

Artificial Intelligence Landscape in South America

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South American countries have also started to develop national AI strategies. The aim of the study is to provide a comparative analysis of strategy development processes in five South American countries: Argentina, Brazil, Chile, Colombia and Peru. For the quantitative analysis, I used data from the OECD AI Policy Observatory (Artificial Intelligence Policy Observatory) and other international databases, while for the qualitative analysis, I used document analysis on national strategies. The countries surveyed have taken different paths in preparing their national strategies, but the common point is that in all of them the strategy is part of a larger digitisation agenda. Although the AI strategies of the countries in the region are still at an early stage, the existence of national intent will allow progress in terms of both national and regional regulation, with the potential for these countries to become AI powers.

Keywords: *South America, artificial intelligence, strategic analysis, AI policy development*

Introduction

Artificial intelligence (AI) has not yet been given a single definition, as it is a very diverse umbrella term applied to a wide range of hybrid technologies used in many ways, both public and private. Artificial intelligence was first mentioned at a summer internship at Dartmouth University in 1956, and today there are around 70 different definitions.² According to one, “artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment”.³ The official OECD definition is: “An AI system is a machine-based system that is capable of influencing the environment by producing an output (predictions, recommendations, or decisions) for a given set of objectives. It uses machine and/or human-based data and inputs to (i) perceive real and/or virtual environments; (ii) abstract these perceptions into models through analysis in an automated manner (e.g., with machine learning), or manually; and (iii) use model inference to

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² CUSSINS NEWMAN 2019: 1–94.

³ NILSSON 2010.

formulate options for outcomes. AI systems are designed to operate with varying levels of autonomy.⁴

The 21st century is the age of artificial intelligence, and the international community associates the latest technological revolution with this technology. Applying AI can help a state achieve a more competitive and better performing national economy. This is why AI is now referred to as the latest “space race [...] where world superpowers battle to define generations of technology to come”.⁵ While AI promises many benefits, it is also a timely reminder that states that lag behind in this race are missing out, due to inequalities in access to AI.⁶ Competition is fierce, but the way forward is still uncertain as far as the use of AI is concerned.⁷ Although the future of AI is still unpredictable, its greatest benefit, reduced costs, is already being felt by states. South American countries also try to catch up in the race for AI power, and in recent years seven countries have developed their own national strategies.⁸

The study compares the AI strategies and policies of five South American countries, Argentina, Brazil, Chile, Colombia and Peru, using a mixed methodology. The analysis aims to provide an overview of the current state of AI and the regulatory environment in these states. In Hungarian language, so far, no such topic has been published focusing on the region, although several topics (including cybersecurity and Latin American migration tendencies) have been covered by strategic document analysis.⁹

This introduction is followed by the core functions of artificial intelligence strategies in national AI policy and the research methodology. I will then present the results of the quantitative and qualitative analysis. Finally, the study concludes with conclusions and options for the way forward.

Core functions of AI strategies

Artificial intelligence can also be a stepping stone for developing regions to improve quality of life and break out of perpetual underdevelopment.¹⁰ The use of technology can bring about significant changes in societies, national economies and public services.¹¹ Seizing the opportunity, South American countries have also joined the AI race, prioritising public capacity building, creating national strategies, training local talent, research and development, and the development of data infrastructure and an ethical framework for AI.¹² Tim Dutton¹³ described this process as a race to become a global AI power. Andrés

⁴ OECD (2019).

⁵ GERSHGORN 2018.

⁶ MILLER–STIRLING 2019.

⁷ MILLER–STIRLING 2019.

⁸ MONTOYA–RIVAS 2019: 1–8.

⁹ THOMÁZY 2021: 58–74; URBANOVICS–GUAJARDO SANTANA 2022: 89–104.

¹⁰ SANCHEZ-PI et al. 2021.

¹¹ VERONESE – NUNES LOPES ESPIÑEIRA LEMOS 2021: 1–31.

¹² TMG 2020.

¹³ DUTTON 2018.

