Global Policy, May 2021

The Colombian Case: A New Path for Developing Countries Addressing the Risks of Artificial intelligence

Victor Manuel Muñoz, Elena Tamayo Uribe and Armando Guio Español

Abstract

Developing countries face specific risks when implementing artificial intelligence. The most effective and viable approach to address those risks remains unclear. Although there is an increasing regulatory pressure from different stakeholders at a global level, traditional regulatory intervention and self-regulation are not as effective and viable due to the nature of artificial intelligence and to the priorities, constraints and circumstances of developing countries. Therefore, developing countries have to overcome regulatory pressure and address regulatory initiatives from an innovative perspective, considering their own needs, strengths, and weaknesses.

This paper focuses on the case of Colombia, a developing country that has adopted a *smart regulation* approach as a way to overcome this impasse, protecting Colombians without generating regulations that hinder economic development. The country has implemented the smart regulation approach through regulatory sandboxes and innovation hubs, which promote innovation and economic dynamism while overcoming information asymmetries and protecting users' privacy. This article also analyses Colombia's potential to deepen its smart regulation approach by implementing policy prototyping and developing a standard for artificial intelligence that could be replicated at a regional level. Colombia has opened a path for other developing countries to address the risks of artificial intelligence while adapting to their own priorities and constraints.

Policy Recommendations

- Developing countries need to address the specific risks that artificial intelligence poses for them, there are issues regarding disinformation and inequality.
- Adopting traditional regulatory models and self-regulation on artificial intelligence does not seem to be an adequate response, considering the current state of innovation, and the priorities and circumstances of developing countries.
- Smart regulation and regulatory sandboxes are an alternative for developing countries to address the risks related to implementing artificial intelligence.
- Colombia should deepen its smart regulation approach through policy prototyping and by developing artificial intelligence standards.

Introduction

Artificial intelligence refers to ‘a field of computer science dedicated to solving cognitive problems commonly associated with human intelligence or intelligent beings, understood as those that can adapt to changing situations. Its basis is the development of computer systems, data availability and algorithms’ (Colombia. National Policy for Digital Transformation and Artificial Intelligence, 2019a, p.16).

Artificial intelligence represents considerable opportunities for developing countries in terms of economic development and access to social services. In education, artificial intelligence applications include AI powered apps through which students can access customized responses and voice assistants that allow them to have conversations with the educational material without the involvement of a teacher. This in turn, allows teachers to focus on emotional intelligence (Analytic Steps, 2020). In healthcare, AI has the potential to substitute doctors, performing diagnoses through machine-learning and providing treatment plans to patients, which are essential in emerging economies that are traditionally short of doctors (Builtin, 2019). Artificial intelligence is also an asset in developing countries to access credit and to conduct payment transactions in areas with low connectivity.

However, the success of AI at helping the world achieve the United Nations’ Sustainable Development Goals (SDGs) depends on how regulators and policymakers face questions of governance. There is a challenge to synchronize the speed of progress in technology and the regulations that promote innovation while addressing risks (ITU News, 2018). Additionally, developing countries should continue to make an effort to maintain a competitive environment and their regulatory models should answer such needs.

Developing countries face specific risks when implementing artificial intelligence such as users’ vulnerabilities to disinformation, increases in inequalities, and human rights violations (Pisa & Polcari, 2019a). Therefore, developing countries need to address these risks. While insufficient regulation creates uncertainty, it can result in areas with no legal protection, and increases in inequalities and discrimination, the best approach to address these risks and regulate AI remains unclear (Madzou, Costignan & McDonald, 2020b). Also, little attention has been paid to how low- and middle-income countries should regulate technologies within their countries and internationally (Pathways for Prosperity Commission, 2019a).

Traditional and self-regulation appear limited for developing countries, which is why smart regulation raises as an alternative. Traditional regulation corresponds to a ‘bipartite process’ in which the government (regulator) exercises social control over business (the regulated entity) taking an ex-ante or ex-post approach. Self-regulation is ‘the controlling of a process or activity by the organization or organizations that are involved in it rather than by an outside organization such as the government’ (Collins). By contrast, the term *smart regulation* refers to ‘flexible, imaginative and innovative forms of social control,’ which take a multistakeholder approach including governments, businesses and third parties (Gunningham & Sinclair, 2017a, p133; 2017c, p.134).

Colombia addresses the risks of users’ vulnerabilities to disinformation and increases in inequalities, as most developing countries. To overcome the

impasse between the need to address the risks of artificial intelligence and the limits of traditional and self-regulation, Colombia has adopted a smart regulation approach. The country has implemented this approach through regulatory sandboxes and innovation hubs.

This paper first presents the impasse that developing countries face addressing artificial intelligence risks, especially from fake news generated by AI and from AI-driven social credit systems. The second part of the paper analyzes the case of Colombia and the smart regulation model it has adopted to overcome this impasse, which it implements though regulatory sandboxes and innovation hubs. This part also presents opportunities for the country to deepen its smart regulation approach and play a guiding role in the region. Finally, the paper concludes by laying out the new approach that other developing countries can adopt, actively addressing the risks of implementing artificial intelligence without engaging in a constraining regulation.

Developing countries need to address the risks of artificial intelligence

Artificial intelligence poses specific risks for developing countries and therefore it is fundamental for them to take action and address them. Those risks include user disinformation related to fake news, difficulties accessing artificial intelligence that exacerbate inequalities and potential exclusions from the geopolitical arena, as well as the human rights and institutional risks of China's AI-driven social credit system.

The first risk concerns user disinformation. Artificial intelligence can be a factor of disinformation as it hinders the identification of robotic activity as well as distinguishing between human accounts and accounts controlled by software bots. AI is also now able to write fake news, which is problematic due to its impacts on disinformation in different domains (Wakefield, 2019). Digital channels are gaining relevance in developing countries, as in Latin America, and there is a negative relationship between the level of exposure to fake news and trust in the government (OECD Library, 2019). In addition, deep fakes and artificial videos are a potential factor that could widen ethnic and religious divisions and negatively impact nascent democratic institutions in African countries (United Nations University, 2019). The use of fake news also shapes information and influences public opinion and, therefore, can have a negative impact, such as over public health in the case of COVID-19 (OECD Library, 2020).

The disinformation risk is higher in developing countries due to four main factors: inexperienced Internet users, trust in online content, insufficient education and digital literacy, and weak surveillance capacities. While disinformation has been influential in Latin America for several years, the digital revolution is deepening its impact (World Economic Forum, 2017). Currently, the massive spread of technology presents relevant opportunities for access to information for new users, but it also brings new risks related to the impact of disinformation. In developing countries users use a limited number of applications which turns them more vulnerable to disinformation compared to users from high-income countries, as their capacity to corroborate information with other sources is lower (Pisa & Polcari, 2019b). For example, a study by the Groupe Spéciale Mobile Association found that most women in Kenya, India, and Indonesia were proficient in using some specific apps, but were unfamiliar with other online services (GSMA, 2015). Among vulnerable populations, old adults are especially at risk due to cognitive factors, social changes in late adulthood, and

inexperience in the use of technology (Brashier & Schacter, 2020).

The second factor that increases disinformation risks is the population's trust in online content. A study by the Harvard Business Review found that Internet users in developing countries trust online content more than in high-income countries (Chakravorti, Bhalla, Chaturvedi, 2018). In Latin America, for instance, the percentages of individuals that trusted social media in 2019 were: 39% in Mexico, 32% in Chile, 32% in Argentina, 31% in Brazil, while the world average was just 23% (OECD Library, 2020).

The third factor is a lack of education regarding the use of digital services in developing countries. The education level is lower in developing countries compared to high-income countries and, according to a study conducted by KU journalism and mass communications researchers, an individual's education level influences his or her vulnerability to false information (KU, 2020). Furthermore, developing countries have made efforts to improve access to technological infrastructure. However, professors lack skills and digital training to teach students how to use their devices and the Internet, but also how to adopt a critical approach to online information (World Economic Forum, 2019).

