general understanding of AI systems; (ii) making people aware of their interactions with AI systems; (ii) allowing those affected by an AI system to understand the results produced; and (iv) allow those adversely affected by an AI system to contest its outcome.

• AI systems must operate in a robust, safe and protected manner throughout their life cycles, and potential risks must be assessed and managed on an ongoing basis.

In addition, the EBIA emphasizes that the principles defined by the OECD in this same recommendation are its guiding principles for responsible management of AI systems, namely: (i) inclusive growth, sustainable development and well-being;

(ii) human-centered values and equity; (iii) transparency and explainability; (iv) robustness, security and protection and; (v) accountability.

In addition to discussions within the OECD, the MCTI also paid attention to the efforts made by countless countries to develop policies, strategies or plans to deal with the issue. Among such initiatives, the main axes identified, according to EBIA, were:

• Research and Development: attracting, retaining and training AI talent from the country itself or from abroad, with academic funding, scholarship programs and the creation of specific master's and doctoral programs in AI; create new centers or programs in basic and applied research, specific to AI.

• Professional skills and the future of work: initiatives to empower the workforce, in general, that develop skills for the future of work, such as investment in lifelong education and digital skills.

• Industrialization and AI: programs to encourage the adoption of AI techno-logies by the private sector, with investments in strategic sectors, financing for AI startups, in small and medium companies, strategies to create clusters for AI.

• Ethical standards for AI: creation of councils, committees or task forces to develop norms and regulations, to support the ethical use and development of AI. This theme also includes specific funding for research or pilot programs to create explainable and transparent AI.

• Data Governance and Digital Infrastructure: financing for partnerships involving the use of open data, shared AI software development platforms and data sets, as well as a commitment to create test environments to protect citizens' rights.

• AI in Government: establishment of pilot programs that use AI to improve the efficiency of Government, service delivery and Public Administration.

• AI for social well-being: designing programs to ensure that AI is used to promote social well-being, economic and cultural growth, and to promote inclusion through its applications.

THEMATIC AXES

From all this analysis of the international scenario, the MCTI identified nine thematic axes that make up the EBIA, which are divided into the following two groups:

I. Transverse Axes:

- Legislation, regulation and ethical use
- AI governance
- International aspects

II. Vertical Axes:

- Education
- Workforce and training
- RD&I and entrepreneurship
- Application in the productive sectors
- Application in the public power
- Public security

1. LEGISLATION, REGULATION AND ETHICAL USE

The technological development of Artificial Intelligence has been accompanied by intense discussions about the need to develop legal, regulatory and ethical parameters to guide the development and application of technology. At the center of such debates is the concern to establish a balance between (i) the protection and safeguarding of rights, including those associated with the protection of personal data and the prevention of discrimination and algorithmic bias; (ii) the preservation of adequate structures to encourage the development of a technology whose potential has not yet been fully understood; and (iii) the establishment of legal parameters that provide legal certainty regarding the responsibility of the different actors that participate in the value chain of autonomous systems.

It was highlighted that the debates about the establishment of general principles and ethical parameters to be adopted by public and private actors on the subject have gained prominence, through codes of conduct, manuals of best practices and high-level guidelines. References cited were the OECD[1] and G20 AI principles[2]; Ethical Guidelines for a European Union Trusted AI[3]; among others.

Many of the documents cited by EBIA indicate that the development of Artificial Intelligence must observe the harmonization of the principles that guide the notion of the rule of law, so that it benefits the society, driving inclusive growth, sustainable development and well-being. To promote an institutional and regulatory environment conducive to innovation and technological development, given its rapidly evolving nature, the document recognizes that there is a scenario in which regulation is complex and prone to become obsolete quickly, and are at risk of preventing the responsible development and use of AI.

> In addition, it is often stated that systems must be designed in a way that respects human rights, democratic values and diversity, imposing the inclusion of appropriate safeguards that enable human intervention, whenever necessary, to guarantee a just society.

