

Artificial intelligence and development in emerging economies: an analysis of Mexico's starting point and the public policy imperative

Inteligencia artificial y desarrollo en economías emergentes: un análisis del punto de partida de México y el imperativo de política pública

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Abstract

The development of Artificial Intelligence (AI) is a transformative force reshaping the economic and social structures globally. Its impact is directly linked to each nation's socioeconomic starting point and public policy framework. This paper analyzes Mexico's readiness for AI adoption, analyzing its strengths and weaknesses. The findings reveal a paradoxical situation: while Mexico stands out regionally in data availability, this strength is offset by critical structural weaknesses, such as the absence of a comprehensive national strategy and a concerning lack of continuity in digitalization policies. The study concludes that the country is at a crossroads; it is imperative to establish a viable, inclusive, and sustainable public policy framework to ensure Mexico is not left behind in this new technological revolution.

Keywords

Artificial Intelligence (AI), readiness for AI adoption, public policy, national strategy, structural weaknesses.

Resumen

El desarrollo de la inteligencia artificial (IA) es una fuerza transformadora que reconfigura la estructura económica y social a nivel global. Su efecto está directamente ligado al punto de partida socioeconómico y a la política pública de cada nación. Este artículo analiza el punto de partida de México para la adopción de la IA, evaluando sus fortalezas y debilidades. Los hallazgos revelan una situación paradójica. Si bien México destaca a nivel regional en disponibilidad de datos,¹ esta fortaleza contrasta con debilidades estructurales críticas, como la ausencia de una estrategia nacional integral y una preocupante falta de continuidad en sus políticas de digitalización. Se concluye que el país se encuentra en un momento definitorio y que es imperativo forjar un marco de política pública viable, inclusiva y sostenible para no quedar rezagado en esta nueva revolución tecnológica.

Palabras clave

Inteligencia Artificial (IA), punto de partida para la adopción de la IA, política pública, estrategia nacional, debilidades estructurales.

Introduction

Over the last decade, the development of artificial intelligence (AI) has been exponential and transformative, transcending the field of specialized research to pave the way for a global reconfiguration of the economic and

1 Cenia, Índice Latinoamericano de Inteligencia Artificial (ILIA) 2024, 2024, p. 352.

social structure (López-Portillo Romano, 2025, p. 23). According to Carlota Pérez, AI is part of a techno-economic revolution, consisting of interrelated innovations that transform the economy and society in general (Pérez, 2024). Its potential uses permeate across sectors from health and education to finance and governance, positioning it as a revolutionary technology with historical innovations such as the steam engine, electricity, and the internet (Baigorri, 2025, p. 318).

The expected effect of AI on the productive structure of nations is not determined solely by its technical sophistication. On the contrary, it is directly linked to the socioeconomic starting point of each economy and the public policy that is implemented as this technology continues to develop. In this context, less developed countries will face challenges in fully exploiting the benefits of AI. The potential exacerbation of pre-existing inequalities in areas such as technological dependence, deficiencies in digital infrastructure, and the gap in technological capacity development urgently requires a strategic approach to the implementation of policies that promote development and close these gaps.

The main objective of this article is to highlight Mexico's starting point for the adoption of AI. To this end, it evaluates the country's strengths and weaknesses in terms of digital infrastructure and contextualizes them in an international comparison, seeking to lay the foundations for the formulation of concrete public policy proposals that promote the inclusive and sustainable development of AI in the country.

To achieve this goal, it is essential to establish a conceptual framework that explains what we mean by the term "artificial intelligence," its historical trajectory, and the reasons for its recent boom, in order to subsequently understand why such a profound impact is expected. This approach allows us to understand the public policy challenges surrounding the digital infrastructure needed for the optimal use of AI at the national level, mitigating risks and maximizing opportunities.

Methodology

The work has been structured in three phases, under a qualitative design of descriptive and propositional scope. Phase 1: Theoretical-historical contextualization of artificial intelligence, briefly tracing its evolution. A vision

is adopted that considers the emergence of generative AI as a techno-economic revolution. Phase 2: Diagnosis of Mexico's starting point. In this phase, Mexico's initial status is assessed using secondary data from multilateral organizations (IMF, ECLAC) and national sources (INEGI, ENDUTIH 2024). For the regional analysis, the primary source used is the Latin American Artificial Intelligence Index (ILIA) developed by the National Center for Artificial Intelligence (CENIA) with support from ECLAC. Assuming its methodology of "enabling factors" (infrastructure, data, and talent) and recognizing that this analysis inherits the scope and limitations with which that composite measurement was originally made. Phase 3: Comparative analysis and policy proposal. The comparative analysis uses the same sources to contrast Mexico. Data from regional leaders in artificial intelligence, such as Brazil and Chile, as well as their most recent legislative frameworks, are used in the comparison.

Finally, based on Mariana Mazzucato's approaches to innovation and Carlota Pérez's technological cycles, industrial and regulatory policy recommendations are derived. These advocate for an active state capable of implementing flexible regulations that do not slow down the pace of innovation while mitigating its risks. The phases outlined above are based on a structuralist concept of development, for which technological dependence is relevant. It is therefore a question of inclusive, sovereign, and state-led development. In the proposed context, policy emerges as the main mechanism to prevent the implementation of AI in Mexico's productive sectors from exacerbating structural inequalities.