Finally, developing countries' weak surveillance capacity to ensure cybersecurity decreases the users' vulnerability to manipulation in the use and consumption of AI. Niels Nagelhus Schia, head of the Norwegian Institute of International Affairs, has highlighted that security measures are limited in developing countries compared to the rest of the world, turning them into attractive targets for cyberattacks (Gjeset, 2018). Therefore, inexperience in the use of technology, trust in technology, insufficient digital education, and weak surveillance capacity are the main factors that explain vulnerabilities to disinformation.

The second risk is how difficulties to access AI reinforce social inequalities that already exist in developing countries. According to the International Telecommunication Union (ITU), 46,7% of households in developing countries have access to the Internet at home in contrast to 87% of households in high–income countries (ITU, 2019). Access to artificial intelligence is especially challenging as the hardware to train an AI model is expensive and the necessary resources to contribute to the machine-learning community are overwhelmingly available to the wealthy, white, males at the expense of the rest of society (Gupta, Lanteigne, Kingsley, 2020a). Therefore, the arrival of AI may reinforce already existing social inequalities.

This risk can also take place at an international level, as there is the potential of exclusion for developing countries from access to artificial intelligence. The Berkman Klein Center organized with their international partners a series of Global AI Dialogue Series workshops in which the participants of the first workshop highlighted a potential monopolization of AI technologies. Vast amounts of data are required to completely take advantage of AI and developing countries fall behind in data collection (ITU, 2017). While China has a considerable data collection capacity due to strong partnerships with large technology conglomerates, in Africa there is a lack of large–scale data collection initiatives from governments and companies, who are also reluctant to share it (K Governance & Media Lab, Berkman Klein Center, 2017a; Atlantic Council, 2020). This 'AI divide' makes developing countries less competitive and deepens existing power imbalances.

Furthermore, the arrival of AI to developing countries through China's AI driven social credit system presents human rights and institutional risks. 'Social credit' is a system that monitors all individuals' behaviors, from consumption to conduct on social networks including real world infractions, and determines, based on those factors and through an algorithm, the individuals' credit score (The Atlantic, 2018). This credit score establishes to a great extent access to credit and also educational opportunities and the modes of travel an individual can use, among other issues.

Credit scores could be attractive for developing countries for three reasons. First, most developing countries lack credit scoring systems in their financial services as well as powerful reporting agencies like Equifax, Experian and TransUnion (Sultana, Muntaha, Anisuzzaman & Sarker, 2016). Second, several developing countries are benefiting from the Belt and Road Initiative, and exporting Chinese technologies is part of this initiative. Third, Chinese systems are free or half-priced (The Diplomat, 2020). Several developing countries, such as Angola, Bolivia and Venezuela, have already acquired surveillance systems from China and Uruguay and Zimbabwe signed a deal to include facial recognition (Miller, 2019). Adopting China's social credit system poses a risk in terms of human rights as the rights to privacy and freedom of speech can be affected, but also in terms of civil liberties and for democratic institutions (Fairfield, 2019).

Consequently, as AI poses specific risks for developing countries, they need to take action through public policies that address them. Several developing countries have taken action through digital regulation (Pathways Commission, 2019b). However, they have encountered specific challenges and constraints in this process.

The limitations of traditional and self-regulation

As stated, traditional regulation and self-regulation have limits when addressing the risks of artificial intelligence. Traditional regulation falls short when it comes to artificial intelligence due to four main characteristics of the technology.

The first characteristic is autonomy: the promise of AI is to achieve its goals through autonomous actions. This characteristic makes establishing the causation of liabilities challenging, as in the case of AI systems writing fake news, and therefore stops ex–post regulation from being a viable alternative (Leenders, 2019b). The second characteristic is opaqueness: individuals and institutions outside the process of developing the technology have a limited understanding of the way it functions. For instance, it is unclear whether the data in recommender systems suggesting products comes from users (Rubin, Burkell, Cornwell, Asubiaro, Chen, Potts & Brogly, 2020). Opaqueness represents a challenge for ex–ante regulation since the object of regulation remains unclear. The third characteristic is diffuseness: the teams developing AI are often dispersed in different countries. It appears challenging for ex–ante regulations to exercise social control over the design and development of technologies created in foreign countries (Scherer, 2016). These limitations of knowledge are more present in developing countries as high-income countries are the ones developing most artificial intelligence programs (Colombia. National Policy for Digital Transformation and Artificial Intelligence. 2019b). The fourth characteristic is permanent evolution. Although there has always been a disconnection between technological pace and regulation, the evolution pace of AI exceeds any other sector (Malyshev & Kauffmann, 2019). An example is the emergence of 'liquid' machine-learning, a new type of neural

network cloud (Ackerman, 2021). Artificial intelligence is in permanent evolution and the path this evolution will follow in the long term remains unclear (Gent, 2020). Regulating artificial intelligence today without having enough clarity on how it will evolve appears risky. Due to these four technical characteristics, traditional regulation is insufficient to address the challenges and risks that artificial intelligence poses.

Developing countries face specific difficulties when seeking to regulate artificial intelligence through traditional regulation. These difficulties mainly appear when thinking about adopting or designing regulations that mitigate risks without hindering economic development. According to the results of the survey with government global experts in technology policy, policymakers in developing countries tend to focus on how digital transformation promotes their economic development (Phillips, Kira, Tartakowsky & Natih, 2020). Adopting regulation from high-income countries, as the GDPR, would impose costs on small firms working in artificial intelligence and it would have a negative impact on the competitiveness of local firms. However, adopting their own regulatory approach could lower developing countries' attractiveness for large technology companies.

Google and Facebook, for example, have focused on targeting users in developing countries and on tailoring their products to users' needs by developing applications for mobile phones that work in areas with low connectivity. Of the 10 countries with the highest number of Facebook users, 8 are in the developing world, and 100% of cities with the largest number of Facebook users are also in developing countries (Chakravorti, 2018). 70% of Facebook's monthly active users live in Africa and Asia, and India surpassed the United States as the country with more users (Pisa, 2019). It is challenging for governments in developing countries to regulate these global giants because of the impact these companies have in dynamizing countries' economies (Pisa, Polcari, 2019c). Additionally, as global tech companies receive partial revenue from operating in developing countries, they could perceive as a more coherent move to exit these countries instead of complying with regulations, which would not happen in the United States and the European Union due to their market size (Pathways for Prosperity Commission, 2018).

Self-regulation emerges as an alternative that several tech companies have adopted. For instance, Google is seeking to withdraw cookies from its ecosystem since they violate users' privacy (Rus, 2021). Microsoft, IBM and Amazon refused to sell their facial recognition technology to the police to prevent it from being used for racial profiling (Greene, 2020). Self-regulation has three main advantages. First, companies are developing technology as well as defining regulations, and therefore regulations follow more closely the high-speed rhythm of technology development. Second, companies have the technical expertise in AI that is taken into account in self-regulation at hand, while traditional regulation relies on the limited access to talent that institutions have (Clark & Hadfield, 2019). Third, self-regulation does not regulate technology but its implementations, which are the ones causing harm (Condliffe, 2020).