Ortega¹⁴ defined this strategy-making process as the geopolitics of the fourth industrial revolution.

In mapping AI strategies, UNESCO experts described the recent period as the “flood of AI strategies”.¹⁵ The field of AI raises a number of regulatory issues, including a number of regional, national and cross-border regulations. In addition to the opportunities already created by the exponential growth of transnational Internet litigations, the sharing of jurisdictional areas and international cooperation in Big Data structures, the race to find automated and computational mechanisms in the fields of inventions, applications and artificial intelligence are creating a convergence of interests and coordinated cooperation of public and non-public actors in the fields of the interfaces between law and technology.¹⁶ However, it is worth pointing out that each state develops its national AI strategy according to its own experience and values, and thus there are significant differences and shifts in emphasis among them.¹⁷ In general, the criteria are the following:¹⁸

- the role of scientific research in the field of AI
- professional development, preparing the labour market for the use of AI
- public capacity development and the development of educational institutions
- public–private cooperation in the field of AI
- standards, regulations and the development of data and digital infrastructure

Due to the different emphases, strategies can also differ greatly in their level of maturity.

In the South American region, Argentina, Colombia and Uruguay are among the countries recognised by the OECD as active in the field of AI. Although many initiatives are underway in the region to coordinate national strategies, these have not yet been achieved.¹⁹ One such international initiative is the movement launched by the United Nations Economic Commission for South America and the Caribbean (ECLAC). ECLAC seeks to make the states of the region leading AI powers and to embed national policies in a global context. In the current phase of its integration efforts, ECLAC seeks to achieve “open regionalism” between states, along the lines of the EU, a phase aimed at technological integration. Two related reports have been published entitled *Industrial and Technological Policies in South America*²⁰ and *Human Resources for the Digital Transition in South America*.²¹ In this sense, AI has become a policy that has an impact on both the economy and social processes, with which ECLAC is coordinated to achieve a “digital regional market” (digital common market).

Another example concerns the use of AI in specific tasks, such as the fight against corruption, as illustrated by the Organization of American States (OAS) initiative.²² OAS supports “e-Government Leaders for South America and the Caribbean” (RedGEALC),

¹⁴ ORTEGA 2019: 21–24.

¹⁵ DUTTON 2018.

¹⁶ POLIDO 2019.

¹⁷ POLIDO 2020: 229–256.

¹⁸ DUTTON 2018.

¹⁹ VERONESE – NUNES LOPES ESPIÑEIRA LEMOS 2021: 1–31.

²⁰ CEPAL 2017.

²¹ KATZ 2018.

²² MOSS 2019.

a network that relies entirely on AI.²³ Since 2003, the network has brought together the authorities of the digital government organisations of the LAC region. Its composition makes it a unique instrument to promote horizontal cooperation, the development of participatory policies on digital government, the training of public officials, and the exchange of solutions and experts among the countries of the region. The network enables member countries to share essential knowledge about the development of national digital government strategies. Its general objective is to support digital government policies that put the citizen at the centre, especially in relation to the most vulnerable populations.²⁴ In addition, there are some non-governmental initiatives, such as IA Latam, a network of businesses and researchers.²⁵ Even the Inter-American Development Bank (IADB) has endorsed the Fair LAC report, which comprehensively covers the policies of the twelve countries of the region.²⁶

Methodology

The present analysis is based on a mixed methodology, with regional comparisons using quantitative and qualitative tools providing the main results. According to Bolgov,²⁷ the effectiveness of a country's policy objectives and strategies can be measured by global indices and rankings, but it is important to emphasise that these rankings may give a different picture of the situation of individual states, due to their different methodologies. In addition to the general indicators presented in the introduction, the analysis relies on open databases available on the Internet, focusing on the most recent data.

One of the core elements is the Government AI Readiness Index,²⁸ which basically measures the readiness of public organisations to use AI technology in 160 countries in 10 dimensions and across 42 indicators. The analysis is prepared and published annually by Oxford Insights. This index is important due to the fact that it presents the national preparedness to use AI technology from the aspect of the national policy.

