ARTIFICIAL INTELLIGENCE REGULATION CHALLENGES FROM DIFFERENT APPROACHES: THE INTERFACE BETWEEN LAW AND ECONOMY

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Abstract: This article aims to investigate the evolution of the phenomenon of artificial intelligence and its regulatory challenges in interface with the law and economic environments. This study takes into account the different approaches adopted by countries based on their legal traditions, and aims to provide insights into the benefits and challenges of each of them.

Keywords: Artificial Intelligence, Regulation, State-of-Art, Law and Economy.

INTRODUCTION: CONTEXTUALIZING AND UNDERSTANDING ARTIFICIAL INTELLIGENCE

Both the market and the technology environment have faced increasingly exciting and fierce discussions about the consequences arising from the diffusion of artificial intelligence ("AI") tools. There is constant fear in social and economic sectors about the impacts of artificial intelligence on the generation of wealth, technological development, respect for civil rights, and the maintenance of employment. However, as there are many uncertainties, it seems difficult to find agreement for what is meant by this new technological phenomenon.

It seems that the reluctance that some economic and legal sectors have faced around the topic stems from an uncertainty in understanding what artificial intelligence itself is about. To address this lapse, such a concept needs to be not too technical to the point of alienating the understanding of economists, sociologists or jurists, nor too legal and bureaucratic to the point of not reflecting and reaching the tech-complexity.

However, not only different sciences and professionals have different approaches over the concept of artificial intelligence: also, over time, the different waves of development approached the phenomenon with different perspectives. As Parentoni well states, if, in the past, we understood

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automatic chess command games as artificial intelligence, today, they seem out of place in most discussions about the topic[1]. It seems evident that when applications become routine, they are no longer remembered as artificial intelligence. This explains the strategy headed by the European Union, that, in their Proposal for Regulation, propose the inclusion of a detailed list of approaches and techniques that might be adapted within time: "The definition of AI system in the legal framework aims to be as technology neutral and future proof as possible, taking into account the fast technological and market developments related to AI"[2].

If, for Law, the concept needs to be as neutral as possible, it remains important to seek a minimum academic consensus on what is being discussed. Looking over the years of development, however, it has become evident that the difficulty of defining the term falls on an even greater difficulty in defining what "intelligence" really is. Jerry Kaplan is known as the precursor of a widely held concept of the theme, from an idea that intelligence is linked to "learning, reasoning, planning, understanding, critical thinking, creativity, and last but not least, problem solving"[3]. Artificial Intelligence is directly linked not only to interpreting data correctly, but also to the ability of machines to correct and, mainly, learn from them as a way to achieve specific objectives in a flexible way[4].

For the purposes of this article, which is not intended to be a technological investigation of the AI phenomenon, we limit ourselves to understanding it as the entire complex interactional framework between data and deep learning tools that instrumentalize the information provided in order to build new deliverables. The technological tools used, as well as the technical languages, can vary infinitely, but we intend to stick to this concept of intelligence, so that, with technological advancement, our concept does not become obsolete.

Having this ability to learn from data and mistakes in common, it is also true that the phenomenon of AI has different applications depending on the context, which makes us categorize it so that we can better understand it.

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[1] Parentoni, Leonardo N., Valentini, Rômulo S. & Alves, Tárik C.O., *Panorama da Regulação da Inteligência Artificial no Brasil*, Rev. Eletrônica Curso Dir. UFSM 15(2) (2020), 3.

[2] European Commission, *Proposal for a Regulation ... on Establishing the Digital Services Market* (COM/2021/206 final) (2021), https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX: 52021PC0206 (last visited Jan. 12, 2025). Kaplan, Andreas, *Artificial Intelligence (AI): When Humans and Machines Might Have to Coexist*, in AI for Everyone? Critical Perspectives (P. Verdegem ed., 2021), 21–32.

[3] Kaplan, Andreas, *Artificial Intelligence (AI): When Humans and Machines Might Have to Coexist*, in AI for Everyone? Critical Perspectives (P. Verdegem ed., 2021), 22.

[4] Kaplan, Andreas & Michael Haenlein, *Siri, Siri, in My Hand: Who's the Fairest in the Land?*, Business Horizons 15–25 (2019), 17.

Kaplan and Haelein propose a classification of AI into three different categories, based on the different competencies, or types of skills, that each category possesses. The first category ("Analytical AI") is directly linked to cognitive intelligence activities, analyzing data and representations of the past world in order to make future decisions. "Human-inspired AI", second category, has both cognitive and emotional intelligence elements, as a way of interpreting human emotions to fulfill the platform's objectives, such as assisting in the recruitment and selection process for example. Finally, the last stage of artificial intelligence development would be called "Humanized AI", which would demonstrate both cognitive, emotional, and social intelligence, having the ability to be self-conscious and self-aware, and not just recognize and imitate the human behavior[5].

Most of the AI tools we currently have access to should be classified as Analytical AI, while the others remain speculative or in different developing progress. At the same time, much of the social reticence that has been built around AI is mainly reflected in the fear of human replacement by machines, which is reduced by this distinction between skills and competencies in which humans are priorital. As said by Mark Ryan, the trust expected from AI tools will, in fact, never be achieved, as they lack purely human aspects such as affectivity and personal responsibility. It remains necessary to trust the humans behind the developments of reliable machines, and not substitute one for the other[6].

For Law, and from a human dignity aspect, it's important to recognize artificial intelligence as machines and tools that continues to fulfill its role of serving humanity and not of controlling[7] or damaging it. It is in this sense that the regulations on the subject have been developed, which seek to conceptualize and regulate, placing the human being at the center of regulatory interests. Our proposal, therefore, is not to conceptualize and understand Artificial Intelligence in opposition to the traits of humanity, but to conceptualize it in such a way that it technically serves human and social interests. In the next chapter, we will understand how this interaction took place over the years, and how the technology development paths were associated with the historical moments in which society was.

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[5] Kaplan, Andreas & Michael Haenlein, *Siri, Siri, in My Hand: Who's the Fairest in the Land?*, Business Horizons 15–25 (2019), 18.

[6] Ryan, Mark, *In AI We Trust: Ethics, Artificial Intelligence, and Reliability*, 26 Sci. Eng. Ethics 2749 (2020), 17.

[7] Tomasevicius Filho, Eduardo, *Inteligência Artificial e Direitos da Personalidade: Uma Contradição em Termos?*, Rev. Fac. Dir. USP 113, 133–149 (2018), 146.

I. BRIEF HISTORY OF ARTIFICIAL INTELLIGENCE

As previously exposed, the concept of artificial intelligence is also the result of a natural evolution of technology over time. For the purposes of this paper, the historical perspective of Artificial Intelligence is held from the 20th century to date, as this is the period in which the primary scientific data, research and official reports date from. In this section, Artificial Intelligence's history is framed into six main stages in accordance to the technology maturity level and the subareas that better flourished within the Artificial Intelligence field: (1) Early Concepts and Foundations (1940s-1950s); (2) The Rise and Fall of Symbolic AI (1950s-1970s); (3) Knowledge-Based Systems and Expert Systems (1970s-1980s); (4) Neural Networks and Connectionism (1980s-1990s); (5) Machine Learning and Data-Driven AI (1990s-2000s); (6) Big Data and Deep Learning (2010s-Present)[8].

The groundwork of Artificial Intelligence started even before the 1940s and outlines events and publications that served as a first substrate. In 1921, Karel Čapek coined the term "robots" by introducing the idea of "artificial people" in the science fiction play "Rossum's Universal Robots". During the Early Concepts and Foundations period researchers pioneered in studies of machines that could simulate human intelligence. Remarkably, Warren McCulloch and Walter Pitts introduced the idea of artificial neurons in 1943 and Alan Turing published his paper "Computer Machinery and Intelligence" in 1950, that eventually became The Turing Test, by which one measures computer intelligence through human capabilities[9].