However, self-regulation has also significant limitations, especially for developing countries. First, self-regulation has encountered limits protecting consumers as it is being highlighted by anti-trust investigations and content monitoring. As a result, large technology companies are urging governments to regulate the use of AI (Mediamana, 2021). Second, self – regulation generates information asymmetries

between large technology companies who would have access to first-hand information, and governments who would have limited capacity to understand new technologies and their implications (Condliffe, 2020). Third, protecting consumers from potential negative effects of AI is a societal issue and therefore governments are better placed to address it (Herrera, 2020). Technology companies that regulate AI applications in developing countries can reduce the governments' margins of maneuver, especially since they are responsible for protecting their citizens' interests. Fourth, incentives for companies to regulate AI applications are limited as they can be perceived as a hinderance to short-term product success, which can be measured by tangible revenue (Chowdhury, Rakova, Cramer & Yang, 2020). The priorities from companies regulating AI differ from those of individuals affected by the technology (Barik, 2021). This gap is even wider in developing countries, given that most technology companies are from high-income countries and they self-regulate based on their impact on the population of their country of origin without taking into account the impact on developing countries. Therefore, self-regulation has limitations for developing countries and is not a viable alternative.

Consequently, as developing countries encounter specific risks in the implementation of AI, they need to take action to prevent, control and mitigate these risks. They also need to establish the specific objectives that regulation aims to address (Quest & Charrie, 2019a). However, neither traditional regulation nor self-regulation are options for developing countries. Traditional regulation is not viable for developing countries because of the nature of these technologies and because of the challenges and constraints of developing countries. Self-regulation is also limited because of the economic interests of companies regulating AI and the gap between the regulators and the population that the technology is impacting, which is wider in developing countries. Colombia adopts a smart regulation approach as an alternative to overcome this impasse as well as implementing regulatory sandboxes for artificial intelligence.

The Colombian case: an innovative approach to address artificial intelligence through smart regulation

The Colombian economy has been historically reliant on exporting commodities as the main source of income. However, there has been a slowdown of commodity prices, which has been reinforced by COVID-19 (Dann, 2020). Hence, digital transformation and artificial intelligence have risen as a vector of development for Colombia, as an opportunity to revolutionize the economy, and as an alternative to preserve competitiveness and to generate new business models. The boost of artificial intelligence has the potential to increase Colombia's GDP by 6.8% in the next 10 years (Zaballos, 2021).

Colombia seeks to promote economic dynamism through digital transformation, nevertheless artificial intelligence poses vulnerabilities to disinformation and increases in inequalities. The main factor that explains the risk of disinformation is the inexperience of users with technology. Until very recently Colombia experienced a generalized low information environment, in fact according to a study by Foundation for Freedom of Press (FLIP) in 2015, 92 municipalities in 8 departments, which were affected by the armed conflict experienced difficulties in accessing local information (Semana Rural, 2018). The number of active users in social networks has increased considerably, by 11% from 2019 to 2020, which may reinforce users' disinformation (Digital 2020 Global Overview Report,

2020). In this context artificial intelligence can be used to manipulate users through fake news, which have been spread in Colombia in the context of COVID – 19 (Naciones Unidas Colombia, 2020).

Regarding the increase in inequalities, the main explanatory factors are the unequal access to Internet and the insufficient access to AI. In 2019, 23,8 million out of 45,5 million Colombians did not have an internet connection (MinTIC, 2019). Also, Colombia has gaps in programming professionals, which highlights challenges for accessing AI. According to a study by the Colombian Federation of the Software and Information Technologies Industry (Fedesoft), Colombia has a deficit of 70 000 professionals in the field of technologies and programing (Catedra e-learning, 2019). This gap may also reinforce international inequalities between Colombia and high-income countries in access to AI.

Colombia has a mature banking sector that has been evolving along the path of digitalization and a solid credit rating system. For instance, Lulo Bank is 100% digital and Colombia has a fintech sandbox that allows startups to conduct digital experimentation under the regulator's supervision (Colombia Fintech, 2020). Colombia also has a mature credit reporting system. The private credit reporting industry has existed for more than 20 years and banks rely on credit reports to take lending decisions (World Bank, 2006). Furthermore, Experian, one of the three main scoring agencies, is present in Colombia and it uses a wide variety of credit-based scoring models to compile credit reports for lenders. Colombia is also using AI to implement a credit scoring system that adapts to the population's needs. For instance, MO Tecnologías uses artificial intelligence and machine-learning to determine individuals' and small- and medium-sized companies' credit scores (Colombia Fintech, 2020). Colombia, therefore, has no need to adopt the Chinese AI driven social credit system, and its attendant risks.

A developing country adopting a smart regulation approach

Colombia adopted a smart regulation model that seeks to ensure the balance between promoting economic dynamism and addressing risks, while promoting collaboration between the government and private companies, and learning from other countries' experiences.

According to the Colombian Smart Regulation Forum, 'the concept of "Smart Regulation" proposes to rationalize the elaboration of laws and defends the fact that it is not a question of regulating more, but of doing it in a more intelligent way, always considering the importance of maintaining an attractive and flexible economic environment for the activity of the private sector' (Foro Regulación Inteligente, 2020). The Colombian 'National Policy for Digital Transformation and Artificial Intelligence' (CNPAI) seeks to ensure the balance between protecting citizens and promoting a dynamic economic market. The third principle of the strategy states that 'any regulation impacting the development of AI in Colombia must be accompanied by evidence supporting the need for State intervention, to avoid becoming an unjustified constraint on the development of a competitive AI market' (CNPAI, 2019c, p.17). Also, the 'Ethical Framework for Artificial Intelligence in Colombia' adopts transparency, explanation, and privacy as principles, which are essential to address the risks related to disinformation and user disinformation and manipulation (Colombia. EFAIC, 2020).

There is a parallel between the approach of Colombia and the approach of the

United States to regulate artificial intelligence. The American 'Guidance for Regulation of Artificial Intelligence Applications' establishes the need to conduct a regulatory impact analysis, estimating the benefits and costs associated with each alternative regulatory approach (Colombia. EFAIC, 2020). The approach of the United States goes beyond the impact analysis and includes evaluating whether the regulatory approaches are appropriate and consistent with Executive Order 13859 Promoting the Use of Trustworthy Artificial Intelligence in the Federal Government in terms of its impacts on equity, human dignity, fairness, potential distributive impacts, privacy, and civil liberties, personal freedom, and other American values.

The Colombian perspective shows how regulation can adapt to the needs and priorities of developing countries whose priorities are mainly pursuing economic development. Although the parallel with the United States is not the result of a policy choice, it highlights the opportunity for Colombia to deepen its regulation towards the path of ensuring the respect of certain principles and values.

Another characteristic of smart regulation that Colombia also adopted is the participation of the government and the private sector in artificial intelligence governance and regulation. The concept of *Smart regulation* includes governmental regulation as well as self-regulation in which the private sector has a relevant role to play (Aspen Institute, 2019). The fourth principle of the Colombian 'National Policy for Digital Transformation and Artificial Intelligence' states that it is essential to consider a governance approach to AI based on risks, which government entities and the private sector should promote (Colombia. National Policy for Digital Transformation and Artificial Intelligence, 2019e). Smart regulation seeks to overcome challenges from traditional as well as from self – regulation as information asymmetries between private companies and the government, collaboration between these two actors allows the government to access information from technologies' impact before their implementation.