1. The Age of Artificial Intelligence: The Engine of the New Industrial Revolution

Studies of Artificial Intelligence (AI) have their origins in the 1950s, with the work of scientists such as Alan Turing. The development of AI techniques and algorithms has evolved since then, moving from basic algorithms to much more complex models such as neural networks, natural language processing, and deep learning—developments that have revolutionized the industry over the last decade. The milestones achieved have transformed various sectors and redefined our expectations for the future.

On November 30, 2022, OpenAI launched the most disruptive AI product to date: its "ChatGPT" model (based on GPT-3.5), an acronym for

“Pre-trained Generative Transformer” (Peller, 2024). Its launch is one of the great technological milestones of the 21st century and marked the beginning of the era of generative artificial intelligence. This milestone created great fascination and adoption, reaching 100 million users in just two months and surpassing any digital product in history (Smink, 2023). However, as with any disruptive technological advance, there are both great opportunities and significant risks. Among the main ones is concern about its effects on the labor market due to widespread automation, making it necessary to establish regulatory frameworks to mitigate the risks associated with this major development.

Added to the risks already mentioned are the current market structure, the heavy dependence of countries that do not have the infrastructure to create their own AI systems, the growing dependence of developing countries, and the potential loss of sovereignty. However, for decision-making, it is important to define what artificial intelligence is and analyze what the future of this technology’s development could be.

The development of AI is organized into three stages: Narrow Artificial Intelligence (Soft AI), the current stage, focuses on repetitive tasks and data analysis with models such as ChatGPT, Gemini, and Grok. Artificial General Intelligence (AGI) is a future stage where AI could match human cognitive abilities, which according to Sam Altman highlights the need for regulation (Altman, 2023). Finally, Artificial Superintelligence (ASI) is the theoretical stage in which AI would surpass human intelligence through exponential self-learning, making regulation necessary to prevent risks, as Nick Bostrom points out (Smink, 2023).

Currently, the state of the infrastructure used for the development of AI systems has created a new divide; it separates the world between nations that have the computing power to build cutting-edge systems and those that do not. The difference is notable between developed and developing nations, creating new dependencies and limiting the race to a few, which could recreate a center-periphery dynamic.

There is a stark contrast in current infrastructure. While OpenAI, a US company, is building a data center estimated to be worth \$60 billion, in Latin America the challenges relate to basic infrastructure and access to the chips and servers needed to create these systems (OpenAI and SoftBank, 2025). There is a high concentration of infrastructure among the current beneficia-

ries, mainly in the United States, China, and the European Union, regions that are home to more than half of the world's largest data centers (Satariano *et al.*, 2025). This group includes only 32 countries, or 16% of all nations, and within it, US and Chinese corporations jointly operate more than 90% of the data centers used by other entities for AI-related purposes (Satariano *et al.*, 2025).

One of the main reasons for market concentration is the increase in the costs of the infrastructure needed to create these systems. The shortage of high-performance chip suppliers is one of the major problems facing developing countries. The most documented case is that of NVIDIA, the world's leading chip manufacturer. The high demand for these products has meant that, for the most part, the infrastructure and its high associated costs can only be afforded by the large capital available in developed nations. This leaves developing nations facing a difficult economic policy decision: invest large sums of their budget in the development of a constantly changing technology that requires a long-term vision, or prioritize other public policies necessary for their societies. The opportunity cost is high, and these decisions must be made imminently.

Market structure

When making decisions in Latin American nations, it is necessary to look at the current market structure for the development of these technologies. Even within developed nations, not all large technology corporations are in a position to compete with those that currently have the most advanced AI systems. It can be seen that the few corporations offering these models are the largest companies in the world: Microsoft (in partnership with OpenAI), Google, Meta, and Amazon. Meanwhile, other large companies that have not managed to develop their own models use the systems of large corporations and focus solely on developing tools for specialized applications.

In addition to the lack of infrastructure and development in Latin America, a crucial factor in the AI industry and in the development of large language models (LLMs) is their cost, which tends to increase as models become more advanced. This problem is observed when developing models: the more advanced the model, the higher the cost, as it requires more and more resources and greater computing power. For example, the development cost

for OpenAI's GPT-3 model was around \$3 million. However, for the development of GPT-4, the figure is estimated to have exceeded \$100 million (Satariano and Mozur, 2025).