Another relevant event for this stage took place in 1949, when Edmund Callis Berkeley published the book "Giant Brains, or Machines that Think". The work is acknowledged to cover the principles behind computing machines and propose a first systematic comparison between human brains and the current application and use of computers[10]. Most famously, Arthur Samuel developed the first self-learning program to play checkers in 1952 and the concept of Artificial Intelligence was coined by John McCarthy in 1955 during the Dartmouth Conference, contributing to popularize the concept[11].

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[8] Parsewar, Rachana Ramesh & Rudrawar, Shireeshkumar Sharadkumar, *Introduction to Artificial Intelligence (AI)*, in AI for Everyone: Fundamentals ch. 1 (2023), https://www.researchgate.net/publication/373511715 (last visited July 30, 2025), 11-13.

[9] Parsewar, Rachana Ramesh & Rudrawar, Shireeshkumar Sharadkumar, *Introduction to Artificial Intelligence (AI)*, in AI for Everyone: Fundamentals ch. 1 (2023), https://www.researchgate.net/publication/373511715 (last visited July 30, 2025), 11-13.

[10] Tableau, *What Is the History of Artificial Intelligence (AI)?*, https://www.tableau.com/data-insights/ai/history (last visited Jan. 15, 2025).

[11] Parsewar, Rachana Ramesh & Rudrawar, Shireeshkumar Sharadkumar, *Introduction to Artificial Intelligence (AI)*, in AI for Everyone: Fundamentals ch. 1 (2023),

During the "Rise and Fall of Symbolic AI" stage, Artificial Intelligence was initially placed in the spotlight across different fields. From programming languages focused on machine learning, to movies introducing the concept of robots, Artificial Intelligence gained visibility and attention. In 1961, General Motors introduced "Unimate", the first industrial robot used to "[...] transporting die casings and welding parts on cars (which was deemed too dangerous for humans)"[12]. Five years later, the first chatbox, "Eliza", was released by Joseph Weizenbaum using natural language processing (NLP) to communicate[13]. In 1968, a soviet mathematician named Alexey Ivakhnenko established the grounds to what is now conceived as Deep Learning through a paper published in the journal "Avtomatika".

Starting the "Knowledge-Based Systems and Expert Systems" stage, one of the first examples of autonomous vehicles, the "Standford Cart", was successfully tested by James L. Adams a couple of years later, in 1979[14]. The advancements reached during this period offered solid bases for consistent government funding to support academic research. Between 1980 and 1987, the first AI dedicated conference organized by the Association for the Advancement of Artificial Intelligence (AAAI) was held at the Stanford University and the "R1" or "XCON", one of the first AI based systems to operate commercially, was launched by John P. McDermott to support the ordering of computer system components based on customer's communicated requirements. It is worth mentioning that in 1986 the first driverless car was demonstrated by Ernst Dickmann at Bundeswehr University of Munich[15].

After almost 30 years of continued growth, however, Artificial Intelligence has seen a decrease in governing funding and skepticism from the academy. During the period known as the "AI Winter", or "Neural Networks and Connectionism" under a technical perspective, there has been reduced public and private interest in investing in AI related projects and research. Along with inflated expectations from the press that have not been materialized in relevant technical and technological achievements[16], one of

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https://www.researchgate.net/publication/373511715 (last visited July 30, 2025), 11-13.

[12] Tableau, *What Is the History of Artificial Intelligence (AI)?*, https://www.tableau.com/data-insights/ai/history (last visited Jan. 15, 2025).

[13] Anyọha, Rockwell, *The History of Artificial Intelligence*, Science in the News, Harvard Univ. (Aug. 28, 2017), https://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/ (last visited July 30, 2025).

[14] Tableau, *What Is the History of Artificial Intelligence (AI)?*, https://www.tableau.com/data-insights/ai/history (last visited Jan. 15, 2025).

[15] Tableau, *What Is the History of Artificial Intelligence (AI)?*, https://www.tableau.com/data-insights/ai/history (last visited Jan. 15, 2025).

[16] Lenardon, João Paulo A., *The Regulation of Artificial Intelligence* (Master's thesis, Tilburg Univ. 2017), http://arno.uvt.nl/show.cgi?fid=142832 (last visited Nov. 28, 2024), 8.

the main reasons for this downward trend was the existence of official reports from the U.S. and the British Governments challenging the possible returns and outcomes out of AI based initiatives and identifying Artificial Intelligence subareas where basic study was firmly recommended[17].

The 1990s mark the AI retake and the increased use of machine learning technology. One event is particularly critical and symbolic for putting AI back on track for project funding and media coverage. In 1997, a chess-playing expert system named Deep Blue, developed by IBM, beat the world chess champion, Gary Kasparov, in a highly-publicized match. As the first time in History that a machine beat a human in chess, Deep Blue's victory is a relevant milestone and represents a new stage for the technology growth. In 2000, Kismet, a robot head that recognize and simulate human emotions was demonstrated and subject of papers published by Dr. Cynthia Breazeal at the Massachusetts Institute of Technology (MIT)[18]. At this point and in the next few years, leading tech companies like Facebook, Netflix, Twitter and Apple granted an ever growing room for AI in their product portfolio and technology agenda. Most relevantly, Apple released Siri, the first advanced machine learning virtual assistant that uses voice queries to answer questions and make recommendations to users.

During the last decade, remarkable milestones have been achieved towards the popularization of Artificial Intelligence and the adoption of Big

[17] Precisely, the official government reports that most decisively compromised the funding to AI based projects were the report from the Automatic Language Processing Advisory Committee (ALPAC) by the U.S. Government, and the Lighthill Report from the British Government. In 1954, the United States were dramatically involved with the Cold War and hence decided to consistently invest funds in the automatic and instant translation of Soviet documents. IBM led a machine learning experiment, and the translation tests were satisfactory. The event has been covered by the media and the project received additional resources to advance the research. Throughout successive years, however, no material progress has been made and the ALPAC was formed to further investigate and recommend actions. The committee analyzed the machine learning experiment through the lens of the translation need in particular and not under a technological perspective that could identify different applications. As a result, the ALPAC report concluded that there was no shortage of translators that could justify the high investment over Artificial Intelligence for this initiative and recommended basic studies in the field. The Lighthill Report, on its turn, was a review of Artificial Intelligence from Professor Sir James Lighthill of Cambridge University in 1973, as a result of a request from Brian Flowers, the head of the British Science Research Council. Through a pessimist prognosis, Lighthill affirmed that no material achievements had been perceived out of AI experiments. Investments from the British Government in the field significantly and progressively eroded among the British universities during that time (Yang, Gary, *AI Winter and Its Lessons*, in The History of Artificial Intelligence, Univ. of Wash., CSEP 590A (2006), 17-21).

[18] Anyọha, Rockwell, *The History of Artificial Intelligence*, Science in the News, Harvard Univ. (Aug. 28, 2017), https://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/ (last visited July 30, 2025).

Data and Deep Learning. In 2016, the first robot with a realistic human appearance with the ability to replicate human emotions was launched by Hanson Robotics. Four years later, OpenAI released the beta testing version of ChatGPT, which stands for "Chat Generative Pre-Trained Transformer", and is a large language model-based chatbot that generate dialogue and may be easily managed by a regular user[19].