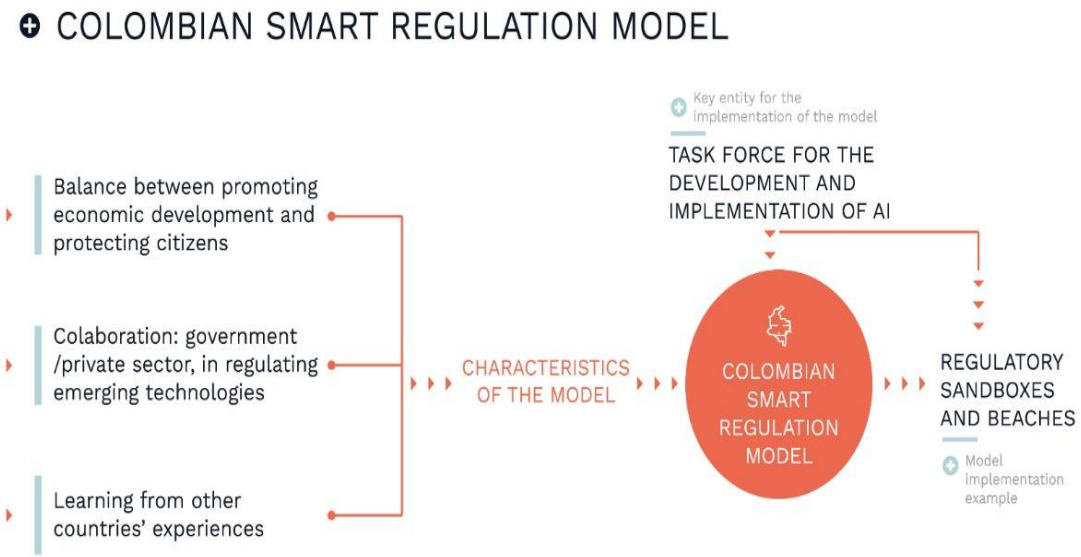
Finally, Colombia adopted a smart regulation model in which learning from other countries' experiences is a vector for its digital transformation. The country is taking the same approach as the European Commission in considering the lessons learned from previous risk governance debates (Budish, 2020). Colombia has not prioritized risks yet since it is still analyzing the lessons from other countries and evaluating their potential impacts. Also, the principles of the 'Ethical Framework for Artificial Intelligence in Colombia' take into account the research done by the Berkman Klein Center, mapping the AI principles that governments, international organizations, NGOs and private actors have proposed as privacy, responsibility, transparency and explanation (Colombia. Ethical Framework for Artificial Intelligence in Colombia, 2020).

In this same optic, the 'Conceptual model for the design of regulatory sandboxes & beaches in AI' takes into account existing models of regulatory sandboxes defined as: 'a "safe space" in which companies can test innovative products, services, business models, and delivery mechanisms, without immediately incurring all of the normal regulatory consequences of engaging in the relevant activity', from the United Kingdom, Singapore and Australia, in their objectives, eligibility criteria, time and costs, and tools (Colombia. CMDRSBAI.2020a).

The approach of learning from other countries goes beyond observing international experiences, asking for advice and participating in international

forums are crucial dimensions of the strategy. Advisors from several countries as well as from international organizations participated in the round tables and provided insight into the 'Ethical Framework for Artificial Intelligence in Colombia'. Colombia's membership at the OECD has also been an asset to reinforce its policy initiatives and also as a basis for cooperation (Colombia - Presidential Advisory for Economic Affairs and Digital Transformation, 2020b). It is usual that developing countries face significant representation challenges in international institutions (Pathways for Prosperity Commission, 2019c). However, the approach of learning and engaging with more experienced countries has been an asset for Colombia to raise developing countries' concerns in multilateral forums and benefit from international support.

Furthermore, Colombia is developing a Task Force for the Development and Implementation of AI in charge of fostering the implementation of the Colombian AI strategy and of facilitating AI implementation in the public sector. This Task Force also adopts a smart regulation ensuring a proportional regulation, establishing an Innovation Hub guiding firms through the regulatory labyrinth, testing regulation regimes, and promoting regulatory sandboxes (Colombia. TFDIAIC. 2020c). The Task Force is also key for observing the behavior of the Colombian technology market as one of its objectives is to 'propose technical guidelines and evidence for the development of regulatory proposals in the field and analysis of the current regulation that impacts the design and development of AI' (Colombia. TFDIAIC. 2020d).



Authors' Realization

Implementing the smart regulation approach through regulatory sandboxes and beaches (innovation hubs)

Regulatory sandboxes and beaches are an example of how Colombia is implementing the smart regulation approach for AI. Regulatory sandboxes and beaches are a vector for promoting innovation and economic dynamism while overcoming information asymmetries and protecting users.

Regulatory sandboxes promote economic dynamism while ensuring a stable regulatory environment, as is the case of the Regulatory FinTech Sandbox. The Financial Superintendency launched in September 2020, through Decree 1234, the Regulatory FinTech Sandbox, which allows companies to enter the Colombian Fintech space for two years and test innovative products and services without the application of rigid regulations (Ossa, Vitoria & Montoya, 2020). Furthermore, the FinTech Sandbox is an asset to promote investments in Colombia. Colombia, along with Brazil and Mexico, has the most potential for FinTech implementations and the sandbox reinforces legal stability (Marenco, 2020).

Regulatory sandboxes reduce information asymmetries and allow evaluating the impacts of technologies in the Colombian context. In the framework of the Regulatory FinTech Sandbox, the first test project concerns digital transactions, which will allow financial institutions to test cash-in (deposit of funds) and cash-out (withdrawal of funds) transactions through exchange platforms (cryptocurrencies) ensuring the traceability of these exchanges through a financial institution. This project is an asset to reduce information asymmetries given that it is an opportunity for the Colombian government and the Fintech ecosystem to analyze the operation and benefits of exchange platforms for Colombia and therefore deepen its knowledge and understanding of these technologies (Colombia Fintech, 2020).

Also, the project for crypto assets allows to analyze exchange platforms in the light of the Colombian context and taking into account the country's priorities and constraints. Therefore, by allowing further comprehension of artificial intelligence and its impact, regulatory sandboxes prepare countries to regulate these technologies once there are enough elements.

Regulatory sandboxes also allow to develop innovative products while ensuring their respect for users' privacy. It is the case of the privacy and default sandbox that establishes a framework in which private companies can launch innovative products in artificial intelligence accompanied by the public sector to ensure from the beginning that AI projects are compatible with the protection of personal data (SIC, 2020). This sandbox is an asset to address the risk of user manipulation.

Colombia is also seeking to implement regulatory beaches or innovation hubs to bring experimentation one step further. Regulatory beaches are similar to regulatory sandboxes, but they have a wider scope. They allow a larger number of companies and sectors to participate in regulatory experimentation during extended amounts of time (more than one year), intending to resolve industry problems and to obtain feedback beyond specific innovations (Colombia. Presidential Advisory for Economic Affairs and Digital Transformation. 2020b). Although regulatory beaches have not yet been implemented in Colombia, their potential in terms of economic development and digital transformation go beyond those of regulatory sandboxes.

Opportunities to deepen smart regulation

Colombia has made considerable progress in establishing smart regulation principles and tools to handle the risks of implementing AI. However, it also has the potential to widen the scope of smart regulation through policy prototyping, sectoral regulation, and by taking smart regulation one step further through developing a standard for artificial intelligence.

Policy prototyping represents an opportunity to implement regulatory experimentation. It takes place in a controlled environment in which companies select an AI application and simulate the application of a prototype law for the selected technology (Gomes de Andrade & Kontschieder, 2021a). Therefore, it allows for it 'to fail early', to learn from future policy options as well as to save resources before implementing the policy (Villa, Auricchio & Mortati, 2020). For instance, one of the lessons of the Open Loop policy prototyping program on Automated Decision Impact Assessment (ADIA) in Europe is the need to evaluate the risks of implementing the system beyond the functioning risks. Evaluating these risks is more challenging than the functioning risks and, therefore, it requires the collaboration of policymakers, academia, civil society, and the industry (Gomes de Andrade & Kontschieder, 2021a). These policy prototyping initiatives should also include the perspective from the civil society, as companies simulate implementing AI systems in the framework of a prototype law, civil society should have an opportunity to provide feedback about its perception of the negative impacts of the policy. Policy prototyping is a scenario to identify the sectors in which tech firms are better positioned and informed than the State to regulate. In this controlled environment it is possible for companies to provide insight in order for policies to become as suited as possible to the market and the challenges of the technology.