Therefore, it is concluded that, in view of the gradual process of large-scale adoption of AI in Brazil and the recent entry into force of the General Data Protection Law (LGPD), which addresses several issues related to the use of AI, the EBIA adopts the understanding that it is necessary to deepen the study of the impacts of AI in different sectors, avoiding regulatory actions (in a broad sense) that may unnecessarily limit AI innovation, adoption and development. However, it argues that concerns about human dignity and the enhancement of human well-being must be present from the conception of these solutions to the verification of their effects on the reality of citizens (ethics by design), making ethical principles be followed in all stages of AI development and use, and may even be raised to normative requirements to be part of all governmental initiatives regarding AI.

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1   https://www.oecd.org/going-digital/ai/principles/
2   https://www.mofa.go.jp/files/000486596.pdf
3   https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai

Strategic actions - Legislation, regulation and ethical use

• To stimulate the production of an ethical AI by financing research projects that aim to apply ethical solutions, mainly in the fields of fairness, accountability and transparency, known as the matrix FAT.

• To encourage partnerships with corporations that are researching commercial solutions for these ethical AI technologies.

• To establish as a technical requirement in tenders that bidders offer solutions compatible with the promotion of ethical AI (for example, establish that facial recognition technology solutions acquired by public agencies have a false positive percentage below a certain threshold).

• To establish, in a multisectoral way, spaces for the discussion and definition of ethical principles to be observed in the research, development and use of AI.

• To map out legal and regulatory barriers to the development of AI in Brazil and identify aspects of the Brazilian legislation that may require updates, in order to promote greater legal certainty for the digital ecosystem.

• To stimulate actions of transparency and responsible disclosure regarding the use of AI systems, and promote the observance, by such systems, of human rights, democratic values and diversity.

• To develop techniques to identify and mitigate the risk of algorithmic bias.

• To develop data quality control policy for the training of AI systems.

• To create parameters about human intervention in AI contexts where the result of an automated decision implies a high risk of harm to the individual.

• To encourage the exploration and development of appropriate review mechanisms in different contexts of use of AI by private organizations and public bodies.

• To create and implement best practices or codes of conduct regarding the collection, implementation and use of data, encouraging organizations to improve their traceability, safeguarding legal rights.

• To promote innovative approaches to regulatory oversight (for example, sandboxes and regulatory hubs).

2. AI GOVERNANCE

As discussions about the ethical use of AI advance, so do the debates about governance frameworks that promote methods and procedures to ensure compliance with these principles. Reference is made to the government of Singapore, As discussions about the ethical use of AI advance, so do the debates about governance frameworks that promote methods and procedures to ensure compliance with these principles. Reference is made to the government of Singapore, which launched the first edition of a "Model AI Governance Framework" that seeks to translate ethical principles into implementable practices in the AI development process.

A fundamental aspect of this process, according to the EBIA, is to establish mechanisms that allow the prevention and elimination of biases, which can result both from the algorithms used, as well as from the databases used for their training. For an algorithm to be "explainable" or "interpretable", it is desirable that the stages of the machine learning process that resulted in an inference are traceable and that the variables that weighed in decision making can be scrutinized. Based on this, it refers to the concept of accountability and the importance of implementing AI governance structures in this regard.

Strategic Actions - AI Governance

• To structure governance ecosystems for the use of AI, both in the public and private sectors.

• To encourage data sharing, observing the LGPD.

• To promote the development of voluntary and consensual standards to manage the risks associated with AI applications.

• To encourage organizations to create data review boards or ethics committees in relation to AI.

• To create an Artificial Intelligence observatory in Brazil, which can connect to other international observatories.

• To encourage the use of representative data sets to train and test models.

• To facilitate access to open government data.

• To improve the quality of the available data, in order to facilitate the detection and correction of algorithmic biases.

• To encourage the dissemination of open-source codes capable of verifying discriminatory trends in data sets and machine learning models.

• To develop guidelines for the draft of Data Protection Impact Reports (RIPD).

•To share the benefits of AI development to the greatest extent possible and promote equal development opportunities for different regions and industries.

•To develop educational and awareness campaigns.

•To stimulate social dialogue with multisectoral participation.

•To leverage and encourage accountability practices related to AI in organizations.

3. INTERNATIONAL ASPECTS

The EBIA recognizes that the global race for AI leadership shows that the development and growing adoption of AI generates impacts that transcend national boundaries, whether in the economic field or in the field of RD&I. And that, in order to expand Brazil's operations in the world, it is essential to promote the intensification of the flows of knowledge, trade, finance, people, data and communications between countries and blocs with converging interests in this field.