Other complex indices also contribute to the report, including the Global Innovation Index,²⁹ published annually by the World Intellectual Property Organization (WIPO), which measures the innovation potential of 132 economies across 81 indicators.

The IMD World Digital Competitiveness Index³⁰ measures countries' digital readiness along three pillars: knowledge, technology and future readiness. The 2021 report shows that the higher scores the country reaches in terms of future readiness, the more quickly it adapts to a changing technological environment, and the more competitive it is.

²³ RedGEALC (www.redgealc.org).

²⁴ RedGEALC.

²⁵ IA Latam (<https://ia-latam.com>).

²⁶ GÓMEZ MONT et al. 2020.

²⁷ BOLGOV 2020: 259–263.

²⁸ Government AI Readiness Index 2021.

²⁹ Global Innovation Index 2021.

³⁰ IMD World Digital Competitiveness Index 2022.

Government technology maturity is measured and compared using the GovTech Maturity Index,³¹ which is based on 46 indicators in 4 dimensions in 198 countries, as measured by the World Bank. The dimensions are the following:

1. Basic Governance Systems Index
2. Provision of Public Services Index
3. Citizen Involvement Index
4. GovTech Incentive Index

For qualitative analysis, we use the AI Policy Observatory platform³² of the Organisation for Economic Co-operation and Development (OECD). It is a platform that gathers and monitors the development of national policies on AI, with voluntary participation from Member States, with the aim of enabling states to develop their regulatory framework in a coordinated way at international level.

In May 2019, OECD member countries established the AI principles along which they are actively developing their policies. These are the following:

1. inclusive growth and sustainability
2. human-centred values and fairness
3. transparency and explainability
4. stability and security
5. accountability
6. investing in AI R&D
7. fostering a digital ecosystem for AI
8. providing an enabling policy environment for AI
9. building human capacity
10. international cooperation for AI

The countries involved in the comparative analysis are member states of the OECD AI initiative. Qualitative document analysis was carried out along the following national-level strategies:

- Argentina: Artificial Intelligence National Plan (2019)³³
- Brazil: Brazilian Artificial Intelligence Strategy (2021)³⁴
- Chile: Artificial Intelligence National Policy (2019)³⁵
- Colombia: Artificial Intelligence National Strategy (2019)³⁶
- Peru: National Artificial Intelligence Strategy (2021)³⁷

It is worth noting here that in Chile and Argentina, regulation at the national level is not referred to as a strategy.

³¹ GovTech Maturity Index 2021.

³² OECD AI Policy Observatory 2022.

³³ Plan Nacional de Inteligencia Artificial Argentina 2019.

³⁴ Estratégia Brasileira de Inteligência Artificial Brazil 2021.

³⁵ Política Nacional de Inteligencia Artificial Chile 2019.

³⁶ Estrategia Nacional de Inteligencia Artificial Colombia 2019.

³⁷ Estrategia Nacional de Inteligencia Artificial Peru 2021.

South American digital readiness

To analyse and contextualise national AI strategies, it is also worth reviewing some indicators related to the digital readiness of the countries surveyed.

The IMD World Digital Competitiveness Index 2021 ranks Chile 39th, Brazil 51st, Peru 57th, Colombia 59th and Argentina 61st. If we look at the pillars that make up the ranking, we see that in most countries the technology pillar is advanced, while in Chile and Peru the digital knowledge and competences pillar stands out.

In terms of innovation potential, the latest data show that Chile stands out (53rd in 2021), followed by Brazil (57th) and Colombia (67th). However, in recent years (2017–2021), Argentina and Brazil have moved up, while Chile and Colombia have moved down and Peru has maintained its 70th position.³⁸ According to the WIPO report, Peru is a global leader in the indicator “Availability of loans from microfinance institutions”, stands at 18th place at “Graduates in science and engineering” and 22nd place at “Utility models”.³⁹

The artificial intelligence market is forecast to grow strongly in the region.