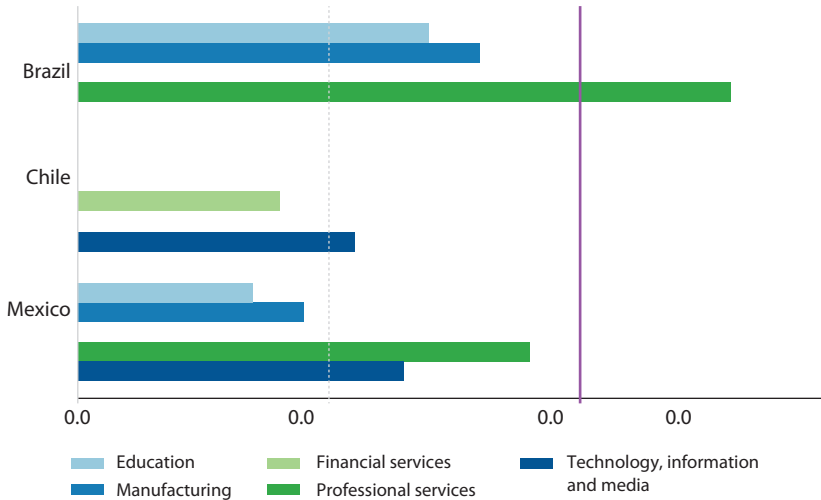
Macroeconomic effects of AI

As mentioned, the incorporation of generative AI into the social, political, and economic structure will have significant impacts. AI could facilitate the automation of multiple processes that are currently performed by humans, profoundly affecting the labor market. Similarly, the increase in per capita productivity could accelerate the tasks performed by a country's economically active population, which could be reflected in an increase in GDP. Not all sectors are equally susceptible to this optimization, which may be a warning sign about the strengthening of certain interest groups and the amplification of inequalities if not properly regulated. One of its already visible effects is the acceleration of markets, from production processes to marketing and consumption. Accompanied by the growth of "platform economies" (e.g., Uber, Rappi, Didi), consumption patterns are becoming increasingly fluid, changing the way companies interact with each other and with their consumers. Another highly relevant factor is access to these advanced technologies without the need for proprietary infrastructure.

According to the International Labor Organization, it is estimated that between 26% and 38% of jobs in the Latin American labor market could be affected by generative AI (World Bank Group and ILO, 2024). This would impact productivity in between 8% and 14% of jobs, especially in urban and high-income areas. Due to AI's ability to replace routine or repetitive jobs, between 2% and 5% of jobs are at risk of being completely automated (World Bank Group and ILO, 2024). Figure 1 shows the relative penetration of AI by productive sector in the most advanced countries in the region in terms of adoption. Although the information is still limited, it can already be seen that the sector with the greatest impact is services. This is attributable to the sector's ability to adopt new technologies without incurring very high costs and to its predominance and rapid change in the region.

Figure 1

Relative penetration of AI skills by productive sector in Mexico, Brazil, and Chile (2015-2023)



To make the best use of this technology, it is crucial that public policy considers literacy and retraining for its use. It is necessary to promote learning initiatives and encourage the use of smart tools, considering the differential impacts by educational level, age, and socioeconomic status. The potential of this technology is enormous, and equally so is the risk of increasing pre-existing inequalities, both within the country and in a global context. Of particular concern is technological dependence on the global north, especially on the large digital companies mentioned above, which puts our digital sovereignty at risk.

2. Mexico and AI: Leader or follower?

Mexico is currently facing both an internal political transition and a context of profound regional and global change. These changes represent both a risk and an opportunity to transform production processes in the Mexican economy through process automation with the support of national talent, innovation, and the growth of its own AI developments. It is projected that automation could add \$15.7 trillion to the global economy by 2030, equiva-

lent to 14% of global GDP (Oxford Insights & C. Minds, 2018, p. 25). This growth is expected to be driven by a considerable increase in the efficiency of production processes and labor force productivity. The realization and distribution of these gains will depend on crucial factors such as the speed of adoption by the private sector, the composition of the economy, and the government policies implemented to support strategic sectors, innovation, and development.

Within this framework, less developed countries, including Mexico, stand out, where the aforementioned factors will be subject to particular challenges that must be overcome in order to fully reap the benefits. In this chapter, we focus on pinpointing Mexico's starting point for AI adoption, analyzing its strengths and weaknesses in terms of digital infrastructure and the digital capabilities of its population.

To describe Mexico's starting point, we draw on the Latin American Artificial Intelligence Index (ILIA), which allows comparing the performance of countries in the region in terms of AI adoption (Centro Nacional de Inteligencia Artificial-Cenia), 2024, pp. 352-353). The index is composed of different dimensions and indicators that reflect the structures of AI ecosystems in these countries. Its composition includes the sub-dimensions of infrastructure, data, and human talent. To measure these dimensions, indicators such as connectivity, data computing infrastructure capacity, number of devices per household, data use and impact, digital literacy, number of STEM graduates, and AI education and skills, among others, are used.

In general terms, the aim is to evaluate each country in three main areas. First, the basic technological conditions that enable the advancement of AI in each nation. Second, the use, availability, and governance of data are analyzed, which will enable the development of national language models (the ILIA relies on data collected by the Global Data Barometer, 2021). Finally, the focus is on human talent, addressing key variables for measuring the technological skills of the general population and the economically active population.

Basic technological conditions

Based on the above indicators, Mexico scored 50.96 in the infrastructure sub-dimension, above the Latin American average of 43.12 (Centro Nacional de Inteligencia Artificial-Cenia), 2024, pp. 352-353). Therefore, it was classified as a country with "high infrastructure capacity," compared to other

regional leaders such as Chile, Uruguay, and Brazil. This contrasts with the International Monetary Fund (IMF) AI Readiness Index, where Mexico scored 0.13 in digital infrastructure, indicating, according to that organization, “significant deficiencies in internet access, broadband speed, and mobile coverage” (Solleiro *et al.*, 2025, p. 250).

In terms of infrastructure, two conclusions can be drawn. The first is that, compared to the Latin American region, our country is at the forefront, with the important task of leveraging this position for the sovereign development of AI. However, in the global comparison presented by the IMF, the outlook is not so positive, and we still face considerable challenges, as our score of 0.13 places us in 56th position out of 174 countries (Solleiro *et al.*, 2025, p. 250).