More specifically, it argues that Brazil should adopt a proactive and purposeful stance at the international level, fostering discussions, initiatives and partnerships on Artificial Intelligence in international bodies and forums, as well as in discussions and negotiations between countries and blocs. It would be also necessary to promote international cooperation in norms, technological, regulatory and legal standards, in order to facilitate economic integration and the dynamics of exchanges in the field of Artificial Intelligence, always valuing the privacy of users and the protection of personal data.

Strategic actions - International aspects

•To assist the integration of the Brazilian State in international bodies and forums that promote the ethical use of AI.

•To promote the exchange of specialists who carry out research in AI, in the various scientific fields, in the exact sciences, humanities and health.

•To encourage the export of AI systems developed by Brazilian companies, including startups.

•To develop cooperation platforms for exchanging information on Artificial Intelligence technologies.

4. QUALIFICATIONS FOR A DIGITAL FUTURE (EDUCATION)

In the field of education, the challenge is to prepare current and future generations to live with the changes and impacts of AI, many of which are not yet fully understood. It is mentioned that some countries already offer training in the area of computing based on the principles and methods used by AI, such as platforms of introduction to non-deterministic programming, use of computational thinking in a non-deterministic way, education based on robotics and other techniques specific to area.

The document states that qualifying for a world with AI involves more than science, technology, engineering and mathematics. As computers behave more like human beings, the social and human sciences will become even more important. Language, art, history, economics, ethics, philosophy, psychology and human development courses can teach critical, philosophical and ethical skills that will be critical to the development and management of AI solutions.

> The promotion of digital literacy becomes a key factor for the development of a new mass of professionals prepared for the challenges of the next century.

In relation to the labor market, the importance of digital literacy is considered even more latent. Many employers, right at the stage of evaluating job applications, require mastery of digital skills, which act as a catalyst, training other important skills. It is essential, according to the EBIA, that each citizen master basic digital skills and have key competences to apply in various professional activities.

Strategic actions - Education

• To assess the possibility of updating the Common National Curriculum Base (BNCC) in a way that more clearly incorporates elements related to computational thinking and computer programming.

• To develop digital literacy program in all areas of education and at all levels of education.

• To expand offer of undergraduate and graduate courses linked to Artificial Intelligence.

• To stimulate the development of interpersonal and emotional skills, such as creativity and critical thinking (soft skills).

• To evaluate ways of incorporating AI technologies in school environments that take into account the peculiar condition of children and adolescents as people in development, as well as their personal data protection rights.

· To institute technological training programs for teachers and educators.

· To add courses in data science, linear algebra, calculus and probability and statistics to the list of complementary activities in high school programs.

· To promote interaction programs between the private sector and educational institutions that allow the exchange of practical knowledge on the development and use of Artificial Intelligence technologies.

· To create mechanisms to increase the interest of Brazilians in STEM group subjects at school age, with a special focus on gender and race inclusion programs in these areas.

5. WORKFORCE AND TRAINING

It recognizes that there will be a growing demand for skills related to technology, both in the field of basic digital skills and also in the area of advanced technological skills, such as computer programming, advanced skills in digital literacy, critical thinking and problem solving. It is believed that important changes will occur, involving the creation of new jobs and the disappearance or transformation of others.

Training, and its continuity over time, plays a very important role in preparing the workforce, not only in view of the creation of new functions and careers, but also to better adapt current professionals to the changes required due to the use of technology.

Strategic actions - Workforce and training

· To establish partnerships with the private sector and academia to define concrete public policies that encourage the training and qualification of professionals, considering the new realities of the labor market.

· To encourage companies and public agencies to implement a continuous training program for their workforce focused on new technologies.

· To create awareness campaigns on the importance of preparing for the development and ethical use of AI.

· To stimulate the retention of ICT-specialized talents in Brazil.

· To create public policies that encourage the training and qualification of professionals, keeping in mind the new realities of the labor market.

· To encourage the diverse composition of AI development teams, in terms of gender, race, sexual orientation and other socio-cultural aspects.

· To reinforce policies aimed at continuing education and lifelong learning, promoting greater interaction between the private sector and educational institutions (universities, research institutes and professional and technical training).