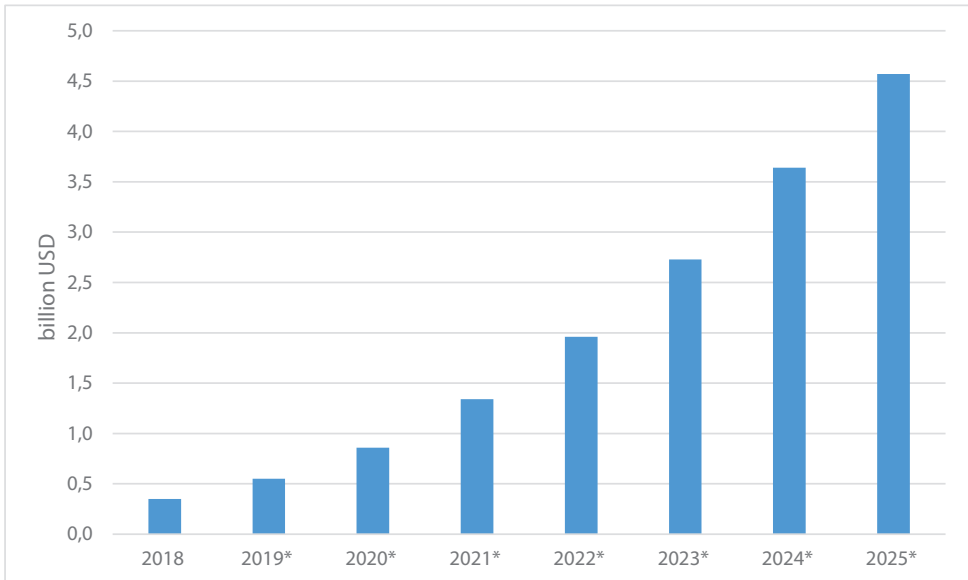


Figure 1: Projected revenues of the South American artificial intelligence market 2018–2025

Source: Compiled by the author based on the data of Statista 2019a.

According to Statista (2019a), the South American region could reach \$4.57 billion in revenue by 2025. In 2021, however, the region’s artificial intelligence market reached

³⁸ Global Innovation Index 2021.

³⁹ Global Innovation Index 2021.

\$1.34 billion in revenue, with a number of emerging technology companies and organisations, including the machine learning and natural language recognition sectors.

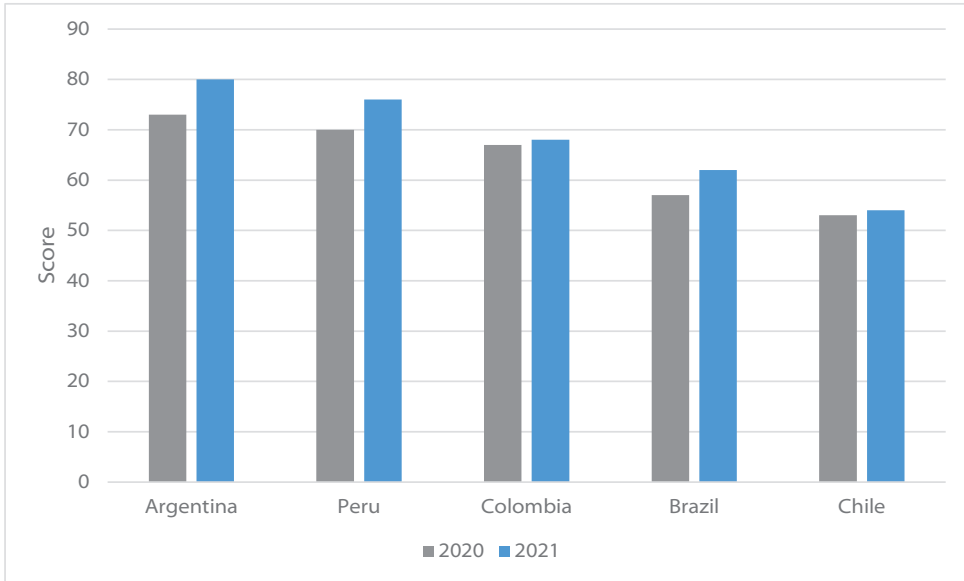


Figure 2: GovTech maturity scores for the surveyed states in 2020 and 2021

Source: Compiled by the author based on the data of GovTech Maturity Index 2021.