A country with a high level of internet-connected population creates the necessary conditions for technological development and growth in AI. According to the ILIA, connectivity is the “backbone of any digitization ecosystem” and a “potential driver for the diversification of a country’s productive matrix.” According to INEGI, based on data from the 2024 National Survey on the Availability and Use of Information Technologies in Households (ENDUTIH), internet access reaches 83.1% of the population.²

Although this figure is above the regional average, there is still significant room for improvement for a nation that wants to position itself as a leader in the region. This becomes even more relevant when considering the gap between urban and rural access: in 2024, 86.9% of the urban population had access, compared to 68.5% of the rural population.³ Closing this gap and expanding access are essential for the inclusive development of AI, especially with regard to the development of digital skills. This has been a historical challenge, mainly due to insufficient government spending on infrastructure deployment and the complications inherent in Mexico’s geography, which makes it difficult to install the necessary cabling.

Some deficiencies in broadband connectivity are partially offset by access to mobile networks, as 97.5% of the population that uses the internet does so via a mobile device. The challenge in this area is to achieve better connectivity. While leading countries have consolidated 5G infrastructure,

2 National Institute of Statistics and Geography (INEGI), National Survey on the Availability and Use of Information Technologies in Households (ENDUTIH) 2024. Press release 57/25 (May 6, 2025), section “Internet availability and use” (reports that in 2024, 83.1% of people aged 6 and over used the internet).

3 *Ibid.*

in Mexico efforts to reach the majority of the population are still in their infancy: only 31.5% of the population has coverage from this network, and only 15% of new devices on the market are compatible with this technology (Vargas, 2024). The implementation of the latter is critical for a nation's technological advancement, as it improves download speeds, supports a higher density of connected devices, and enables advanced uses such as the Internet of Things (IoT).

In terms of computing—which refers to the existence of conditions for processing large volumes of data and performing complex calculations—Mexico is below the regional average. The country is deficient in one of the basic capabilities for data processing, which is necessary for the development and learning of national generative artificial intelligence models. While no major developments from scratch are expected at the national level, the adaptation of foundational models available on the market also requires the processing of large amounts of data. This dimension includes servers and specialized hardware available in the country, such as graphics processing units (GPUs) and neural processing units (NPUs), which are used to perform high-speed parallel calculations. One of the major shortcomings is that the initial and maintenance costs of this equipment are often very high, especially for small companies wishing to enter this sector.

Similarly, the development of cloud services—defined as a range of data storage and processing services through remote server networks—enables the advancement of real-time AI applications in all sectors. Currently, this is one of the most transformative areas for both the private and public sectors. If its benefits are properly leveraged, it enables the analysis of large volumes of data, process automation, and security improvements.

As mentioned above, the major players in this sector are transnational companies such as Amazon Web Services (AWS), Google Cloud, and Microsoft Azure. In early 2024, AWS announced a \$5 billion investment in Querétaro to create an infrastructure “region” (Amazon Web Services (AWS), 2024). This represents one of the most significant opportunities to take advantage of the development of the digital industry in a sovereign manner and should not be seen as just another foreign investment.

Despite this, Mexico has below-average levels of computing capacity and certified data centers compared to the regional average, which highlights another important area of opportunity for the development of this industry in the country. The scalability of this infrastructure is crucial in order to adapt

to the demand for AI applications (Centro Nacional de Inteligencia Artificial-Cenia), 2024, pp. 352-353).

Data availability, capacity, and governance

Data availability and quality are considered the raw material for the development of Artificial Intelligence. They are vital for research and the creation of programs that promote a national digital industry and, therefore, represent one of the most important points when promoting digital strategies. In the context of AI, data is necessary for training and refining learning models, including large language models (LLMs). Without open, high-quality data, the raw material for these developments is scarce.

In the region, and especially in Mexico, data availability is understood as the existence of clear, secure, and easy-to-process public data for open use. Our country is among the most advanced in the region in this area; according to the ILIA, it has a score of 48.23 in the data sub-dimension and 50.58 in the availability of public data, almost 15 points above the regional average. The Mexican government has actively promoted the publication of open data through various means, most notably the *datos.gob.mx* platform, as well as the creation of innovative civic projects such as Data Laboratory and HackCDMX, which promote the use of government data. However, the online availability of this data loses functionality without adequate dissemination of its existence and methods of access. There are major limitations in the region, not necessarily in the availability of data, but in equitable access to it, which highlights the need to promote policies that encourage more widespread use of information.

Data capacity refers to a country's ability to collect, download, use, and share such information. In the Oxford Insights AI Readiness Index, Mexico ranked fifth out of 35 countries in data availability and ninth in data capacity. These results are attributable to the aforementioned efforts and, in particular, to the previous government's National Digital Strategy (EDN). The EDN was a pioneer in open data, participating in and signing the *Open Contracting Data Standard* and being one of the first countries to implement the agreement (Oxford Insights & C Minds, 2018, pp. 13, 14).