The timeline described in this section denotes the progressive, yet nonlinear maturation process of Artificial Intelligence throughout time. It is definitive not a novelty, nor a decentralized tool that has been historically made available to governments, universities and private agents. The very recent years, however, bring a brand-new landscape where AI large language model (LLMs) technology applications are accessible by Internet at no relevant cost for users. Understand the AI's impact (and the speed by which it is used and consumed) – be it either from a legal, economic, social, cultural or technological perspective – is unveil the potential social transformations just ahead of the curve.

II. RISKS, CHALLENGES AND BENEFITS OF AI ACCORDING TO CURRENT EXPERIENCES

The latest advances in AI have made clear a social fear about the risks emerging from these technologies but also an excitement about the technological and marketing benefits associated with this revolution. The historical trajectory mentioned previously demonstrates that we have reached a crucial point, in which countries and political/economic groups have addressed the issue not only as a technological development, but also as a legal and legislative issue to create a competition for global protagonism. However, it's clear that our degree of benefit, in this development cycle, will be proportional to our global capacity for cooperation.

Even if much is said about the global fear of a new cold war driven by a leading role in AI, for Kai-Fu Lee, however, we are closer to a historical moment like the industrial revolution. In this sense, although government initiatives for legal instrumentalization emerge to create local competitive advantages[20], the newest developments and technological achievements continue to serve creation and economic prosperity[21], at least in a more

[19] Tableau, *What Is the History of Artificial Intelligence (AI)?*, https://www.tableau.com/data-insights/ai/history (last visited Jan. 15, 2025).

[20] Souza, Carlos Affonso, *Japão Afasta Direitos Autorais para Impulsionar Inteligência Artificial*, UOL (2023), https://www.uol.com.br/tilt/colunas/carlos-affonso-de-souza/2023/06/13/japao-afasta-direitos-autorais-para-impulsionar-inteligencia-artificial.htm (last visited Jan. 15, 2025).

[21] Lee, Kai-Fu, *Inteligência Artificial* (Globo Livros 2019), 220.

optimistic approach.

A study by Forbes Advisor launched in 2023 however showed that more than 75% of employed Americans are afraid that AI will impact job losses, while also more than 75% of this same group is concerned about misinformation from AI[22]. This confirms that it is undeniable that two of the biggest social concerns in the AI revolution are the job displacement and damage that may arise from mistakes made by these technologies. Regarding this first concern, however, it is becoming widely argued that even if some positions will no longer exist, new jobs that wouldn't exist in a world without AI will be created. For example, in a new social and economic reality, even if the car drivers' positions become uncommon, we will continue needing the equivalent of the air traffic controllers to control autonomous vehicles[23].

Therefore, these impacts on employment cannot be separated from the impact that will also be felt (and are already benign felt) on the economy. Some market studies show that the economic impact of the AI revolution can be felt by productivity gains from business automating processes, by productivity gains from business augmenting their existing labor force and by increased consumer demand resulting from the availability of personalized and/or higher-quality AI-enhanced products and services[24]. According to McKinsey, AI technology could generate value for the retail and consumer packaged goods (CPG) industry by increasing productivity by 1.2 to 2.0 percent of annual revenues, or an additional $400 billion to $660 billion[25].

This data is clearly reflected in the day-to-day lives of corporations, both in the direction of top executives and in the engagement of a workforce increasingly concerned with AI-focused training. However, according to a study presented by Russell Reynolds, while 72% of leaders point out that a deep understanding of AI will be a fundamental skill for leadership roles, only 32% of them believe they have the necessary skills to implement it in their organizations[26]. There is, therefore, a clear space for not only technical areas to become interested in AI, but above all a need for training and capacity

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[22] Forbes, *Artificial Intelligence: Consumer Sentiment* (2023), https://www.forbes.com/advisor/business/artificial-intelligence-consumer-sentiment/ (last visited Jan. 15, 2025).

[23] PwC, *AI Analysis: Sizing the Prize* (2023), https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf (last visited Jan. 15, 2025), 4.

[24] PwC, *AI Analysis: Sizing the Prize* (2023), https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf (last visited Jan. 15, 2025), 4.

[25] McKinsey & Co., *The Economic Potential of Generative AI: The Next Productivity Frontier* (2023), https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier#introduction (last visited Jan. 15, 2025).

[26] Russell Reynolds Assocs., *The State of Generative AI and Its Implications for Business Leaders* (2023), https://www.russellreynolds.com/en/insights/articles/the-state-of-generative-ai-and-its-implications-for-business-leaders (last visited Jan. 15, 2025).

building for business areas on the subject. Corporate areas of companies, such as legal, financial and sales departments, need to be as attentive to the AI revolution as purely technological areas, as this seems to be a natural movement for the entire market.

Likewise, Legal teams and the structures of Law as a whole also still seem far from being prepared, at the state or parastate level, to deal with the AI revolution. Although at an economic level, the main fears about the AI revolution seem to be rebutted in numbers, at a social and regulatory levels, these fears, mainly referring to the damage possibly caused by these technologies, seems further away from being resolved by the Law. It is possible to summarize that the main challenges that AI has presented to Law in an attempt to avoid harm to society in general could be grouped into data, fundamental rights, safety and (cyber)security, intellectual property, transparency, accountability and compliance[27], but it is also certain to say that these challenges will flourish within time.

One of the most popular and relevant controversial legal aspects within the Artificial Intelligence revolution is the protection of Intellectual Property. This field of Law has always been focused on protecting human innovation and creativity as a way of encouraging economic progress and protecting competition. However, to what extent could we say that a creation originating from any AI tool linked to a database already constructed a priori can be considered as an innovative and creative result? In other words, could we say that there is any possibility of effective creativity in artificial intelligence tools outputs?

In the United Kingdom, the possibility of an artificial intelligence tool being named inventor has already come to trial, and recently its supreme court indicated that only natural people can be protected in this way[28]. Creativity and innovation still seem to be purely human characteristics. But at the same time, even if an IA tool is integrated in the course of the creative process, the mere use of it would be an impediment to the granting of intellectual property to the human end user? This does not seem to be the best understanding as although AI connects to already consolidated and known data sources, the outputs generated still depend on human activity in bringing the answer needs and the right questions (what we can understand as creativity). Knowing the best answers to do (and therefore, managing the AI tool) seems to be even more important than knowing how to build the final

[27] Barata, Sofia, Nuno Carrolo dos Santos, & Iakovina Kindylidi, *Portugal*, in Global Legal Insights: AI, Machine Learning & Big Data (C. Kerrigan ed., Global Legal Insights 2023).

[28] Reuters, *AI Cannot Be Patent Inventor, UK Supreme Court Rules in Landmark Case* (2023), https://www.reuters.com/technology/ai-cannot-be-patent-inventor-uk-supreme-court-rules-landmark-case-2023-12-20/ (last visited Jan. 15, 2025).

result yourself.

This is a very common concern and discussion for designers, painters, artists and art/layouts creators in general, to whom using AI software for automatic generation is becoming increasingly challenging and attractive in the same way. AI-based designs have become famous on social media, attracting curiosity and excitement from consumers, but it is true and safe to say that any of these AI tools still require input from humans to generate truly innovative products[29]. From this perspective, AI tools continue to be tools and thus serve purely the human interests and creativity in directing and instrumentalizing them.

In addition to intellectual property, however, another clear point of recent attention in AI law is the protection of personal data. In recent years, several countries have created their own laws to deal with the topic, in many cases inspired by the General Data Protection Regulation (GRPD) at European level. In a new, highly digitalized and integrated society, data (and especially personal data) has assumed a primary role in economic and technological exchanges, and regulation over them has become a public need for protection. Over time, then, aware of increasingly present regulation and the need to create value from this data, not just the data itself, but rather the intelligence through it became something like the "new petrol"[30].