6. RESEARCH, DEVELOPMENT, INNOVATION AND ENTREPRENEURSHIP

The EBIA again cites the OECD recommendation on AI, emphasizing that national states should promote and encourage public and private investments in R&D, contemplating interdisciplinary efforts to promote innovation in reliable AI, in order to focus not only on technical challenges, but also on social, legal and ethical implications associated with AI. In addition, the document recommends that governments enable investments in open databases, which should be representative and respect the rights to privacy and protection of personal data, in order to (i) promote an environment for research and development in AI that is free from bias; and (ii) improve interoperability and the use of common standards. In addition to these aspects, the OECD also indicates that governments should promote a public policy environment that supports an agile transition from the R&D phase to the development and operation phase of AI systems.

In the understanding of MCTI, Artificial Intelligence Research and Development must adopt ethical design approaches to make the system reliable. This may include, but is not limited to: making the system as fair as possible, reducing possible discrimination and prejudice, improving its transparency, providing explanation and predictability and making the system more traceable, auditable and accountable.

In addition, with regard to public policies aimed at RD&I, for categorization purposes, EBIA identified three categories of government action:

(i) Financier or direct investor: governments can provide financing to support the development and adoption of emerging technologies, with practical application in the public sector, as well as private sector R&D projects whose results can apply to the entire economy.

(ii) Flexible regulator: Accelerated innovation cycles in emerging digital technologies require rethinking the types of policies and regulatory instruments used and their implementation. Legal certainty is essential to guarantee investment.

(iii) Data administrator: Governments own or maintain vast databases. This data can power AI-based technologies, especially when well managed.

EBIA also recognizes the importance of adopting regulatory sandboxes in order to support organizations that are developing innovative products and services using personal data and to develop a shared understanding of what compliance is like in specific innovative areas. As an example, it cited the "Sandbox Guide" developed by the Information Commissioner's Office, designed to guide entrepreneurs who want to develop innovative businesses safely .

Strategic actions - Research, Development, Innovation and Entrepreneurship

· To define priority areas for investments in AI, in line with other policies related to the digital environment.

· To expand the possibilities of research, development, innovation and application of AI, by making it possible to provide specific resources for this topic and by coordinating existing initiatives.

· To establish connections and partnerships between the public sector, the private sector and scientific institutions and universities in order to advance the development and use of AI in Brazil

· To promote a public policy environment that supports an agile transition from the R&D phase to the development and operation phase of AI systems.

· To promote an environment for research and development in AI that is free from bias.

· To improve interoperability and the use of common standards.

· To promote incentive mechanisms that encourage the development of AI systems that adopt ethical principles and values.

7. APPLICATION IN THE PRODUCTIVE SECTORS

In the industry, Artificial Intelligence will play a key role in making business more effective, with reduced costs and a minimum operational error rate. It can be used in different sectors, automating a series of processes and making the day-to-day business more flexible and agile. Thus, entrepreneurs will be able to dedicate more time to activities close to the enterprise's core business and less to bureaucratic and operational issues. Industries with large assembly lines, for example, can use Artificial Intelligence to decrease the number of errors in product assembly processes.

It recognizes that among the challenges to establish public AI policies, is to identify the branches of use of AI and the market areas in which the investments to be applied can generate the best results. These areas can give visibility to the country in international terms, generate jobs with better qualifications, attract large IT companies in the offer of technological solutions, generate AI products and applications for the diverse needs of the public and private sectors and, also, prepare the country for the need for requalification that technology has been imposing on a global level.

Strategic actions - Application in the productive sectors

• To define or identify a public-private governance framework to promote the advancement of intelligent IT industries, along the lines of the Brazilian Chamber of Industry 4.0.

• To foster the emergence of new Brazilian Startups in the area through new publicprivate partnerships.

• To create collaboration networks between technology-based startups and small and medium-sized companies (SMEs).

• To incorporate in initiatives such as the Brasil Mais Program incentive mechanisms for the use of AI by small and medium-sized companies, in order to improve management processes and promote their digital transformation.