Similarly, Mexico is a leader in data infrastructure, driven by large foreign investments such as Microsoft's hyperscale data center in Querétaro, where data for AI developments is stored, processed, and distributed. Howe-

ver, it is important to note that this type of investment does not only represent advantages (García Montes and Savage, 2025, pp. 451-452). The cost to the country of electricity consumption for their operation and water consumption for cooling their infrastructure should be one of the focal points when creating regulatory policies. Mexico has shown great openness to providing the material basis necessary for the development and implementation of these data centers.

Although data availability is a strong point for Mexico in the international arena, the sub-dimension of governance presents significant areas of opportunity. There is uneven development in regulatory frameworks related to data protection. This is particularly noticeable in what the ILIA classifies as “institutional strategy and vision,” as Mexico lacks an entity responsible for the supervision, coordination, evaluation, security, and reliability of AI systems. One of the most tangible examples of this weakness is the implementation of such systems in public security, such as the FanID for accessing soccer matches and facial recognition cameras from providers such as Dahua Technology and Thales Group. In this regard, the INAI has pointed out major gaps in personal data protection, privacy, lack of transparency, and accountability (García Montes and Savage, 2025, pp. 450, 451, 456, 457).

In general, the absence of laws regulating the ethical use of AI, as well as a policy for the strategic promotion of its development, is a cause for concern in Mexico. It is also important to consider specific issues such as cybersecurity and privacy. Although progress has been made in special cases—such as the initiative to criminalize the manipulation of images with AI for sexual purposes—these efforts are not part of a comprehensive, long-term national strategy.

Talent and skills

Mexico is well positioned in terms of early science education, according to its score of 70.52 out of 100 on the PISA test (Centro Nacional de Inteligencia Artificial-Cenia), 2024, pp. 352-353). Similarly, initial efforts have been made to integrate technological skills into basic education. In the case of specialized talent, the situation is even better, with the country scoring 15 points above the regional average, according to the same index. In terms of research, Conahcyt supported 16 projects related to *big data* between 2011 and 2017 (Oxford Insights & C Minds, 2018, p. 351). Likewise, 464 reser-

chers specializing in big data and AI are registered in the National System of Researchers (SNI) (p. 351).

The outlook is less encouraging when it comes to the human talent available in the labor market. According to a Cisco report on AI readiness (2024), only 27% of Mexican companies considered themselves to have personnel trained to adapt to the changing AI environment, revealing a stagnation in their self-perception of their capabilities. The study analyzed 8,000 companies in 30 countries and classified organizations into four levels; in Mexico, only 13% of companies are at the highest level (“leader”). The low sophistication of jobs, which require less specialized talent, is exacerbated by the growing gender gap. In Mexico, female participation in AI literacy is 25.19%, making it the country with the highest rate in the region, followed by Uruguay with 17.5%. However, globally, this figure remains low (Cisco, 2024).

One of the biggest challenges in this area is the brain drain. Since 2019, most countries in the region have lost more AI specialists than they have managed to attract, a situation that repeats in Mexico. Since that year, the only countries in the region that have shown a net attraction of talent are Uruguay and Costa Rica; however, this trend has not been constant, as they have also recorded years with greater outflows.

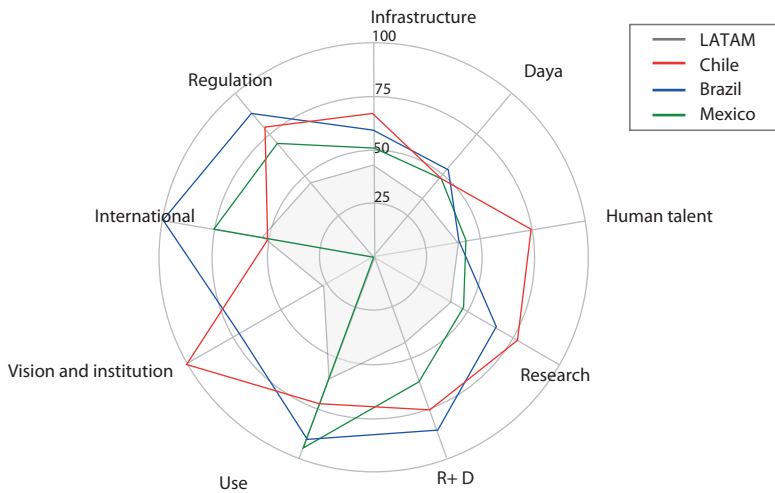
Likewise, the inequality in development compared to the global north is worrying, and is exacerbated by the brain drain. Countries in the region, such as Mexico, have not managed to close the gap in this area, a situation that is even more acute in advanced technical engineering skills related to AI. While in Mexico, specific AI skills still focus on pattern recognition and decision trees, in countries at the forefront of development (China, the US, and the EU), they focus on model training and natural language processing (NLP). Although the gap is not yet insurmountable, the call to focus efforts on this industry is clear.

Regional comparison

After presenting Mexico’s starting point, a brief comparative analysis is presented that contrasts its performance with that of leading countries in the region, such as Brazil and Chile, as well as with the overall average for Latin America. The objective is to integrate the details presented on Mexico with certain lessons offered by the regional analysis.

Mexico's position suggests a notable momentum in knowledge generation and AI adoption, despite the limitations inherent in its infrastructure and support policies. However, Mexico stands out as the only country with strong performance in AI research, development, and adoption that simultaneously faces significant challenges in its governance framework, a factor that limits its overall progress (Oxford Insights & C Minds, 2018, p. 351). Figure 2 shows the notable national deficiency in the regulatory and governance framework compared to the other countries mentioned.