The 'Task Force for the Development and Implementation of Artificial Intelligence in Colombia' is an asset to deepen smart regulation. The Task Force can play an essential role in policy prototyping as one of its objectives is 'to propose public policies, strategies, and actions that allow the design, implementation, and deployment of AI' (Colombia. TFDIAIC. 2020e).

To deepen smart regulation, sectorial regulations also emerge as an alternative. Although 'technology neutrality' has assets as it provides equal treatment to old and new technologies and helps to overcome the risks of technologies becoming obsolete, this approach appears limited (Greenberg, 2016). However, this approach reduces the regulator's ability to address risks of specific sectors and implementation contexts, especially for concerning technologies with the potential to become systematically important. Likewise, sectoral regulation clarifies expectations for companies in specific fields (Deloitte, Center for Regulatory Strategy EMEA b&c).

An example of relevant sectorial regulation for the hiring sector is the 'Local Law to amend the administrative code of the city of New York, concerning the sale of automated employment decision tools' (The New York City Council, 2020). The bill would require companies to use automated decision tools in different parts of the hiring process, such as screening candidates and defining compensation, and to inform users that they are using this technology (Simonite, 2021a). Also, providers of these technologies would need to conduct a 'bias-audit' each year and inform users of the results (Simonite, 2021b). Frida Polli, the CEO of Pymetrics,

whose technology would be regulated by the bill and that had an audit for fairness on its technology, considers the bill 'moderate, but in a powerful way' (Simonite, 2021c).

Adopting a standard for artificial intelligence is an opportunity to promote innovation while ensuring the promotion of best practices and a cultural change in the technologies' ecosystem. Standard based regulatory regimes are more adaptable to technological and social change than regulations since it is possible to rework them to address new risks without an extensive process of public consultation (Quest & Charrie, 2019b). A standard is an asset to turn the principles Colombia adopted in the 'Ethical Framework for Artificial Intelligence in Colombia' as well as the OECD principles, to which Colombia has adhered, into best practices (Colombia - Presidential Advisory for Economic Affairs and Digital Transformation, 2020). A standard is also a tool to promote the adoption and spread of best practices in artificial intelligence, as they have done in the past with environmental sustainability and quality management (Cihon, 2019a). A standard reinforces transparency and helps to overcome black boxes in technology and in the incentives that stakeholders provide to develop and implement AI, as the certification parameters are established (K Governance & Media Lab, Berkman Klein Center, 2017b). Adopting a standard is also an opportunity to promote a cultural change in the digital field. As organizations commit to adopting a standard with certain practices, other actors in the ecosystem are expected to follow these good practices as well.

Concerning the content of the standard, it is important to focus on the procedure instead of on the substance of technology, to evaluate the impacts of the technology and to ensure a sustainability certification. The first characteristic of the standard should be to take a procedural approach instead of a prescriptive and substantial one. A prescriptive and substantial approach is rigid and constrained to certain uses (Gomes de Andrade & Kontschieder, 2021b). The procedural approach in the case of Colombia should be a step-by-step assessment of the risks of the technology and following up the technology's evolution. The second characteristic for the standard is prioritizing the effects of the technology instead of the technology itself. Third, as sustainability is a pressing challenge for the implementation of AI, the standard should seek to ensure the technologies' social and environmental sustainability (Gupta, Lanteigne & Kingsley, 2020b). A multi-stakeholder, co-designed, and inclusive approach to create the standard is essential to ensure the social license and trust in the governments and companies developing and implementing the products and services. For instance, the New Zealand nationwide discussion to shape its domestic position on artificial intelligence included indigenous people, which is essential in respecting diversity and avoiding domestic digital divides (Madzou, Costignan & McDonald, 2020). An alternative to ensure social and environmental sustainability is to adopt the LEEDesque certificate for products and services by evaluating their social and environmental impacts (Gupta, Lanteigne & Kingsley, 2020c). This certification is a sign that consumers can use as evidence that companies take their social and environmental duties seriously. The certification process relies on an independent third party that certifies that the product or service meets the requirements.

Opportunities to create a regional standard

It is also pertinent for Colombia to help develop a standard that can be applied throughout Latin America. Latin American

countries should cooperate to address AI risks and a regional standard becomes an alternative for that purpose. While similar fiscal and development postures do not justify a need for cooperation, similar social challenges that exacerbate the risks of AI represent a significant incentive for cooperation. Insufficient digital education is a cross-cutting issue in Latin America; less than 50% of students in the region have access to an educational software (Solórzano, 2020). As previously stated, insufficient education increases the individuals' vulnerability to false information. High inequality is also a risk present throughout the region: the average Gini coefficient of Mexico, Costa Rica, Dominican Republic, Trinidad and Tobago, Colombia, Ecuador, Peru, Brazil, Paraguay, Uruguay, Argentina, and Chile is 46 percent, positioning the region as one of the most unequal in the world (Gomez, Del Pozo, Martinez & Martín, 2020). Concerning access to connectivity, 70% of the population of these 12 countries has access to internet (IDB, 2020). As it was stated previously, the arrival of AI to an environment with significant inequalities, such as that of Latin America, poses a risk of increase in inequalities. Furthermore, there is a general concern in the region about the risks of AI concerning personal data privacy and security, system reliability, and safety and transparency (IDB, 2020).

The objective number 28 of the United Nations Economic Commission for Latin America and the Caribbean's digital agenda is to 'promote digital regulatory coherence at the regional level, especially in the areas of data protection, cybersecurity, ecommerce, and online consumer protection' (eLAC, 2020). The AI standard is a potential starting point to implement the digital agenda and to insure regulatory coherence throughout the region, especially regarding a cross-boundary technology. Furthermore, a standard is 'a guide for behavior' and therefore it is an asset to ensure accountability in the use of AI without being binding, which in turn allows countries to adopt diverse policy approaches oriented towards their specific priorities, among the framework of the standard (Cihon, 2019, pp11). Also, although the effects of implementations of AI remain unknown, adopting a standard provides a framework large enough for each country to adopt specific regulations as the effects of technology become evident. Colombia, which has a clear smart regulation approach and has taken part in international forums discussing topics of how to address the risks of artificial intelligence, has the assets to support other countries in adopting and implementing smart regulation as well. Cooperation is also an asset for developing countries to increase their weight in the geopolitical landscape to address the risks of exclusion and power imbalances.

Conclusion

Developing countries need to address the specific risks that artificial intelligence implementations pose for them: disinformation and increases in inequalities and human rights violations, mainly in the form of fake news and AI driven credit rating systems. However, traditional regulation and self-regulation are not viable alternatives due to the nature of these technologies and to the challenges, constraints and circumstances that developing countries face when seeking to regulate them. Colombia adopted an alternative path through smart regulation to overcome this impasse. Its model seeks to balance economic development with user protection, and it uses regulatory sandboxes and beaches to overcome opaqueness and permanent evolution issues. Colombia also has the potential to deepen smart regulation by implementing policy prototyping and by developing an AI standard. Therefore, the Colombian

case illustrates how developing countries can adopt new approaches that actively address the risks of implementing artificial intelligence without engaging in constraining regulation. COVID-19 has highlighted the importance of regulating AI and the need for international cooperation among emerging economies, and, therefore, it is an opportunity for developing countries to cooperate around smart regulation approaches and adopting an artificial intelligence standard.

Victor Manuel Muñoz is the director of the administrative department of the Colombian presidency. He led the national policy for digital transformation (AI Strategy).

Elena Tamayo Uribe is a graduate of Sciences Po in Paris. She works as an advisor to the Colombian presidency in artificial intelligence.

Armando Guio Español is a graduate of Harvard University and Oxford University. He led the design and implementation of Colombia's AI Strategy, and Colombia's AI Ethical Framework. He continues to advise international organizations on these topics in Latin America.