Artificial intelligence tools fit directly into this context, and precisely for this reason, the main legislation that began to address the subject were those pertinent to the protection of personal data. Laws such as the Brazilian one (*Lei Geral de Proteção de Dados* - "LGPD"), already in its enactment, provided for duties of transparency and clarity regarding automated decisions, as well as the right of the data subject to request a review of any decision that is the result of an automated analysis. The reluctance regarding the processing of personal data based on artificial intelligence is clear, which has been demonstrated, in practice, also in recent decisions by regulatory authorities on the subject.[31]

In a context that still lacks specific legislation on AI and still maturing in regulatory decisions regarding data, the challenge is to establish a framework applicable to all economic and business stakeholders. A case-by-case

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[29] Ali Elfa, Mayssa A. & Mina Eshag T. Dawood, *Using Artificial Intelligence for Enhancing Human Creativity*, Journal of Art, Design and Music 2 (2023), https://doi.org/10.55554/2785-9649.1017 (last visited Jan. 17, 2025), 118.

[30] Oliveira, Márcio, *Os Dados Não São Mais o Novo Petróleo*, Exame (2023), https://exame.com/colunistas/relacionamento-antes-do-marketing/os-dados-nao-sao-mais-o-novo-petroleo/ (last visited Jan. 15, 2025).

[31] For reference, we can cite a recent decision by the Brazilian Data Protection Authority: Autoridade Nacional de Proteção de Dados (ANPD), *Despacho Decisório No. 20/2024*, Diário Oficial da União (Jan. 18, 2024), https://www.in.gov.br/en/web/dou/-/despacho-decisorio-n-20/2024/pr/anpd-569297245 (last visited Jan. 18, 2025).

approach may seem like an effective solution at first glance, but it could also lead to competitive complaints and arguments[32], given the regulatory inability to create common and secure standards that apply across all markets. As a result, it becomes increasingly evident that this lack makes the application of its benefits much more difficult for companies that want to make use of its tools, as well as for people who want (or not) to interact with them. In the next sector of this article, we will investigate how legislators have acted to try to resolve this issue.

III. REGULATING AI: STATE OF THE ART AND PATHWAYS

The degree of governmental intervention in the market relies on several factors, from the public interest in the correction of certain practices considered to be inefficient, to the governmental response in return to demands and expectations from private organized groups[33]. Given the potential and critical impacts, as described in this study, arising from the use and development of Artificial Intelligence, there is an increasing and disseminated concern about the best formula to regulate it.

The spectrum of regulation is vast, encompassing diverse formulas, strategies and measures that converge into a collective objective embedded in each country's agenda. These different approaches are conciliated with local and cultural aspects to ensure efficiency and adherence among the participants (regulator and regulated). Nonetheless, it is possible to note a pattern where regulations attempt to balance out incentives and safeguards. Safeguards tend to be prominent where the exposure for risks or unintended consequences is greater.

Arguing about risks and potential adverse impacts from a new technology, a general feeling of fear, or regulation calls from the governments are not a new phenomenon in the tech scene. Nevertheless, Artificial Intelligence carries some traits that bring some additional complexity layers to the debate. In particular, the speech adopted by leaders from the most relevant technology companies voicing serious concerns about AI adoption – not only about employment or overall misuse, but even about the human race existence[34] – denotes the need of deeper and more articulated

[32] Following recent decisions against Facebook's practices regarding AI usage, Meta has argued that its protocols are no different from those adopted by other stakeholders, such as Google and OpenAI, presenting a relevant comparative and competitive argument. See at: Facebook, *Building AI Technology for Europeans in a Transparent and Responsible Way* (2024), https://about.fb.com/news/2024/06/building-ai-technology-for-europeans-in-a-transparent-and-responsible-way/ (last visited Jan. 18, 2025).

[33] Posner, Richard A., *Theories of Economic Regulation*, 5 Bell J. Econ. & Mgmt. Sci. 335 (1974), 1-2.

[34] In this regard, Elon Musk stated, during an interview at MIT's 2014 AeroAstro

discussions on the subject in all levels – local, national and international.

As a topic in constant and rapid change, any governmental intervention in AI should be seen as an ongoing effort to either minimize adverse consequences from its adoption (the "protective role") and/or to stimulate desired outcomes and developments (the "enabling role")[35]. Particularly, the self-learning capability inherent to AI-based systems brings considerable complexity to any regulator as the consequences and impacts that one could intend to rule are unpredictable to some degree – even for the technologists, designers and operators that developed the system. Moreover, the already discussed difficulty in defining Artificial Intelligence places some practical hurdles to determine what to be scoped in or out of a proposed regulation[36].

An additional layer of complexity may be noticed in the cross-functional way as Artificial Intelligence is managed from a technological standpoint. As an umbrella term, AI is a set of different technologies and applications that are not exclusively used for Artificial Intelligence and yet may be exposed and vulnerable to a possible strict regulation intended to minimize and control its effects. It is not difficult to foresee events and companies whose general use of technology may fall under a given regulation for Artificial Intelligence and may hence be in an unfair position to compete[37]. As a considerably broad

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Centennial Symposium: "I think we should be very careful about artificial intelligence. If I had to guess at what our biggest existential threat is, it's probably that... I'm increasingly inclined to think there should be some regulatory oversight, maybe at the national and international level, just to make sure that we don't do something very foolish". [Aileen Graef, Elon Musk: We Are "Summoning a Demon" with Artificial Intelligence, UPI (Oct. 27, 2014, 7:50 AM), http://www.upi.com/Business_News/2014/10/27/Elon-Musk-We-are-summoning-a-demon-with-artificial-intelligence/4191414407652/.

[35] Under a protective role, States may make use of mandatory requirements to participants or impose auditing procedures to ensure consistency and compliance with applicable rules. As an "enabler agent", States may offer tax subsidies, facilitate migration policies for specific-desired positions, open lines of funding for guided research in universities, among others. In any case, it is worth mentioning that a silent attitude from Governments may also represent a regulatory decision towards a choice of leaving AI to be autoregulated by the market Smuha, Nathalie A., *From a "Race to AI" to a "Race to AI Regulation"*, 13 L. Innovation & Tech. 57 (2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3501410 (last visited Dec. 10, 2024), 60-62.

[36] According to Nathalie Smuha, "[T]his is referred to as the so-called 'AI-effect', whereby technologies that were initially deemed 'intelligent' but over time became normalised by habitual use and exposure, lose their 'intelligent' status". Smuha, Nathalie A., *From a "Race to AI" to a "Race to AI Regulation"*, 13 L. Innovation & Tech. 57 (2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3501410 (last visited Dec. 10, 2024), 63.

[37] In that context, a 'technology-neutral or agnostic approach' is defended in order to mitigate the risks and challenges of regulating an ever changing and interconnected subject, like technology. Instead of regulating a specific yet undefined field, this approach aims at determining the risks that shall be prevented and the rights to be safeguarded. As per Nathalie Smuha, "The EU's General Data Protection Regulation (GDPR) is an example of such

technology concept, Artificial Intelligence may also encompass different components not necessarily in-scope and therefore drag the entire system to a set of rules that could originally be designed to capture 'pure' AI[38].

Regulating Artificial Intelligence may also encounter hurdles in the way it is operated. AI is researched and developed in a decentralized and non-coordinated manner, by a plurality of dispersed individuals and companies. The diffuse character of AI along with its inherent self-learning capability makes it hard to control and may render either an ex-ante or ex-post regulation ineffective[39].