8. APPLICATION IN THE PUBLIC POWER

The idea of digital government presupposes taking advantage of and incorporating scientific and technological advances in the field of data science and artificial intelligence in the creation of solutions to improve public services. The combination of data science, automatic learning and high computational power constitutes an important contribution to transform the large amount of data available in Public Administration into relevant information (finding patterns) and transformative knowledge (anticipating failures and optimizing actions). These transformations may modify the decision-making processes, relating to matters with a critical impact on the lives of citizens, and also improve operational processes, reducing deadlines and obtaining more effective responses to the needs presented.

It recognizes that the Public Power has an important role in promoting the adoption of AI, creating an enabling environment for its full development. This should start with the adoption of responsible AI technologies in the public sector, in order to improve the quality of the service offered to the citizen, to promote a transparent and efficient interaction, to increase the level of public confidence in the government and to generate better results for the citizens.

Strategic actions - Application to the public authorities

• In line with the provisions of the Digital Government Strategy, to implement Artificial Intelligence resources in at least 12 federal public services by 2022.

• To incorporate AI and data analysis into public policy formulation processes.

• To implement data experimentation spaces with AI and develop AI-oriented RD&I partnerships with higher education institutions, the private sector and the third sector.

· To update and reassess work processes and practices, in preparation for possible changes in the environments in which AI systems are introduced.

· To consider, in tenders and administrative contracts aimed at the acquisition of Artificial Intelligence products and services, criteria aimed not only at technical efficiency, but also related to the incorporation of ethical principles related to transparency, equity and non-discrimination.

· To establish mechanisms for swift investigation of complaints and complaints about violations of rights in decisions made by AI systems.

· To promote the exchange of open data between Public Administration entities and between them and the private sector, always with respect to the right to the protection of personal data and trade secrets.

· To conduct impact analysis on AI use cases that directly affect the citizen or the public servant.

· To establish ethical values for the use of AI in the Federal Public Administration.

· To encourage public bodies to promote awareness of the use of AI in their staff.

9. PUBLIC SECURITY

Artificial Intelligence systems have potential applications in numerous activities related to security and defense, whether in the context of the Public Power or in the private sector. One of the main applications of AI in the field of security concerns solutions that allow the identification of objects and people in images and videos, which can be used in simple applications - such as the detection of a person jumping over a wall - even applications that are able to identify people carrying guns on the street and/or assaulting others.

On the other hand, the use of such technologies has also been widely discussed, mainly with regard to the problems associated with bias and discrimination arising, in many cases, from insufficiently representative training databases. Although facial recognition systems for public security have been adopted in a number of contexts, including in Brazil, the rates of false positive identifications raise concerns.

Taking into account the opportunities and challenges of using AI within this sector, EBIA identifies some measures that would guarantee technological development and the protection of personal data:

(i) Soft law mechanisms: Guides and recommendations that assist regulators and regulated parties in applying the normative provisions of the relevant laws. Examples include the ICO, the European Data Protection Supervisor and the NIST.

(ii) Supervisory structure: Supervisory structures usually include one or more representative parties legitimized by the State that have instruments to guarantee

the applicability of the law (enforcement), as well as the recommendation of best practices and other safeguards.

(iii) Adoption of technical norms or standards (standardization): Technical norms and standards are established by the technical-scientific communities, in order to guide the industry in the development and implementation of technological solutions. An internationally recognized organization for standards publication is the International Organization for Standardization (ISO).
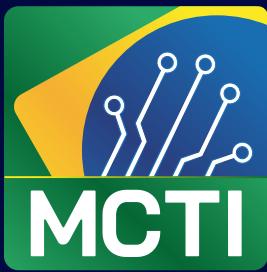
(iv) Data protection regulations applied to public security: The processing of data in the context of public security requires a specific law, since this topic is outside the scope of the LGPD.

(v) Implementation of a regulatory sandbox: The regulatory sandbox is an important regulatory technique that allows transparency regarding technological solutions developed by private or state entities.

Strategic actions - Public security

• To establish supervisory mechanisms to monitor the use of AI for public security activities.

• To encourage bodies that use AI for monitoring to submit a data protection impact report prior to implementation.

• To provide effective mechanisms so that monitored individuals can react to the surveillance operation.

• To present reports with statistics and results of the implemented service.

• To draft law on data protection applied to public security.

• To implement a privacy and data protection regulatory sandbox for AI systems aimed at public security.

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