The authors thank Beatriz Kira, from the Blavatnik School of Government from Oxford University, for commentary on earlier versions of the text.

Bibliography

Ackerman, D. (2021) '"Liquid" machine – learning system adapts to changing conditions'. *MIT News* [online]. Available from: https://news.mit.edu/2021/machine-learning-adapts-0128 [Accessed 1 February 2021]

Analytic Steps (2020). '4 Major applications of Artificial Intelligence in Education Sector'. Available from: https://www.analyticssteps.com/blogs/4-major-applications-artificial-intelligence-education-sector [Accessed 25 March 2021]

Aspen Institute (2019) 'In Harm's Way: Smart Regulation of Digital & Network Technology' [online]. Available from:

https://www.aspeninstitute.org/events/in-harms-way-smart-regulation-of-digital-network-technology/ [Accessed 15 December 2020]

Atlantic Council (2020) 'Can AI and emerging tech boost African development?' [online]. Available from:

https://www.atlanticcouncil.org/content-series/smart-partnerships/can-ai-and-emerging-tech-boost-african-development/[Accessed 24 February 2021]

Atlantic Council (2019) 'Desinformation in Democracies Strengthening Digital Resilience in Latin America' [online]. Available from: https://www.atlanticcouncil.org/wp-content/uploads/2019/09/Disinformation-in-Democracies.pdf [Accessed 20 March 2021]

Barik, S. (2021) '#NAMA: Is It Possible to Regulate Artificial Intelligence?' Medianama [online]. Available from: https://www.medianama.com/2021/02/223-regulating-artificial-intelligence-nama/ [Accessed 21 March 2021]

Berkman Klein Center and K Governance & Media Lab (2017) 'Global AI Dialogue Series - Observations from Seoul Workshop' [online]. Available from:https://cyber.harvard.edu/sites/cyber.harvard.edu/files/AI%20Global%20Dialogue%20Seoul%20Memo.pdf [Accessed 20 January 2021]

Blind, K., Petersen, S., & Riillo, C. (2017) 'The impact of standards and regulation on innovation in uncertain markets' pp. 249 – 64. DOI: 10.1016/j.respol.2016.11.003

Brashier & Schacter (2020) 'Aging in an Era of Fake News'. pp. 1. DOI: 10.1177/0963721420915872

Budish R. (2020) 'AI & the European Commission's Risky Business'. *Berkman Klein Center* [online]. Available from:

https://medium.com/berkman-klein-center/ai-the-european-commissions-risky-business-a6b84f3acee0 [Accessed: 5 February 2021]

Cátedra e-learning (2019). 'La inteligencia artificial vive su gran momento en Colombia' [online]. Available from:https://www.catedra.edu.co/articulos/la-inteligencia-artificial-vive-su-gran-momento-en-colombia/ [Accessed 20 January 2021]

Chakravorti, B (2018) 'Why the Rest of the World Can't Free Ride on Europe's GDPR Rules'. *Harvard Business Review* [online]. Available from: https://hbr.org/2018/04/why-the-rest-of-world-cant-free-ride-on-europes-gdpr-rules [Accessed 20 January 2021]

Chakravorti, B., Bhalla, A., Chaturvedi, RS. (2018) 'The 4 Dimensions of Digital Trust, Charted Across 42 Countries'. *Harvard Business Review* [online].

Available from: https://hbr.org/2018/02/the-4-dimensions-of-digital-trust-charted-across-42-countries [Accessed 20 January 2021]

Chowdhury, Rakova, Cramer % Yang (2020) 'Putting responsible AI into practice'. *MIT Sloan Management Review* [online]. Available from: https://sloanreview.mit.edu/article/putting-responsible-ai-into-practice/ [Accessed 22 March 2021]

Clark J. & Hadfield G. (2019) 'Regulatory markets for AI Safety'. *Cornell University.* pp 21. [online]. Available from: https://arxiv.org/pdf/2001.00078.pdf [Accessed 24 January 2021]

Cihon, P. (2019) 'Standards for AI Governance: International Standards to Enable Global Coordination in AI Research & Development'. *Future of Humanity Institute University of Oxford.* pp 6 - 32. [online]. Available from: https://www.fhi.ox.ac.uk/wp-content/uploads/Standards_-FHI-Technical-Report.pdf [Accessed 3 February 2021]

Collins. 'self-regulation' [online]. Available from: https://www.collinsdictionary.com/es/diccionario/ingles/self-regulation [Accessed March 22 2021]

Colombia Fintech (2019) 'Lulo Bank, banco digital de los Gilinski, operará antes de junio del próximo año' [online]. Available from: https://www.colombiafintech.co/novedades/lulo-bank-banco-digital-de-los-gilinski-operara-antes-de-junio-del-proximo-ano [Accessed 21 March 2021]

Colombia Fintech (2020) 'Sandbox para criptoactivos en Colombia: transacciones de cash – in y cash – out'. [online]. Available from: https://www.colombiafintech.co/novedades/sandbox-para-criptoactivos-en-colombia-transacciones-de-cash-in-y-cash-out [Accessed 4 February 2021]

Colombia Fintech 'MO Tecnologías, un líder en la revolución de la industria crediticia' [online]. Available from: https://www.colombiafintech.co/novedades/mo-tecnologias-un-lider-en-la-revolucion-de-la-industria-crediticia [Accessed March 20 2021]

Condliffe J. (2020) 'Big tech says it wants government to regulate AI. Here's why'. Protocol [online]. Available from: https://www.protocol.com/ai-amazon-microsoft-ibm-regulation [Accessed March 23 2021]

Dann, C. (2020) 'Trade finance, macro and markets COVID – 19 and commodities'. Flow, Deutsche Bank [online]. Available from:

https://cib.db.com/insights-and-initiatives/flow/trade-finance/covid-19-and-commodities.htm [Accessed 21 January 2021]

Daley S. (2019) '32 examples of AI in healthcare that will make you feel better about the future'. Builtin [online]. Available from: https://builtin.com/artificial-intelligence/artificial-intelligence-healthcare [Accessed: 28 March 2021]

Deloitte. Center for Regulatory Strategy EMEA 'AI and risk management Innovation with confidence'. Center for Regulatory Strategy EMEA [online]. Available from:

https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/innovatie/deloitte-nl-innovate-lu-ai-and-risk-management.pdf [Accessed: 8 February 2021]

eLAC. (2020). 'Propuesta de Agenda Digital para América Latina y el Caribe'

[online] pp. 7. Available from: https://gobernanzadeinternet.co/apc-aa-files/bb9cdd26e110b7763a22e4becac32240/propuesta_agenda_digita_elac2022.pdf [Accessed 21 January 2021]

European Commission (2010) 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions. Smart Regulation in the European Union'. [online]. Available from: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0543:FIN:EN:PDF [Accessed: 24 February 2021]

Executive Order on Promoting the Use of Trustworthy Artificial Intelligence in the Federal Government. Executive Order 13960. (2020). The White House [online]. Available from: https://www.federalregister.gov/documents/2020/12/08/2020-27065/promoting-the-use-of-trustworthy-artificial-intelligence-in-the-federal-government [Accessed 3 February 2021]

Fairfield J. (2019) 'Data Diets and Democracy: the Chinese Social Credit System From a Machine Learning Perspective'. Verfassungsbog on Matters Constitutional [online]. Available from: https://verfassungsblog.de/data-diets-and-democracy-the-chinese-social-credit-system-from-a-machine-learning-perspective/ [Accessed March 20 2021]

Foro Regulación Inteligente (2020) 'No se trata de regular más, sino de hacerlo de manera inteligente' [online]. Available from: https://regulacioninteligente.org/smart-regulation/ [Accessed 19 December 2020]

Gent, E. (2020). 'Artificial intelligence is evolving by itself'. *Science* [online]. Available from: https://science.sciencemag.org/ [Accessed 24 February 2021]

Gjeset, U (2018) 'Poor countries are more vulnerable to cyberattacs'. Partner Science Norway, Article from the Norwegian Institute of International Affairs [online]. Available from: https://partner.sciencenorway.no/forskningno-internet-norway/poor-countries-are-more-vulnerable-to-cyber-attacs/1453684 [Accessed 3 February 2021]

Gomez, Del Pozo, Martinez & Martín (2020) 'Artificial Intelligence for Social Good in Latin America and the Caribbean: The Regional Landcape and 12 country snapshots'. A fairLACK repport, Intern – American Development Bank [online]. Available from: https://publications.iadb.org/publications/english/document/Artificial-Intelligence-for-Social-Good-in-Latin-America-and-the-Caribbean-The-Regional-Landscape-and-12-Country-Snapshots.pdf [Accessed 29 March 2021]

Gomes de Andrade N. & Kontschieder V. (2021) 'AI Impact Assessment: A Policy Prototyping Experiment'. Open Loop. Pp. 7 – 57.