Despite the challenges of regulating AI[40], at least 50 countries developed or are in the process of developing a "national AI strategy" according to the OECD - Organization for Economic Co-operation and Development[41] [42], and a few have been able to substantiate it in legal frameworks that aim to address risks and minimize adverse effects from its use[43].

The European Union started regulating AI in 2017 through the enactment by the European Parliament of the Resolution on Civil Law Rules on Robotics. The document had a specific focus on legal responsibilities for

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technology neutral regulation, as it focuses on a particular aim – safeguarding the protection of personal data when processed – regardless of the means used for the processing (a basic computer program or a complex AI system)". Smuha, Nathalie A., *From a "Race to AI" to a "Race to AI Regulation"*, 13 L. Innovation & Tech. 57 (2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3501410 (last visited Dec. 10, 2024), 64.

[38] Smuha, Nathalie A., *From a "Race to AI" to a "Race to AI Regulation"*, 13 L. Innovation & Tech. 57 (2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3501410 (last visited Dec. 10, 2024), 60-65.

[39] Lenardon, João Paulo A., *The Regulation of Artificial Intelligence* (Master's thesis, Tilburg Univ. 2017), http://arno.uvt.nl/show.cgi?fid=142832 (last visited Nov. 28, 2024), 35-37.

[40] The technical challenge of regulating AI comes with legal and ethical risks as well. Privacy, transparency, equity (and non-discrimination), employment, intellectual property and security are legal fields directly impacted by the adoption of Artificial Intelligence by governments, companies and individuals.

[41] The OECD itself released the organization's set of AI Principles in 2019 to inspire governments on how to promote an innovative and trustworthy use of artificial intelligence, which included: inclusive growth, transparency, human centered fairness, safety and security, and accountability. For more information, please see: https://oecd.ai/en/ai-principles

[42] Ulnicane, Inga, *Artificial Intelligence in the European Union: Policy, Ethics and Regulation*, in The Routledge Handbook of European Integrations 254–69 (Routledge 2022), https://www.taylorfrancis.com/chapters/oa-edit/10.4324/9780429262081-19/artificial-intelligence-european-union-inga-ulnicane (last visited Jan. 10, 2025), 254.

[43] For the purposes of this article, the regulatory narrative will focus on the main policies, strategies and laws issued by countries that are relevant in both the context of AI use/deployment and regulatory production. As a result, incident laws that may impact artificial intelligence or algorithms, such as data privacy bills, will not be covered in this opportunity.

damages caused by robots but also touched on broader topics[44] such as security, employment and ethics. In particular, the Resolution was in the spotlight due to the controversial recommendation to grant robots a legal status, as an 'electronic person'[45].

As a result of the Parliament directive, the European Commission launched an AI strategy for the EU[46] in the following year aiming at three main goals: (i) increase both private and public investments in AI, targeting EUR 20 billion euros per year in the next decade, (ii) prepare the State Members for socio-economic changes by recommending actions to modernize the education system and the labor market, and (iii) ensure the appropriate ethical and legal framework to operate AI, which includes addressing topics such as ethics, data protection, safety and liability[47].

The AI Strategy was followed by a Declaration signed by each State Member where their commitment to address AI on a national/regional level was affirmed and where joint actions for closer cooperation have been established[48]. In essence, the EU publicly intended to adopt a different

[44] The Resolution has also stated the need of placing AI underneath and subject to the Treaty of the European Union and the Charter of Fundamental Rights, "[...] such as human dignity, equality, justice and equity, non-discrimination, informed consent, private and family life and data protection" (Ulnicane, Inga, *Artificial Intelligence in the European Union: Policy, Ethics and Regulation*, in The Routledge Handbook of European Integrations 254–69 (Routledge 2022), https://www.taylorfrancis.com/chapters/oa-edit/10.4324/9780429262081-19/artificial-intelligence-european-union-inga-ulnicane (last visited Jan. 10, 2025), 258).

[45] Ibiden, 258.

[46] The EU approach towards AI may serve as an important reference bar for other regions. Given its material impact to the global market, relevant private actors (among major multinational companies and the big techs) tend to extend the 'EU rule' across countries and markets out of the European zone. This is particularly relevant when the companies under the EU influence are the ones in the forefront of the AI development. Called as the Brussel Effect, the EU unilaterally sets standards and patterns that are mirrored by other countries' regulatory efforts (Bradford, Anu, *The Brussels Effect: How the European Union Rules the World*, 107 Nw. U. L. Rev. 1 (2020), https://doi.org/10.1093/oso/9780190088583.001.0001 (last visited Jan. 3, 2025), 3). A clear example of the "Brussel Effect" is the General Data Protection Regulation (GDPR) reflection on regulations issued by third party countries around the globe, as the California Consumer Privacy Act (CCPA) in the United States and the Lei Geral de Proteção de Dados (LGPD) in Brazil.

[47] Ulnicane, Inga, *Artificial Intelligence in the European Union: Policy, Ethics and Regulation*, in The Routledge Handbook of European Integrations 254–69 (Routledge 2022), https://www.taylorfrancis.com/chapters/oa-edit/10.4324/9780429262081-19/artificial-intelligence-european-union-inga-ulnicane (last visited Jan. 10, 2025), 259-260.

[48] Through a more coordinated plan between the European Commission and the State Members, certain measures have been adopted on a national and regional level, like the creation of robust common European data spaces to leverage AI systems, the nurture and capacitation of workforce, and the development of a 'trustworthy AI', which may be taken as a framework by which ethical principles are embedded in AI products and services, and

strategy for certain activities and business that could represent a potential higher harm risk to society. The intervention plan was structured upon two criteria. The first one listed sector that should be under stricter rules, such as healthcare, transport and energy, while the second identified contexts where the policies should be subject to robust requirements relating to human oversight and information accuracy, such as potential injury, damage or death[49].

Just recently, in March 2024, the European Parliament approved the "AI Act" as a first comprehensive law regulating artificial intelligence. The regulation was designed to be extra-territorial, meaning that it will not only be applicable in the EU, but overseas, since multinational companies may be required to comply with its standards in certain circumstances even if they are not based in a European country. The AI Act intends to support the development of a trustworthy framework, driven to safety, ethics, and fundamental rights standards, while better calibrating the regulatory burden for small and medium-sized enterprises (SMEs). It materializes the European preference for a 'risk-based' approach towards artificial intelligence applications, attributing stricter obligations based on the potential impact arising from the technology use[50]. On the one hand, the Act allows the flexible use of minimal-risk AI, being the gaming industry an example in this regard. On the other, the use of artificial intelligence in some applications,

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by which privacy, data governance, human oversight, transparency, non-discrimination and accountability are key pillars. Nevertheless, it is expected that an EU regional regulation may only be effective in a couple of years, since the proposal needs to be negotiated and approved on a domestic level by each of the twenty-seven state members. International collaboration, such as the European experience, is not an utopia. However, artificial intelligence may not be taken as a common ground where States could easily adopt the same standards, processes and structures. Even within the EU, there is a different level of institutional maturity for matters that are instrumental for any regulation of artificial intelligence, such as privacy, data protection and digital sovereignty. Ulnicane, Inga, *Artificial Intelligence in the European Union: Policy, Ethics and Regulation*, in The Routledge Handbook of European Integrations 254–69 (Routledge 2022), https://www.taylorfrancis.com/chapters/oa-edit/10.4324/9780429262081-19/artificial-intelligence-european-union-inga-ulnicane (last visited Jan. 10, 2025), 260-261.

[49] Ulnicane, Inga, *Artificial Intelligence in the European Union: Policy, Ethics and Regulation*, in The Routledge Handbook of European Integrations 254–69 (Routledge 2022), https://www.taylorfrancis.com/chapters/oa-edit/10.4324/9780429262081-19/artificial-intelligence-european-union-inga-ulnicane (last visited Jan. 10, 2025), 263-264.