Figure 2
Comparison of AI sub-dimensions in LATAM



Note: Replicated from the Artificial Intelligence Report for Latin America, 2025.

This comparison shows that Mexico's structural weakness is the absence of an official and comprehensive national strategy on AI and a worrying lack of continuity in digitization policies (Oropeza García and Negrete 2025, pp. 254-255; National Center for Artificial Intelligence (Cenia), Latin American Artificial Intelligence Index (ILIA), 2024, pp. 946, 961, 966). This six-yearly intermittency in federal public administration stands as a substantial obstacle to the sustained growth of AI in the country. In contrast, Brazil and Chile have well-defined national AI strategies that are currently being upda-

ted, providing them with a solid foundation for the development and regulation of these technologies.

Another significant challenge is intellectual property. In Mexico, this represents a particular obstacle, as current legislation does not allow the unauthorized use of protected works for training AI systems, nor the collection of data through web scraping (Oropeza García and Negrete 2025, pp. 400, 410, 491-492). Additionally, works generated by AI cannot be legally recognized or protected, limiting the incentive for innovation in this field.

Mexico

In Mexico, no specific legal mechanisms have been established to regulate the use of AI. The laws in force within the current legal framework are insufficient to address the changes brought about by its adoption, and the protection of rights is only indirect. These include the Law on the Protection of Personal Data Held by Private Parties, the Federal Law to Prevent and Eliminate Discrimination, and international human rights instruments. The 2021-2024 national digital strategy established a foundation in infrastructure and data, but it is not an AI transformation plan *per se*. Currently, 20 of the 32 states in the republic do not have a state digital policy; less than 40% of the country has one (UNESCO, Mexico, 2024, p. 14, citing CEIAP, 2022).

There are also limitations in the legal framework. For example, the General Law on Transparency and Access to Public Information can be a means of requesting information on the use of AI systems by public entities, but there are regulatory limits to algorithmic transparency established in the USMCA (Unesco, Mexico, 2024, p. 21). This lack of legislation and the existing limitations highlight the urgent need to update and implement a specific legal and regulatory framework for AI.

UNESCO proposes mapping the ecosystem to visualize the relevant actors in the AI cycle and identify the interactions between them (UNESCO, Mexico, 2024, pp. 10, 51, 53). It also suggests integrating a legal framework that is agile and flexible, adapting to existing provisions and creating new ones when necessary. This framework should update and adapt current regulations, define criteria for ethical use, and establish legal responsibilities. To this end, there are legal frameworks already in place in the region and around the world. Below, we will analyze the work carried out by our Latin Ameri-

can peers, Brazil and Chile, and the first large-scale regulatory framework: the European Union's AI Act.

Brazil

In the Latin American context, Brazil is positioned as the leader in AI development in the region and has made significant progress in its regulation. Bill 2338 of 2023 is an initiative whose main objective is to regulate the use of this technology. This bill has been in the Chamber of Deputies since March 17, 2025, and outlines the regulatory directions, as well as the main concerns regarding AI (Brazil. Federal Senate (2023) Bill No. 2338).

Among its proposals, the law requires an identifying label for audiovisual materials produced by AI (deepfakes). It prohibits the development, distribution, and application of certain AI systems, imposing legal obligations on developers. A framework for copyright and intellectual property is established, as well as the regulation of regulatory *sandboxes*. The protection of vulnerable groups, such as people with disabilities, children, and adolescents, is also contemplated.

It also encourages research and training, both for workers and through incentives for professional training in AI. Finally, as relevant points, it establishes a framework for active transparency and freedom of expression, along with a periodic review of the law every three years.

Chile

Chile is one of the leaders in AI in the region and has made significant progress in its regulation. The National Artificial Intelligence Policy, published on January 28, 2025, has as its central objective the promotion of the ethical and responsible development and use of this technology.⁴ The policy seeks to establish a people-centered framework that promotes robustness, security, privacy, transparency, diversity, and social well-being, as well as a system of accountability and responsibility.

⁴ Ministry of Science, Technology, Knowledge, and Innovation (Chile), Decree No. 12, Official Gazette (Chile), January 28, 2025, "Approval of the update to the 'National Artificial Intelligence Policy'".

In the economic sphere, the aim is to diversify the economic matrix, increase productivity, and strengthen the ecosystem of research, innovation, and entrepreneurship. To this end, the participation of various actors and international cooperation are promoted; it is noteworthy that Chile leads the “Santiago Declaration for Ethical AI in Latin America and the Caribbean.”⁵

In terms of talent, the policy promotes the teaching of skills in the school system and AI as a cross-cutting discipline. It seeks to provide job training, foster experts, periodically scout for talent, and educate on its ethical use.

Likewise, an agenda of data of public interest is created with clear governance by the State and the coexistence of a public-private ecosystem. To support this, the aim is to establish a solid technological infrastructure, with national connectivity systems and *high-performance* computing (HPC). The plan outlines a path for development and adoption through research, development, and innovation, using productivity indicators and promoting collaboration between academia and the productive sector. In terms of adoption, it proposes modernizing the government, increasing productivity with a focus on economic growth.