Greenberg B. (2016) 'Rethinking Technology Neutrality'. *Minnesota Law Review* [online]. Available from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2748932 [Accessed February 24, 2021]

Greene, J. (2020) 'Microsoft won't sell police its facial – recognition technology, following similar moves by Amazon and IBM'. The Washington Post [online]. Available from: https://www.washingtonpost.com/technology/2020/06/11/microsoft-facial-recognition/ [Accessed 22 March 2021]

GSMA (2015) 'Accelerating Digital Literacy: Empowering women to use the mobile internet' [online]. Available from: https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2015/06/DigitalLiteracy_v6_WEB_Singles.pdf [Accessed 22 January 2021]

Gunningham N., Sinclair D. (2017) 'Regulatory Theory: Foundations and applications' [online]. pp. 133 – 148. Available from: https://www.jstor.org/stable/j.ctt1q1crtm.16?seq=1#metadata_info_tab_contents [Accessed 24 February 2021]

Gupta, A., Lanteigne C. & Kingsley S. (2006) 'SECure: A Social and Environmenal Certificate for AI Systems'. Montreal AI Ethics Institute [online]. pp. 4 – 11. Available from: https://arxiv.org/ftp/arxiv/papers/2006/2006.06217.pdf [Accessed 22 January 2021]

Herrera, S. (2020) 'Tech Giants' New Appeal to Governments: Please Regulate Us'. The Wall Street Journal [online]. Available from: https://www.wsj.com/articles/tech-giants-new-appeal-to-governments-please-regulate-us-11580126502 [Accessed 25 April 2021]

ITU News (2018) 'How to govern AI to make it a force for good: Harvard's Urs Gasser' [online]. Available from: https://news.itu.int/artificial-intelligence-govern-gasser/ [Accessed 3 January 2021]

ITU (2017) 'AI for Good Global Summit. AI for Good Global Summit. Artificial Intelligence can solve humanity's greatest challenges [online]. Available from: https://www.itu.int/en/ITU-T/AI/Documents/Report/AI_for_Good_Global_Summit_Report_2017.pdf [Accessed 24 February 2021]

ITU (2017) 'AI for Good Global Summit. Artificial Intelligence can help solve humanity's greatest challenges [online]. Available from: https://www.itu.int/en/ITU-T/AI/Documents/Report/AI_for_Good_Global_Summit_Report_2017.pdf [Accessed 24 February 2021]

Kira, B. (2020) 'Governing a Globalized Digital Economy: How to Make Technology Policy and Regulation Work for Developing Countries'. *Global Policy* [online]. pp. 6 -7. DOI: 10.2139/ssrn.3679406

Leenders, G. (2019). 'The Regulation of Artificial Intelligence – A Case Study of the Partnership on AI'. *Becoming Human* [online]. Available from: https://becominghuman.ai/the-regulation-of-artificial-intelligence-a-case-study-of-the-partnership-on-ai-c1c22526c19f [Accessed 24 February 2021]

Madzou L., Costignan M. & McDonald K. (2020) 'Reimagining Regulation for the Age of AI: New Zealand Pilot Project'. White Paper. World Economic Forum [online]. Available from: http://www3.weforum.org/docs/WEF_Reimagining_Regulation_Age_AI_2020.pdf [Accessed: 8 February 2021]

Malyshev, N & Kauffman, C. (2019) 'Regulatory effectiveness in the era of digitalization'. OECD [online]. Available from: https://www.oecd.org/gov/regulatory-policy/Regulatory-effectiveness-in-the-era-of-digitalisation.pdf [Accessed 3 February 2020]

Marenco, A. (2020) 'Regulatory Fintech Sandbox: Colombia 2020'. *Ongresso* [online]. Available from:

https://ongresso.com/regulatory-fintech-sandbox-colombia-2020/ [Accessed 4 February 2021]

Ministry of Information Technologies and Communications of Colombia. (2019). 'La mitad de Colombia no tiene internet'. [online]. Available from: https://www.mintic.gov.co/portal/inicio/Sala-de-Prensa/MinTIC-en-los-Medios/100837:La-mitad-de-Colombia-no-tiene-internet [Accessed 24 February 2021]

Naciones Unidas Colombia (2020) 'Noticias falsas y desinformación, otra pandemia del Coronavirus' [online]. Available from: https://nacionesunidas.org.co/onu-internacional/noticias-falsas-y-desinformacion-otra-pandemia-del-coronavirus/ [Accessed: 25 April 2021]

National Planning Department, Ministry of Information Technology and Communications & Administrative Department of the Presidency of the Republic. National Policy for Digital Transformation (AI Strategy). National Council for Economic and Social Policy CONPES 3975. (2019) *Política Nacional para la Transformación Digital e Inteligencia Artificial.* COL. https://www.mintic.gov.co/portal/604/articles-107147_recurso_1.pdf

OECD AI Policy Observatory (2020) 'Policy initiatives for Colombia' [online]. Available from: https://oecd.ai/dashboards/policy-initiatives/2019-data-policyInitiatives-26723 [Accessed 20 January 2021]

OECD Library (2020) 'Latin American Economic Outlook: Digital Transformation for Building Back Better'. Chapter 4 Rethinking public institutions in the digital era [online]. Available from: https://www.oecd-ilibrary.org/sites/2f8d4fc8-en/index.html?itemId=/content/component/2f8d4fc8-en [Accessed: 27 March 2021]

Ossa, ML., Vitoria M., Montoya G (2020) 'Colombia Launches Regulatory Sandbox for Fintech Companies'. Willkie Farr & Gallagher [online]. Available from: https://www.willkie.com/-/media/files/publications/2020/10/colombialaunchesregulatorysandboxforfintechcompani.pdf [Accessed 4 February 2021]

Ovanessof, A., Plastino, E. 'How Artificial Intelligence can drive South American Growth'. Accenture [online]. pp.18. Available from: https://www.accenture.com/_acnmedia/pdf-49/accenture-how-artificial-intelligence-can-drive-south-americas-growth.pdf [Accessed 20 January 2021]

Pathways for Prosperity Commission Technology & Inclusive Development (2018) 'Meaningful Connections for the Next 3 Billion'. Blavatnik School of Government. online]. pp. 9 -10. Available from: https://pathwayscommission.bsg.ox.ac.uk/sites/default/files/2018- [Accessed 11 December 2020]11/digital_lives_report.pdf [Accessed 11 December 2020]

Pathways for Prosperity Commission Technology & Inclusive Development (2019) 'Digital diplomacy' [online]. Available from: https://pathwayscommission.bsg.ox.ac.uk/digital-diplomacy [Accessed 11 December 2020]