[50] According to the Act, "AI systems identified as high-risk should be limited to those that have a significant harmful impact on the health, safety and fundamental rights of persons [...] taking into account both the severity of the possible harm and its probability of occurrence" (European Commission, *AI Act* (2024), https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai (last visited Jan. 17, 2025). The AI Act provides a list of what should be understood as "high risk applications", which would be subject to the stricter requirements and obligations.

such as "essential public services" and "administration of Justice", is considered to pose considerable impacts or risks, and therefore is subject to stricter requirements and surveillance[51]. Certain AI applications, such as those used for law enforcement, are considered to pose unacceptable risks and are thus prohibited in the EU. The AI Act will be valid in twenty days after its publication in the Official Press and is expected to be fully applicable within the next two years "[...] with some exceptions: prohibitions will take effect after six months, the governance rules and the obligations for general-purpose AI models become applicable after 12 months and the rules for AI systems - embedded into regulated products - will apply after 36 months"[52].

Differently from the "risk-based" approach and a more "ethical-human" driven policy adopted by the EU, the United States is under a decentralized set of AI legal frameworks, lacking a unified approach[53]. Until 2023, the United States held eight federal laws and twenty-six state laws on Artificial Intelligence[54].

Overall, the legislative efforts in the United States focused on the use of artificial intelligence in specific applications like facial recognition and autonomous vehicles[55].

In 2019, President Donald Trump issued the Executive Order no. 13,859

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[51] Entities willing to perform such activities are required to pass through adequate risk assessments, ensure high quality data bases and traceability of results, and provide appropriate human oversight measures to minimize risks. European citizens are eligible to submit claims and receive detailed explanations on AI-based decisions that may impact their rights (European Commission, *AI Act* (2024), https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai (last visited Jan. 17, 2025).

[52] European Commission, *AI Act* (2024), https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai (last visited Jan. 17, 2025).

[53] Despite a decentralized AI framework in the United States of America, some recent developments in the AI framework may demonstrate the government's will towards a more unified and harmonic approach. The White House's "A Blueprint for an AI Bill of Rights" is an example. The document offers guidelines for the design and development of AI, including the observance of principles relating to safety, data privacy, and algorithm discrimination or bias. Even though not a binding document, the "framework provides a national values statement and toolkit that is sector-agnostic to inform building these protections into policy, practice, or the technological design process" (The White House, *Blueprint for an AI Bill of Rights* (2022), https://www.whitehouse.gov/ostp/ai-bill-of-rights/ (last visited Jan. 17, 2025), 4). More importantly, the framework contains a Definitions' section along with an Appendix describing examples of what should be taken as an automated system, which clearly outlines the document's purpose of standardizing a view of AI across the country.

[54] Dotan, Ravit, *U.S. Regulation of Artificial Intelligence*, in The Handbook on Applied AI Ethics (Alexander Kriebitz, Christoph Lütge & Raphael Max eds., Elgar 2023), 3.

[55] Chae, Yoon, *U.S. AI Regulation Guide: Legislative Overview and Practical Considerations*, 3 J. Robotics, Artificial Intelligence & L. 17 (2020), https://www.bakermckenzie.com/-/media/files/people/chae-yoon/rail-us-ai-regulation-guide.pdf (last visited Jan. 5, 2025), 18.

on Maintaining American Leadership in Artificial Intelligence. Taken as "The American AI Initiative", the document required that all the executive departments and agencies that used or developed AI follow certain strategic objectives, which worth noting the use of the technology in line with "American values", promoting innovation and minimizing the vulnerability from malicious attacks. In the same order, the National Institute of Standards and Technology ("NIST") was tasked to create a federal plan with general standards for the use of AI and a risk management framework. Even though the NIST framework is nonbinding, it could potentially lead to an example of industry-standard autoregulation. These developments indicate Trump's administration preference towards a standard-driven approach for artificial intelligence[56].

During the same tenure, the Algorithmic Accountability Act was introduced in the Congress as "[...] the first federal legislative effort to regulate AI across industries" and required that certain larger organizations conducted assessments of high-risk systems that involve personal information or that made automated decisions[57]. Next, the Commercial Facial Recognition Privacy Act was introduced aimed at restricting the collection and use of facial data without notice and the individual's consent. Still on a federal level, the Equal Opportunity Employment Commission (EEOC) created the "algorithmic fairness" in employment in 2021, an initiative to provide guidance on employment hiring acceptable practices through AI tools.

Artificial Intelligence has been a trending subject among bills and legislative debates in the United States on a federal and state levels. Despite being a common ground in the country's agenda, Republicans tend to focus on the AI capabilities whereas Democrats demonstrate greater concerns with AI ethics and fairness[58]. The lack of a unified approach to manage AI uncertainties and undesired effects may create interoperability issues among the states. This non-uniform portray may create challenges, starting by the adoption of an overall accepted concept – and hence the regulation scope – which tends to generate conflicts of legal understanding and interpretation. Moreover, the use of different requirements to minimize the negative effects

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[56] Chae, Yoon, *U.S. AI Regulation Guide: Legislative Overview and Practical Considerations*, 3 J. Robotics, Artificial Intelligence & L. 17 (2020), https://www.bakermckenzie.com/-/media/files/people/chae-yoon/rail-us-ai-regulation-guide.pdf (last visited Jan. 5, 2025), 19-20.

[57] Chae, Yoon, *U.S. AI Regulation Guide: Legislative Overview and Practical Considerations*, 3 J. Robotics, Artificial Intelligence & L. 17 (2020), https://www.bakermckenzie.com/-/media/files/people/chae-yoon/rail-us-ai-regulation-guide.pdf (last visited Jan. 5, 2025), 21-22.

[58] Dotan, Ravit, *U.S. Regulation of Artificial Intelligence*, in The Handbook on Applied AI Ethics (Alexander Kriebitz, Christoph Lütge & Raphael Max eds., Elgar 2023), 2-3.

of AI may lead to enforce differences across the country.

Japan, on its turn, decided to adopt an even more flexible policy on AI. Rather than focusing on the risks associated with its implementation, Japan developed a legal framework aimed at maximizing AI positive socioeconomic effects. According to Hiroki, "[t]he emphasis is on a risk-based, agile, and multistakeholder process, rather than a one-size-fits-all obligation or prohibition"[59].

In 2017, Japan amended the Copyright Act to clarify that processing data through the Internet to develop AI models is not qualified as an infringement of copyright. Further, in 2021, the Japanese Ministry of Economy, Trade, and Industry (METI) published the "AI Governance Report", which stated that "[...] legally-binding horizontal requirements for AI systems are deemed unnecessary at the moment". METI defends the 'agile governance' approach towards digital governance, consistent with a continuous assessment over technology benefits and challenges without compromising companies' ability to test and innovate[60].

Japan's approach towards AI values the voluntary adherence of private companies to governance frameworks and industry accepted standards and reserves the provision of nonbinding guidelines to a governmental role. Nonetheless, Japan is clearly committed to ensure a minimum level of transparency and requires that businesses disclose relevant information about risks associated with artificial intelligence and connected technologies[61]. Hiroki Habuka[62] describes two examples in this regard. The Digital Platform Transparency Act (2020) imposes transparency requirements on large online

[59] Habuka, Hiroki, *Japan's Approach to AI Regulation and Its Impact on the 2023 G7 Presidency*, Center for Strategic & Int'l Studies (2023), https://www.csis.org/analysis/japans-approach-ai-regulation-and-its-impact-2023-g7-presidency (last visited Jan. 10, 2025), 2.

