ARTIFICIAL INTELLIGENCE FRAMEWORK FOR THE INTER-AMERICAN DEVELOPMENT BANK GROUP

2025 / January

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Abbreviations

AI	artificial intelligence
GenAI	generative artificial intelligence
GPT	general-purpose technology
HPC	high-performance computing
IDB	Inter-American Development Bank
IDBG	Inter-American Development Bank Group
LAC	Latin America and the Caribbean
NIST	National Institute of Standards and Technology
OECD	Organisation for Economic Co-operation and Development
R&D	research and development
UNESCO	United Nations Educational, Scientific, and Cultural Organization

Executive Summary[1]

This document outlines the strategic framework for the Inter-American Development Bank Group (IDBG)'s engagement with artificial intelligence[2] (AI) in Latin America and the Caribbean (LAC). The IDBG recognizes AI as a potential catalyst for development and economic growth and aims to support innovation and its responsible adoption across the public and private sectors. As the new institutional strategy *Transforming for Scale and Impact* points out, the IDBG can maximize the impact of its work by leveraging new technologies.

AI has the potential to boost productivity and sustainable economic growth. Similar to past technological breakthroughs, the impact of AI will depend on the depth of its use and the extent of its adoption. It can boost productivity by improving decision making, allowing full or partial automation of tasks and processes, and enabling new production models in both the private and public sectors. It can also accelerate the rate of productivity growth by augmenting ideas and hypothesis generation processes for new products and technology development. Given the early stage of development of this technology, the coming years are a window of opportunity for LAC to leverage AI for technological leapfrogging. Implementing public policies that foster a conducive environment for rapid and responsible AI adoption is urgent. This strategic push can foster sustainable economic growth.

AI can accelerate the development of clean energy technologies, helping to combat climate change. AI can reduce emissions and promote sustainability by optimizing energy consumption, agricultural production, and urban planning. Additionally, AI

[1] During the preparation of this work, the authors edited the text using alternatively ChatGPT-4o, Claude 3.5, and Gemini 1.5. After using these tools, the authors reviewed and edited the content as needed. The authors remain exclusively responsible for the content and any remaining errors.

[2] The document relies on the OECD definition of AI: "...a machine-based system that for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments. Different AI systems vary in their levels of autonomy and adaptiveness after deployment."

can help alleviate poverty by improving access to education, healthcare, and financial services in underserved communities, driving economic inclusion. AI-driven analytics can lead to better decision making in areas ranging from supply chain management to disaster risk reduction. AI can also transform the public sector, potentially supporting every stage of the policy cycle and allowing the provision of more and better services (Wirjo et al., 2022). For example, it can make healthcare more predictive, personalized, and ubiquitous, improve educational outcomes through adaptive learning, facilitate better job matches and transitions, enhance security and efficiency in transportation, reduce losses in water and energy provision, accelerate the transition to cleaner energies, expand access to financial services for underserved populations, and improve the allocation of police to reduce crime (Biallas and O'Neill, 2020; Calatayud, Katz, and Riobó, 2022; Calatayud et al., 2022; Silcox, 2020; Urquidi and Ortega, 2020).

It is critical to implement policies to maximize the benefits of AI and mitigate its risks. The uneven distribution of resources between and within LAC countries can make AI diffusion exacerbate inequality. High-performing firms and highly skilled individuals are more likely to benefit from AI, while others risk being left behind, widening the gap between firms and among people. Policies should strengthen AI capacities, which will allow countries to keep pace with global advancements and ensure that firms and individuals with limited resources can effectively adopt and benefit from AI technologies. Furthermore, AI implementation poses risks such as unethical uses of data, expanding social biases, or creating barriers to entry that reduce competition. Not addressing these risks creates problems, as evidenced by the increase in AI incidents reported by the Organisation for Economic Co-operation and Development (OECD).[3] Proper policies can help mitigate these risks, promoting the digital inclusion of citizens and companies,[4] protecting against data privacy violations, and mitigating potential biases in data and AI algorithms.

The IDGB's approach to AI focuses on three interdependent pillars: institutions and governance, data and infrastructure, and people. These pillars aim to drive AI innovation and enable the rapid and responsible adoption of AI in the region's public and private sectors. By leveraging its unique capacity to collaborate directly with governments on public policies, invest in private projects, and engage with startup ecosystems, the IDBG is well-positioned to create enabling conditions tailored to the specific contexts of each country of the region. This strategy prioritizes building robust governance frameworks to ensure ethical AI use, enhancing digital

[3] Incidents reported in the platform have increased 183 percent in the last year. Available at: https://oecd.ai/en/incidents (checked on September 15, 2024).

[4] Mostly providing more segments of the population and micro, small, and medium-sized companies with access to knowledge, skills, computational capacity, and data.

infrastructure and fostering data collection, management, and sharing technologies to spur AI applications, and nurturing a skilled workforce capable of leveraging AI technologies. Together, these pillars will provide the foundations for AI ecosystems that accelerate adoption, enhance productivity, and promote equitable development throughout the region.

The IDBG will pursue a research agenda prioritizing three key areas: impact, obstacles, and governance. These areas tackle significant region-specific knowledge gaps that currently hinder informed decision making. The proposed agenda will strengthen the IDBG's ability to assist policymakers, businesses, and other stakeholders with evidence-based strategies that cater to the different contexts across the region. Moreover, the IDBG will build on the success of fAIrLAC as a platform to promote the fair and ethical use of AI and expand it into a Group-wide coordination mechanism to focus the efforts to mainstream AI across the Bank. fAIrLAC+ will leverage knowledge across the Bank to actively promote intersectoral collaboration and provide the best possible technical support for the implementation of AI strategies, regulations, and solutions in the region. The IDBG will continue to contribute to the global development of responsible and ethical AI frameworks and can adapt global best practices to LAC countries, bridging international expertise with local needs.