Phillips, T., Kira, B., Tartakowsky, A., Dolan, J. and Natih, P. (2020) 'Digital technology governance: developing countries' priorities and concerns.' Digital Pathways at Oxford Paper [online]. Series; no. 3. pp. 2 – 18. Available from : https://pathwayscommission.bsg.ox.ac.uk/sites/default/files/2020-05/final_digital-tech-gov-21may20_0.pdf [Accessed 11 December 2020]

Pisa, M & Polcari, J (2019) 'Governing Big Tech's Pursuit of the "Next Billion Users"'. CGD Policy Paper. *Washington, DC: Center for Global Development*

[online]. pp 13. Available from: https://www.cgdev.org/publication/governing-big-techs-pursuit-next-billion-users [Accessed 11 December 2020]

Pisa, M. (2019) 'Developing Countries Seek Greater Control as Tech Giants Woo the "Next Billion Users"'. *Washington, DC: Center for Global Development* [online]. Available from: https://www.cgdev.org/blog/developing-countries-seek-greater-control-tech-giants-woo-next-billion-users [Accessed 11 December 2020]

Presidential Advisory for Economic Affairs and Digital Transformation (2020). *Ethical Framework for Artificial Intelligence in Colombia*. Colombia.

Presidential Advisory for Economic Affairs and Digital Transformation (2020). *Modelo Conceptual para el Diseño de Regulatory Sandboxes & Beaches en Inteligencia Artificial*. Colombia. Available from: https://dapre.presidencia.gov.co/AtencionCiudadana/DocumentosConsulta/consulta-200820-MODELO-CONCEPTUAL-DISENO-REGULATORY-SANDBOXES-BEACHES-IA.pdf

Presidential Advisory for Economic Affairs and Digital Transformation (2020). *Task Force for the Development and Implementation of Artificial Intelligence in Colombia.* Colombia. Available from: https://dapre.presidencia.gov.co/AtencionCiudadana/Documents/TASK-FORCE-para-desarrollo-implementacion-Colombia-propuesta-201120.pdf

Quest, L. & Charrie, A. (2019) 'The Right Way to Regulate the Tech Industry'. MIT Sloan [online]. Available from: https://sloanreview.mit.edu/article/the-right-way-to-regulate-the-tech-industry/ [Accessed: 5 February 2021]

Rubin, Burkell, Cornwell, Asubiaro, Chen, Potts & Brogly (2020) 'AI Opaqueness: What makes AI Systems More Transparent' Conference CAIS 2020 [online]. Available from: https://www.researchgate.net/publication/343403464_AI_Opaqueness_What_Makes_AI_Systems_More_Transparent [Accessed: 28 March 2021]

Rus C (2021) 'Google quiere acabar con las cookies de Internet, y dice que su alternativa es casi igual de eficaz para los anunciantes'. Xataka [online]. Available from: https://www.xataka.com/privacidad/google-quiere-acabar-cookies-internet-dice-que-su-alternativa-casi-igual-eficaz-para-anunciantes [Accessed: 21 March 2021]

Semana Rural (2018) 'El desafío de informarse en la Colombia rural' [online]. Available from: https://semanarural.com/web/articulo/el-desafio-de-informarse-en-la-colombia-rural/643 [Accessed: 20 March 2021]

Sultana, Muntaha, Anisuzzaman & Sarker (2016) 'Automated Credit Scoring System for Financial Services in Developing Countries' [online]. Available from: https://www.researchgate.net/publication/328559774_Automated_Credit_Scoring_System_for_Financial_Services_in_Developing_Countries [Accessed: 20 March 2021]

Simonite T. (2021) 'New York City Proposes Regulating Algorythms Used in Hiring'. Wired [online]. Available from: https://www.wired.com/story/new-york-city-proposes-regulating-algorithms-hiring/ [Accessed: 3 February 2021]

Superintendencia de Industria y Comercio, Consejería Presidencial para Asuntos Económicos y Transformación Digital (2020) 'Sandbox sobre privacidad desde el diseño y por defecto en proyectos de Inteligencia Artificial' [online]. Available from:

https://www.sic.gov.co/sites/default/files/normatividad/112020/031120_Sandbox-sobre-privacidad-desde-el-diseno-y-por-defecto.pdf [Accessed: 3 February 2021]

The New York City Council. A Local Law to amend the administrative code of the city of New York, in relation to the sale of automated employment decision tools. (2020). Available from: https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=4344524&GUID=B051915D-A9AC-451E-81F8-6596032FA3F9&Options=Advanced&Search

The Polish Institute of International Affairs (2020) 'The Growing Problem of Disinformation in Latin America' [online]. Available from: https://pism.pl/publications/The_Growing_Problem_of_Disinformation_in_Latin_America [Accessed 28 March 2021]

Solórzano (2020) 'Así es como la brecha digital ha afectado los estudiantes en América Latina y el Caribe'. La República [online]. Available from: https://www.larepublica.co/globoeconomia/asi-es-como-la-brecha-digital-ha-afectado-a-los-estudiantes-de-america-latina-y-el-caribe-3049822 [Accessed 25 August 2021]

Scherer, M. (2016) Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies. *Harvard Journal of Law &Technology*, pp. 353–400.DOI:102139

United Nations University. Center for Policy Research (2019) 'AI & Global Governance: AI in Africa is a Double – Edge Sword' [online]. Available from: https://cpr.unu.edu/publications/articles/ai-in-africa-is-a-double-edged-sword.html [Accessed 15 March 2021]

United Nations University Center for Research Policy (2019) 'AI & Global Governance: Using International Standards as an Agile Tool for Governance' [online]. Available from: https://cpr.unu.edu/publications/articles/ai-international-standards.html [Accessed 3 February 2021]

Villa D., Auticchio V. & Mortati M. (2020) 'Design prototyping for policymaking'. Synergy - DRS International Conference 2020. pp. 668. [online]. Available from: https://www.researchgate.net/publication/344362848_Design_prototyping_for_policymaking [Accessed: 3 February 2021]

Vinayak V. (2019) 'The Human Rights Implications of China's Social Credit System'. Oxford Human Rights Hub [online]. Available from: https://ohrh.law.ox.ac.uk/the-human-rights-implications-of-chinas-social-credit-system/ [Accessed: 20 March 2021]

Wakefield J. (2019) '"Dangerous" AI offers to write fake news'. BBC [online]. Available from: https://www.bbc.com/news/technology-49446729 [Accessed: 25 March 2021]

World Bank 'Social inclusion is the process of improving the terms on which individuals and groups take part in society—improving the ability, opportunity, and dignity of those disadvantaged on the basis of their identity' [online]. Available from: https://www.worldbank.org/en/topic/social-inclusion [Accessed: 3 February 2021]

World Bank (2020) 'Everyone Equal: Making Inclusive Growth a Priority for Afro-Descendants'. [online]. Available from:

https://www.worldbank.org/en/news/feature/2020/08/03/everyone-equal-making-inclusive-growth-a-priority-for-afro-descendants [Accessed: 3 February 2021]

World Economic Forum (2017) ‘Populism and fake news – Latin America has seen it all before’ [online]. Available from: https://www.weforum.org/agenda/2017/04/latin-america-highlights-day-one/ [Accessed: 20 March 2021]

Yan Y. (2020) ‘Exporting China’s Social Credit System to Central Asia’. The Diplomat [online] Available from: https://thediplomat.com/2020/01/exporting-chinas-social-credit-system-to-central-asia [Accessed: 20 March 2021]

Zaballos, A. G. (2021) ‘Inteligencia artificial como catalizador para la reactivación económica y el crecimiento productivo’ Puntos sobre la i [online] Available from: https://blogs.iadb.org/innovacion/es/inteligencia-artificial-como-catalizador-para-la-reactivacion-economica-y-el-crecimiento-productivo/ [Accessed: 1 May 2021]