[60] Habuka, Hiroki, *Japan's Approach to AI Regulation and Its Impact on the 2023 G7 Presidency*, Center for Strategic & Int'l Studies (2023), https://www.csis.org/analysis/japans-approach-ai-regulation-and-its-impact-2023-g7-presidency (last visited Jan. 10, 2025), 3-5.

[61] Another milestone to Japan's non-binding approach towards AI is the release of the Social Principles of Human Centric AI. The Social Principles, as the document is called, is built under three main philosophies: human dignity, diversity and inclusion, and sustainability. In clear harmony with the overall Japanese AI framework, the Social Principles was not set to restrict the use of artificial intelligence, but to indicate ways on how to preserve and develop these pillars through its power. Habuka, Hiroki, *Japan's Approach to AI Regulation and Its Impact on the 2023 G7 Presidency*, Center for Strategic & Int'l Studies (2023), https://www.csis.org/analysis/japans-approach-ai-regulation-and-its-impact-2023-g7-presidency (last visited Jan. 10, 2025), 3.

[62] Habuka, Hiroki, *Japan's Approach to AI Regulation and Its Impact on the 2023 G7 Presidency*, Center for Strategic & Int'l Studies (2023), https://www.csis.org/analysis/japans-approach-ai-regulation-and-its-impact-2023-g7-presidency (last visited Jan. 10, 2025), 3.

malls, app stores and digital advertising business, while the amended Financial Instruments and Exchange Act (2018) demands companies engaging in automated high-speed trading to register with the government and follow specific transaction records in the benefit of the users.

Concurrent to Japan initial measures on AI, China released the 'New Generation Artificial Intelligence Development Plan' (AIDP) in 2017[63], setting the strategy through which the country would become an industry leader by 2030 and an emerging force on defining ethical norms for its use. The AIDP is the first national-level legislative effort under a unified strategy for AI in China[64].

Even though the AIDP is a national effort towards the development of AI in China, the document is not intended to work as a centralized source on the subject but rather emphasizes the importance of coordinating AI with the private sector and local governments to reach the projected milestones. The Chinese Government even precises the private companies that are endorsed[65] to advance AI in the country, such as Baidu for autonomous driving, Alibaba for smart cities and Tencent for medical diagnosis[66].

A direct result from the AIDP's expert committee was the release of the "Governance Principles for New Generation AI: Develop Responsible Artificial Intelligence" in 2019, which detailed certain principles that should guide the AI development in China, including privacy, safety and agile governance. The same committee issued the "Ethical Norms for New Generation AI" in 2021, through which China stated that "[…] humans should maintain control over AI and bear ultimate responsibility for the systems"[67].

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[63] Before that, in 2015 China had published a guideline document entitled "Internet +", which among other aspects, outlined the importance of investing in research and development of AI emerging technologies. The next year the Communist Party of China (CCP) published its 13th 5-year plan where AI was treated as one of the six critical areas to stimulate economic growth (Roberts, Huw, Josh Cowls, Jessica Morley et al., *The Chinese Approach to Artificial Intelligence*, AI & Society 36, 59–77 (2021), https://doi.org/10.1007/s00146-020-00992-2 (last visited Dec. 20, 2024), 60).

[64] Roberts, Huw, Josh Cowls, Jessica Morley et al., *The Chinese Approach to Artificial Intelligence*, AI & Society 36, 59–77 (2021), https://doi.org/10.1007/s00146-020-00992-2 (last visited Dec. 20, 2024), 60-62.

[65] To be endorsed means that certain companies sign a deal with the Chinese Government whereby these companies will develop activities that are part of government strategic plan and, in return, are granted preference rights to bid and contract with the government, and easy access to funding (Roberts, Huw, Josh Cowls, Jessica Morley et al., *The Chinese Approach to Artificial Intelligence*, AI & Society 36, 59–77 (2021), https://doi.org/10.1007/s00146-020-00992-2 (last visited Dec. 20, 2024), 61).

[66] Roberts, Huw, Josh Cowls, Jessica Morley et al., *The Chinese Approach to Artificial Intelligence*, AI & Society 36, 59–77 (2021), https://doi.org/10.1007/s00146-020-00992-2 (last visited Dec. 20, 2024), 61.

[67] Sheehan, Matt, *Tracing the Roots of China's AI Regulations*, Carnegie Endowment

Between 2021 and 2022, China enacted detailed, binding regulations on relevant AI-based applications, in particular over automated content recommendation algorithms, generative AI and facial recognition technologies. Motivated by the public concerns about online content dissemination, the Chinese Government stipulated an obligation against individual developers or companies consistent with the need of registering all the recommendation algorithms. Specifically, the regulation prescribed that the content generated by such algorithms should be labeled as such and that the technology could not be used for anti–competitive business practices (such as excessive price discrimination)[68].

In China, these regulations are particularly subject to political will and intervention. The enacted regulations are composed by vague requirement expressions – such as the need to "adhere to the correct political direction" and not "disturb economic and social order" – targeted at shaping the AI development within the CCP's agenda[69]. Not by accident, one of the first AI regulatory measures implemented by the Chinese Government was to foster visibility and control over online content recommendation technologies.

Finally, the Brazilian approach towards artificial intelligence follows the guidelines provided by the OECD and is principle-driven, emphasizing a sustainable development of AI[70]. According to Parentoni[71], the AI legal framework in Brazil is composed of four main milestones: (i) the Senate draft bills no. 5051/2019 and 5691/2019, (ii) the creation of the National System for Digital Transformation, (iii) the formation of eight Centers for Applied Research in Artificial Intelligence[72], and (iv) the House of Representatives draft bill no. 21/2020. After 2020, some relevant events took place in Brazil

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for Int'l Peace (2023), https://carnegieendowment.org/research/2024/02/tracing-the-roots-of-chinas-ai-regulations?lang=en (last visited Dec. 5, 2024), 10.

[68] Sheehan, Matt, *Tracing the Roots of China's AI Regulations*, Carnegie Endowment for Int'l Peace (2023), https://carnegieendowment.org/research/2024/02/tracing-the-roots-of-chinas-ai-regulations?lang=en (last visited Dec. 5, 2024), 4.

[69] Sheehan, Matt, *Tracing the Roots of China's AI Regulations*, Carnegie Endowment for Int'l Peace (2023), https://carnegieendowment.org/research/2024/02/tracing-the-roots-of-chinas-ai-regulations?lang=en (last visited Dec. 5, 2024), 13.

[70] Barbosa, Leonardo Figueiredo & Caroline da Rosa Pinheiro, *Inteligência Artificial no Brasil: Avanços Regulatórios*, Revista de Informação Legislativa 60(240), 11–41 (2023), https://www12.senado.leg.br/ril/edicoes/60/240/ril_v60_n240_p11 (last visited Jan. 4, 2025), 36.

[71] Parentoni, Leonardo N., Valentini, Rômulo S. & Alves, Tárik C.O., *Panorama da Regulação da Inteligência Artificial no Brasil*, Rev. Eletrônica Curso Dir. UFSM 15(2) (2020), 6.

[72] These centers are located within the Universidade de São Paulo; Universidade Federal de Minas Gerais; Universidade Estadual de Campinas; Centro Universitário Senai Cimatec (Bahia); Instituto de Pesquisas Tecnológicas do Estado de São Paulo; and Universidade Federal do Ceará.

as well, such as the release of the draft bill no. 1.969/2021 from the House of Representatives, and draft bills no. 872/2021 and no. 2338/2023[73], both from the Senate.