A comprehensive regulatory framework is also established with ethical requirements for public procurement, as well as minimum standards for transparency and data protection, encouraging citizen participation. International coordination is proposed, seeking regional cooperation and cooperation with more developed nations to align standards. The policy addresses the environment, seeking to use AI for monitoring and promoting its use with renewable energies. It promotes gender equality, women’s participation in AI, inclusion, and non-discrimination. In addition, it recognizes the impacts on work and seeks to establish retraining and training mechanisms, as well as a review of labor legislation.

Finally, it proposes updating the intellectual property system for issues of creation and ownership, and ensuring transparency in generative AI. The goal is to create a secure digital ecosystem that prevents misinformation and digital violence.

European Union

The European Union’s Artificial Intelligence Act (*AI Act*), enacted on June 13, 2024, represents a milestone in the regulation of AI worldwide. Its

5 Ministerial and High Authorities Summit of Latin America and the Caribbean, “Santiago Declaration ‘To promote ethical artificial intelligence in Latin America and the Caribbean,’” Santiago, Chile, October 23-24, 2023; the Declaration elects the Republic of Chile to head the regional AI Working Group.

objective is to improve the functioning of the internal market through a uniform legal framework, promoting human-centered and reliable AI, and ensuring a high level of protection of health, safety, and fundamental rights (EU Regulation 2024/1689).

The law defines AI as a machine-based system designed to operate with varying levels of autonomy and applies to providers both within and outside the European Union. The *AI Act* takes a risk-based approach. It establishes prohibitions for unacceptable uses, such as real-time remote biometric identification systems and crime prediction through profiling. It also considers AI used in critical infrastructure, education, employment, essential services, justice, and migration to be high risk.

For these high-risk systems, obligations such as risk management, data quality, technical documentation, human oversight, and cybersecurity are established. The law also promotes the assignment of responsible parties, monitoring, access to information by workers, and human rights impact assessments.

Another important point is the regulation of general-purpose AI models. These must comply with technical documentation, respect copyright laws, submit a summary of the content used for training to the authorities, and have a legal representative. In addition, systemic risks must be assessed, cybersecurity must be ensured, and incidents must be reported.

The law supports innovation through regulatory *sandboxes*, facilitating testing in real conditions and providing support to SMEs and startups. It also establishes a governance system, with the creation of an AI Office, an AI Council, and national authorities. Penalties of up to €35 million or 7% of the firm's global turnover are set. Finally, rights are created for affected individuals, such as the right to complain, to receive an explanation, and protection from retaliation. The Artificial Intelligence Act came into force on August 2, 2024, and will be phased in between 2025 and 2030.

3. Building the future: global lessons for a national strategy

The United Nations Educational, Scientific and Cultural Organization (UNESCO), in collaboration with the National Alliance for Artificial Intelligence (ANIA), assessed Mexico's preparedness in AI (UNESCO, Mexico, 2024). Together, they point out the public policy challenges facing the country. In recent years, momentum has been lost: there is no national AI plan or strategy in place. This is reflected in global and Latin American studies, where Mexico lacks vision and strategy.

On the other hand, social differences are not addressed either. Technological inequality is alarming, with large gaps in internet access between urban and rural areas. AI reproduces and amplifies these social challenges, highlighting existing inequalities. There is a lack of representativeness in the data and biased algorithms that affect vulnerable groups. This is because AI is trained with internet data, which is rarely representative of rural areas or areas without access to electricity.

There is great inequality in linguistic diversity. Current AI models are offered in few languages and are more efficient in English. Mexico has 68 recognized indigenous languages; these are not adequately represented in the models (UNESCO, Mexico, 2024). This represents a challenge for the country's cultural and linguistic preservation. Inequality persists in low average levels of education. Likewise, scientific production in AI is low in Mexico compared to international standards.

In particular, government spending on science and research does not allocate specific funds for AI projects. In 2023, a similar project was presented: the creation of the Mexican Agency for AI Development. This sought to emulate the role of the European Commission's decentralized entity, responsible for planning and executing public AI policies. The project was ambitious, seeking to cover everything from education and employment to infrastructure in the analysis and creation of proposals on AI. However, it was rejected in 2024 (Alcalá, 2025). Since then, there have been no further proposals for a Comprehensive AI Strategy in Mexico.

As for regulating the use of AI, more proposals have been submitted to the Senate. During the 2021-2025 period, around seven initiatives related to this topic were presented (Alcalá, 2025). However, there is still no clear path for discussion, let alone for advanced stages of legislation. Rolando Zapata, president of the Senate Commission for Analysis, Monitoring, and Evaluation of the Application and Development of Artificial Intelligence, confirmed that discussions will begin in September of this year. The time to regulate is now, because, as Zapata points out, the public and private sectors and academia are waiting for a regulatory framework because "things are already happening" (Calderón, 2025).

We must address AI regulation promptly and effectively, learning from international examples. According to Margrethe Vestager, AI has a dual nature that complicates its preventive regulation. Under this approach, AI is inherently neutral, and its impact depends on how it is used. Vestager mentions that many

uses of AI are harmless and that space should be given to innovation. However, in high-risk uses, incisive public policy intervention is necessary. The inability to conduct laboratory tests to analyze the effects of a regulatory policy requires caution. We must work with the dual objective of not undermining creativity and innovation, while not allowing uses that put human integrity at risk. It is crucial to conduct risk assessments and ensure technical robustness for high-risk uses, in addition to prohibiting those that violate fundamental values. Beyond traditional public policies that regulate use, it is necessary to be creative in directing AI development toward the common good. Authors such as Mariana Mazzucato suggest new, more flexible tools and proactive government to bridge the gap between risk and innovation.