In the context of public readiness for AI, it is also worth studying the GovTech maturity index, where the overall scores show that Argentina, Peru and Colombia stand out. Of the three pillars that make up the index, Argentina, Brazil and Peru scored the highest in the government pillar, while Colombia and Chile scored the highest in the data and infrastructure pillar. Brazil stands out in the governance pillar, and Colombia in both the technology, and data and infrastructure pillars.

In 2019, a survey on the public use of AI in the public sector was conducted. In both Brazil and Chile, 15% of the respondents said that the state should not use these technologies, while Brazil has the highest proportion (29%) of those who think that the government should be allowed to use these technologies without restrictions as long as the situation requires. The questionnaire asked about the use of artificial intelligence and facial recognition in the context of maintaining law and order. The exact results are summarised in Figure 3.

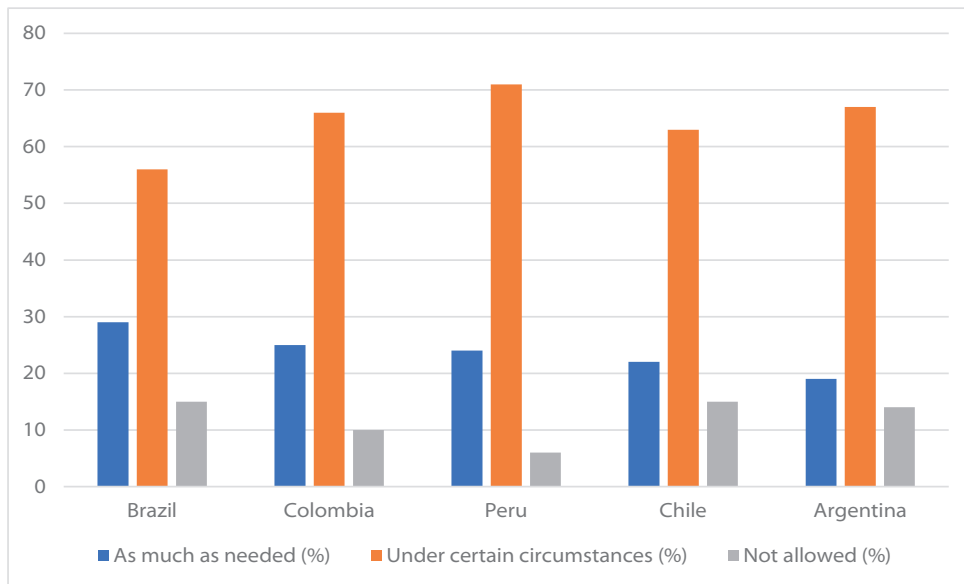


Figure 3: Results of the public opinion survey for the surveyed states on the adoption of AI and facial recognition by the state to maintain law and order

Source: Compiled by the author based on the data of Statista 2019b.

Comparison of national AI strategies in the countries surveyed

Although it is beyond the scope of the present study to analyse the AI strategies of the countries under study in detail, we can compare them along content elements, both in terms of strategy and implementation.

One such aspect is the definition of the exact time frame, which is as follows: Argentina (2019–2029, 10-year framework), Chile (2021–2030, 9-year framework), Colombia (2019–2022, 3-year framework), Peru (2021–2026, 5-year framework). Brazil does not have an exact time frame. Setting out time frame is crucial in terms of implementing the strategies as it puts pressure on the state to achieve strategic goals within a certain period. Another aspect is the coordinating organisation, in most cases the ministries of science and technology. This is different in Colombia, where the Ministry of Information and Technology, the Ministry of Education, the Ministry of Science, Technology and Innovation, the Office of the Department of President of Colombia, the National Planning, and in Peru, where the responsible bodies are the Office of Government and Digital Transformation, the Office of the Council of Ministers.