The development of artificial intelligence in Brazil is part of a wider plan to digitally transform Brazil, as projected by the Decree no. 9.319/2018 (the "E-Digital"), which was subsequently regulated by MCTIC Ordinance no. 1.556/2018. Even though artificial intelligence challenges are not specifically addressed in the document, the E-Digital expressly places AI as a technology priority for the Brazilian Government[74].

Following the federal government directive, the MCTIC introduced the Artificial Intelligence Brazilian Strategy (EBIA) through MCTI Ordinance no. 4.617/2021, whose main goal was to provide government bodies and agents with relevant guidelines and expectations on the use of AI tools and technologies[75]. The EBIA was followed by subsequent and ongoing draft bills, which outline an intense legislative discussion on the subject in Brazil[76].

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[73] Differently from the previous legislative efforts (i.e. draft bills no. 5051/2019, 5691/2019 and 21/2020, the draft bill no. 2338/2023 proposes a consolidated framework with responsibilities for AI suppliers, operators and users. This draft bill is in line with the approach adopted by the EU for artificial intelligence and tends to calibrate rules, boundaries and requirements upon assessing or classifying risks attached to specific activities and areas. Artificial Intelligence models used for criminal investigation purposes, public safety or credit assessments are examples of high-risk activities, reasons why would be (more) subject to material regulation (Mendonça Junior, Claudio do Nascimento & Dierle José Coelho Nunes, *Desafios e Oportunidades para a Regulação da Inteligência Artificial*, Revista Contemporânea 3(7), 7753–7785 (2023), p. 7778).

[74] Nonato, Luiza G., *O Cenário Regulatório da Inteligência Artificial* (Master's dissertation, Mackenzie Univ. 2022), https://adelpha-api.mackenzie.br/server/api/core/bitstreams/119ead8e-3103-446e-ab1b-97ffe2539242/content (last visited Dec. 5, 2024), 26-27.

[75] The EBIA was structured under nine strategic axes: (i) regulation and ethic use; (ii) artificial intelligence governance; (iii) international aspects; (iv) digital future; (v) workforce and capacitation; (vi) R&D, innovation and entrepreneurship; (vii) industry applications; (viii) government applications; and (ix) national security (Instituto de Tecnologia e Sociedade (ITS Rio), *Panorama Regulatório de Inteligência Artificial no Brasil* (2022), https://itsrio.org/wp-content/uploads/2022/10/Relatorio-Panorama-IA.pdf (last visited Oct. 20, 2024), 6). The EBIA received criticism from AI specialists for its lack of effectiveness. The document focused on principles and was not able to provide concrete targets, planning and budget directives for a coordinated implementation of AI initiatives in Brazil. Even though the interest in structuring a national and centralized strategy on AI had already been communicated by the MCTIC, it is said that the public announcement preceding its publication was not supported by a diverse audience of stakeholders, weakening a proposal that would be targeted for the entire country. - Nonato, Luiza G., *O Cenário Regulatório da Inteligência Artificial* (Master's dissertation, Mackenzie Univ. 2022), https://adelpha-api.mackenzie.br/server/api/core/bitstreams/119ead8e-3103-446e-ab1b-97ffe2539242/content (last visited Dec. 5, 2024), 27-30.

[76] The legislative proposals indicate a growing maturity curve on how the development of AI has been treated from a legal perspective, since the drafts move from a spectrum

Despite following a principle-driven European matrix, the Brazilian AI regulatory framework also embraced a more tangible experience. The Resolution no. 332/2018 from the National Council of Justice (CNJ) introduced and regulated the use of artificial intelligence in the Brazilian courts. The Resolution's intent is to streamline the response time while ensuring equal treatment for similar cases and the required confidentiality to sensitive information. Before any use, however, the Resolution specifies that the processed data should be originated from safe sources, preferably from governmental sources, and that any AI system must be certified and subject to a regular human oversight[77].

Among the different frameworks and strategies adopted by the countries covered in this section, it may be possible to infer that some of them opted to adopt a more "holistic and hard law" based approach, while others decided to explore a "sector-oriented and soft-law" based framework (HABUKA, 2023, p. 6). The first group – which includes the EU, China and Brazil – is driven towards a more comprehensive regulation of artificial intelligence, and built upon the adoption of concrete obligations, requirements and sanctions. The second group, among which are the United States and Japan, favors nonbinding frameworks, rather than definitive playbooks for AI, that are usually designed to tackle artificial intelligence developed or used by specific sectors, activities or agents.

Regardless of the group, regulating AI is still in its early-stage and countries are still assessing effective ways to collaborate vis-à-vis the wide and decentralized character inherent to AI technologies, tools and systems. As a general rule, artificial intelligence has been addressed as part of national plans, strategies and nonbinding guidelines[78], with few examples of

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focused on general principles to a more detailed framework composed of applicable definitions (such as "artificial intelligence" itself, and "AI agents"), mandatory reports and transparency requirements against those creating and developing AI applications. An additional layer touched by the recent draft bills is the need of harmonizing these regulations with existing and related laws, such as the LGPD (General Personal Data Protection Law), the Brazilian Civil Rights Framework for the Internet ("Marco Civil da Internet") and the Consumer Protection Code (CDC).

[77] The Resolution reserves predictive criminal decisions from the AI technology and applications, except for objective instances, such as sentence dosimetry, claims triage and classification (Instituto de Tecnologia e Sociedade (ITS Rio), *Panorama Regulatório de Inteligência Artificial no Brasil* (2022), https://itsrio.org/wp-content/uploads/2022/10/Relatorio-Panorama-IA.pdf (last visited Oct. 20, 2024), 32-33).

[78] It is worth mentioning that concurrent with governmental regulatory experiences on artificial intelligence, the International Organization for Standardization (ISO) has been making some progress on an AI framework under the ISO/IEC 42001. Designed for entities either providing or using AI-based products and services, ISO sets international standards with acceptable requirements for implementing, maintaining and continually improving artificial intelligence. For more information, please see:

substantive laws that frame rights and obligations to be observed and surveilled. With no prejudice, the debate on whether to regulate AI, and to establish normative boundaries for its use and development, is pressing and part of the current public agenda.

CONCLUSION

During the course of this article, it became clear that artificial intelligence is not necessarily a new topic for technological discussions. For years, the topic has been developing and attracting more and more attention and prominence. However, it is also notable that, in recent years, the economic exploitation of this technology by companies and individuals has brought the need for a legal understanding that brings security and stability to it. The recent waves of investment and attention on the subject promises to draw even greater responsibility from the government and private sectors in the upcoming years. Being prepared for this new context is mandatory especially in the corporate context.

Challenges that were only sectoral and technological became competitive, economic and legal challenges, calling on the entire social structure to present responses to this new scenario. Law, as responsible for bringing legal security to these relationships, has been taking a leading role in this modulation of it, trying to find economically prosperous, socially safe and technologically attentive solutions.

Legal solutions vary between different countries and legal traditions: sometimes more civil law-based, and sometimes more general and principled, regulation still struggles to provide concrete answers to modern challenges. Given the technical uncertainties, however, legal definitions based on principles over the subject seem to be more appropriate, bringing us closer to typical soft law conceptions. It is evident that open and generic definitions leave the task of implementing legal provisions to the interpreter—whether judicial or administrative. Hence, the need for even greater technical knowledge from legal experts to implement this regulation arises as mentioned during this article.

While state structures fail to regulate the issue, companies and major market players have taken on a crucial role not only in driving technological advancements but also in presenting best practices that guide the market in its implementation. Economy and Law then need to walk together in a way to address accordingly this new technical, social and market revolution.

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https://www.iso.org/standard/81230.html.

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