The lack of long-term vision and institutionality in Mexico represents a great opportunity to implement AI correctly from the outset. Based on the perspective of Mazzucato and Gerone, the Mexican government must take on an active and strategic role. This role would involve orienting AI regulation toward short- and medium-term missions. The approach should prioritize pre-existing inequalities, such as digital inclusion and language barriers. The biggest challenge is to ensure that the development of this technology benefits society as a whole, not just large technology companies.

A clear example of a strategic approach is China. Its AI development has been going on for years, being one of the main destinations for government resources (Juárez, 2025). Strategically, China has invested in infrastructure, education, and data availability. Unlike the United States, where large companies lead the way, the Chinese government finances much of the data infrastructure. The situation is similar for AI startups, with heavy subsidies and special zones for professionals.

In Mexico, the starting point is different, but there are important lessons to be learned about active state participation. The budget for fiscal year 2025 for the humanities, sciences, technologies, and innovation program amounts to \$159,275,204,098 MXN.⁶ Even if it were allocated entirely to AI development, it would represent only 15% of the estimated \$60 billion cost of OpenAI's data center under construction. It is clear that Mexico cannot develop the necessary infrastructure on its own. However, we must promote the active participation of both local and federal government agencies. These

⁶ Chamber of Deputies of the Honorable Congress of the Union, "Federal Expenditure Budget for Fiscal Year 2025," Official Gazette of the Federation, December 24, 2024.

agencies must prioritize ensuring that concessions to large technology companies guarantee openness, inclusion, and neutrality.

According to Pérez (2024), the techno-economic revolution driven by AI is part of broader cycles of innovation. However, our current moment has the potential to foster new technologies, sustainable and equitable economic growth, and the transition to greener industries. Based on the above, it is necessary to create a national strategy that addresses the adoption of AI from three main angles:

1. Regulation of inclusive use: encourage creativity and innovation wherever possible. This involves considering existing inequalities and including educational programs for digital skills development.
2. Incentives for development and industrial policy: promoting Mexican companies that adopt existing AI models for national uses. An industrial policy is needed that encourages the creation of data infrastructure in the country, always prioritizing national interests. We can learn from countries such as those in Europe, China, and Chile.
3. Clear limits for development: establish physical and social limits for the development of this technology. This will avoid climate risks associated with its environmental impact and protect human interests, preventing the widening of inequality gaps, as has occurred with female employment in AI.

Final thoughts

Artificial intelligence is undoubtedly emerging as the driving force behind the next industrial revolution (Yalovetzky and Simg Atilano, 2025). It is clear that some countries foresaw this reality much earlier than others, strategically positioning themselves for what is to come. The effects that this technology will have on the foundations of our social and economic bases are becoming less speculative; they are becoming tangible and omnipresent realities. Society, with its characteristic agility, has been quick to adopt this technology, effortlessly breaking down barriers that were once considered insurmountable in order to integrate it into its daily life.

Adding to this dynamic, large technology corporations, predominantly American, are immersed in a frantic race to develop increasingly capable models. Their ambition is clear: they anticipate that these advanced AI sys-

tems could effectively replace human capacity within the next 10 years (López Blanco, 2025). However, amid this dizzying pace of innovation and social adoption, one critical aspect is lagging significantly behind: regulation. Despite the rapid progress in all other areas of AI development, most governments around the world still seem to lack the momentum to take decisive action in the face of this monumental change.

The case of Mexico is no different, but it presents a unique and pressing opportunity. Historically, our nation has often found itself lagging behind during periods of similar technological transformations. Today, however, the gap is not so great as to be insurmountable. We have a critical window of opportunity to act quickly and decisively, facing this unprecedented opportunity with our sights set on not falling behind again.

Crucially, we have compelling precedents within our own region. Nations such as Chile and Brazil have demonstrated the remarkable effectiveness that Latin American countries can achieve in regulating this powerful technology (Soto *et al.*, 2025). Their experiences serve as an excellent starting point, offering invaluable lessons that we can adapt and expand to incorporate our own national characteristics and priorities. Mexico already has a solid foundation in various areas, and there is palpable interest within society in accessing and using this technology. The time for hesitant vision or institutional inertia is over. We must now forge a robust policy framework that not only supports the vital efforts of the private sector but also actively ensures that equitable benefits are derived from the significant investment made in this area in our country. It is not just a matter of keeping pace; it is about leveraging AI to build a more prosperous and just future for all Mexicans.

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Declaration of Authorship - CRediT Taxonomy	
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Statement on the Use of Artificial Intelligence
<p>The authors DECLARE that, in the preparation of the article entitled <i>Artificial Intelligence and Development in Emerging Economies: An Analysis of Mexico's Starting Point and the Public Policy Imperative</i>, Artificial Intelligence tools were used in a manner that complemented, rather than replaced, the intellectual work of the authors.</p> <p>The tool used was: Notebook LM</p> <p>The tasks for which it was used were: Extracting data from selected sources, identifying errors, and correcting style.</p>