When the strategies of South American countries are examined collectively, several key themes and objectives emerge. For example, they often seek to catalyse economic development through funding and incentives for research and development, transform the labour market and strengthen talent pools through refresher programs, and promote

strong governance and data sharing, including the opening of public administration data. It should be noted that all strategies include provisions to ensure that AI systems are designed and implemented in an ethical and trustworthy manner (for example, through the creation of ethics-related frameworks and governance bodies). In addition, several strategies emphasise international collaboration, particularly those from Argentina, Brazil, Chile and Peru. Some of them include more specialised components, such as the gender perspective that Chile incorporates in AI research and development. Looking at the targets set, we can see that Argentina, Brazil and Colombia have the most complex strategies. The most common targets are:

- achieving inclusive and sustainable economic growth through AI (Argentina, Chile, Colombia, Peru)
- research and development, education and innovation using AI (Argentina, Brazil, Chile, Colombia)
- establish an ethical and cybersecurity framework for AI (Brazil, Chile, Colombia)
- reducing social inequalities through the use of artificial intelligence (Colombia, Peru)
- becoming a regional AI “powerhouse” in South America (Argentina, Peru)

But if we look at quantified targets, which by their very nature are well measured in terms of effectiveness, we find none in Brazil or Peru. The national strategies of these two countries set objectives in general terms and do not link them to a set of measurable indicators. The only exception to the Brazilian strategy is the requirement for at least 12 state governments to adapt AI to their workflows by 2022. Argentina and Chile have action plans to ensure measurability, while in the Colombian strategy, the objectives are well measurable in terms of their formulation. The policy areas most frequently concerned are government (in all the countries surveyed), industry and business (Argentina, Brazil, Colombia, Peru), and education (Brazil, Chile, Colombia, Peru). However, defence policy is only reflected in the Brazilian strategy. It is important to note that by the Research, Development, Test and Evaluation (RDT&E) agreement made in April 2022 between Brazil and the United States, the two nations strengthened the cooperation and defence technology exchange. Three Brazilian cutting-edge defence technology projects have caught the attention of the U.S. military, including mind mapping, bioprinting and artificial intelligence.⁴⁰

It is also worth looking at the OECD principles in terms of how much and what principles are taken into account in the strategy.

Based on this, Argentina shows the most complex picture, having incorporated all 10 OECD AI principles into its strategy, followed by Peru with 9. In Chile, however, only three have received attention: developing the digital ecosystem for AI, providing an enabling policy environment for AI and building human capacity.

Social inequality and job insecurity are the most frequently cited *societal challenges* related to AI identified in the strategies in the countries surveyed. In addition, environmental sustainability and climate change, as well as the impact of the technological revolution are also identified as potential risk factors.

⁴⁰ BARRETTO 2022.

Table 1: Analysis of AI strategies of the surveyed countries based on OECD principles

OECD principles	Argentina	Brazil	Chile	Colombia	Peru
Inclusive growth and sustainability	X			X	X
Human-centred values and fairness	X	X			X
Transparency	X	X			X
Stability and security	X				
Accountability	X				X
Investing in AI R&D	X	X			X
Digital ecosystem for AI	X	X	X	X	X
Providing an enabling policy environment for AI	X	X	X	X	X
Building human capacity	X	X	X	X	X
International cooperation for AI	X	X			X

Source: Compiled by the author based on the data of the OECD AI Policy Observatory 2022.

Furthermore, it is necessary to address the *regulatory environment* and the background to the national AI strategy in the countries studied. The data show that in all cases the AI strategy was part of a larger public programme for digital development. The importance of artificial intelligence was discussed by Brazil and Colombia along efforts related to digital transformation of the public sector, by Peru along the public sector as a strategic priority, and by Chile along the importance of AI in education and R&D. In Argentina, the AI strategy is part of Argentina’s 2030 Digital Agenda and one of the 2030 national challenges of the Innovative Argentina Strategy. On the last day of President Mauricio Macri’s mandate (December 2015 – December 2019), the government released the AI National Plan. The document was the end result of a drafting process that lasted more than a year and consultations with different actors in thematic panels and meetings. One of its main objectives is to build capacity so that Argentina assumes a leading role in technology in order to boost local development, instead of being a simple consumer of foreign technologies and advancements. Furthermore, the plan lays the foundation for the new government as a guideline, mentioning priorities including the talent, data, supercomputer infrastructure, research, development and innovation, implementation in the public and private sectors, impact on employment, ethics and regulation, international involvement and innovation laboratories. In Brazil, in recent years, measures have been defined along the lines of the strategy called the E-Digital strategy (Brazilian Digital Transformation Strategy) and the General Data Protection Law. The current AI strategy is the result of a two-year consultation with more than a thousand participants, the first to focus on AI at the federal level. In May 2019, the federal government, together with the Brazilian Competitiveness Movement, organised the AI Seminar on Digital Transformation with the participation of relevant authorities, scholars and systems developers. As the result of their work, the national AI strategy has been launched. The strategy has two types of axes: vertical (research, development, innovation and entrepreneurship; implementation in the public sector; implementation in the productive sectors; and public security); and

cross-cutting (legislation, regulation and ethical aspects; use; and international and AI governance). Besides these, the government established specific working groups focusing on areas of health, agriculture, industry and intelligent cities. In Chile, the publication of the AI strategy was planned for April 2020, but the Covid-19 epidemic and the series of protests that started in the autumn of 2019 delayed the work (see Pólyi–Thomázy⁴¹ on the reasons for the protests in 2019), so it was not published until early 2021. The longer period allowed for the organisation of a strategy-making process based on an even broader consultation. The strategy focuses mainly on the use of AI by Chileans, involving them in the creation of legal, ethical, social and economic regulations. In November 2019, Colombia adopted a digital transformation, including an AI strategy. The policy seeks to create international alliances for the innovation, design and implementation of initiatives that foster entrepreneurship and digital transformation. Its priorities are to create an AI market in the country and attract global talent. In Peru in 2018, Decree 1412 and the Law on Digital Governance lay the foundations for the AI strategy.

Conclusions and options

Artificial intelligence is one of today's key strategic technologies, present in many areas of the economy and society. Developing countries are expecting technology to rise above others in terms of economic growth and boost their competitiveness, while the great powers are in increasing competition for the power of artificial intelligence. Several regional and international initiatives seek to harmonise and control the use of AI and encourage states to cooperate. One such initiative is the OECD AI Policy Observatory, which monitors developments in countries on an ongoing basis. Several South American countries have joined this competition and the development of national strategies is inevitable for the responsible use of AI, of which this study comparatively examines the strategies and developments in Argentina, Brazil, Chile, Colombia and Peru. Some results are worth highlighting, which illustrate the current situation and the way forward.

On the one hand, South American countries are committed to digital switchover and have been modernising both the private and public sectors accordingly. They have already prepared their AI strategy to be competitive, but in terms of cybersecurity (data protection, critical infrastructure protection), they are more in the mid-range, among the developing regions. But their e-government developments classify them among the prepared states. Many international and regional initiatives are trying to harmonise their AI strategies, but this has not yet been achieved, so strategies are formulated at national level.

In the context of the strategy analysis, it is worth noting that although all the countries studied have an AI strategy, the precision of the strategies varies. This is illustrated both by the lack of measurable targets in some cases and by the fact that only Argentina's and Colombia's strategies seek to take into account as many AI principles as possible. When analysing the regulatory context of these strategies, it is clear that they are the result of

⁴¹ PÓLYI–THOMÁZY 2019: 79–103.

the digitisation of the state, which both demonstrates the strategic importance of AI and highlights the potential for a much larger, robust programme.

Although the Covid-19 epidemic has in many cases caused a setback in the strategy-making process, the key objective for the states in the region is to reduce social inequalities through the use of AI. National regulations can be a good starting point, but the real breakthrough could come from regional integration efforts, mainly based on the EU model, the creation of a so-called “digital regional market”.

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