1.

The Importance of Artificial Intelligence for Economic and Social Development

AI has the potential to spur growth and become a transformative general-purpose technology (GPT).[5] Its rapid advancements could reshape economies and societies, much like past innovations such as steam power, railroads, electricity, and personal computers (Aschenbrenner, 2024; Roser, 2022). AI shows the same key characteristics as these earlier GPTs: broad applicability across sectors, continuous improvement through data feedback and technological developments, and the capacity to drive downstream innovations (Bresnahan, 2024; Bresnahan and Trajtenberg, 1995; Jovanovic and Rousseau, 2005). Like electricity, which fundamentally changed how organizations operated and led to the creation of new sectors (Landes, 2003), AI has the potential to disrupt industries and generate significant wealth. AI's transformative impact comes from its capacity to enable new and inherently more productive organizational frameworks when more activities become highly predictable (Agrawal, Gans, and Goldfarb, 2022). Unlike previous technologies that primarily enhanced physical labor, AI can augment human cognitive abilities, reshaping occupations and tasks. This extends beyond productivity, with AI potentially altering economic structures, business models, and the distribution of wealth and opportunities (Brynjolfsson and Unger, 2023; Korinek and Suh, 2024).

Data, computing power, and human capital are the main inputs of AI. The production of AI involves designing sophisticated algorithms using advanced mathematical and computer science knowledge, training these algorithms on extensive datasets with powerful computational resources, and applying domain expertise to ensure relevance and practicality. The trained models are then deployed in environments tailored for their operation, where they are continuously improved through further data feedback, analysis, and updates, ensuring they adapt and remain effective over time.[6] Even for adopting and applying AI systems, significant capacity is needed to assess original models and intended use and to scrutinize the training data to ensure its compatibility with a desired application. It also requires re-training or fine-tuning these models on datasets relevant to the new context. Hence, the deployment of effective AI systems requires access to high-performance computing (HPC), large and high-quality datasets, and skilled human capital proficient in AI

[5] As a clarification, this is not the "GPT" acronym popularized in AI by "Chat-GPT," which means Generative Pre-trained Transformer.

[6] The development process also requires specific software and platforms, data storage capacities, high-quality internet infrastructure, and intensive use of energy

technologies (Filippucci et al., 2024). At the core of AI resides a powerful prediction technology that produces high-precision predictions significantly faster and cheaper than before by using complex supervised, unsupervised, and reinforcement learning algorithms capable of self-improving over time (Agrawal, Gans, and Goldfarb, 2022). This fundamental prediction capability, complemented by additional layers of software and algorithms, enables the development of different types of AI applications. For instance, computer vision predicts and identifies features in images, while Generative AI (GenAI) creates new content by identifying patterns in training data and generating outputs based on these patterns and the input it receives.

AI can increase public and private sector efficiency by enabling better decision making, automation, and new business models. AI improves the quality and timeliness of predictions, which can significantly enhance performance in various processes (Jordan and Mitchell, 2015). These predictive capabilities extend to numerous fields, improving everything from weather forecasting and forest fire management to market trend analysis. By interacting with additional layers of software, hardware, and other complementary assets, these predicting capabilities enable the automation of complex processes in the digital and physical world, redefining how private and public sector activities can operate (Brynjolfsson and McAfee, 2014; Estevez et al., 2024).

The ability to predict and automate at granular levels across complex systems also opens resource allocation and value creation possibilities beyond traditional efficiency gains. In essence, AI could not just automate existing processes but enable fundamental changes in how entire industries and public services can be delivered (Agrawal, Gans, and Goldfarb, 2022).[7] For instance, the capacity to provide hyper-personalized medicine, preventive care, and education may allow a significant reorganization of how these services are provided (Luckin et al., 2016a; Topol, 2019). Nevertheless, for those opportunities to materialize, downstream innovations that transform predictive capacity into actionable outcomes are necessary, much as household appliances, industrial machinery, and communication tools have materialized the benefits of electricity (Lo and Sutthiphisal, 2010).

AI is a driver of new inventions and technologies. It can accelerate the rate of productivity growth by revolutionizing the innovation process itself, lowering the

[7] As Agrawal, Gans, and Goldfarb (2022) pointed out, Uber is an early example of how an AI-enabled business model can disrupt an industry. By integrating data such as maps, real-time traffic updates, and GPS with AI to match supply and demand in real-time, and optimize routes, Uber transformed the urban transportation sector. It provided non-experts with expert-level city navigation capabilities, which were once the domain of professional drivers, and consequently, significantly expanded the supply of vehicles in the market.

cost of generating and recombining ideas (Aghion, Jones, and Jones, 2019). AI enhances research and development (R&D) by automating tasks and accelerating the product development cycle (Besiroglu, Emery-Xu, and Thompson, 2024; Bianchini, Müller, and Pelletier, 2022). For instance, AI can rapidly generate and evaluate thousands of design iterations, potentially leading to more innovative and optimized products (Cockburn, Henderson, and Stern, 2019). In scientific research, AI systems can generate more and better hypotheses that reduce testing uncertainty by analyzing vast amounts of literature and data, potentially uncovering connections that human researchers might miss (Agrawal, McHale, and Oettl, 2023). Indeed, early evidence shows that a tailored AI system increased the discovery rate of new materials by 44 percent in a private material science R&D lab in the United States (Toner-Rodgers, 2024). This AI-driven innovation model promises to significantly accelerate the pace of discovery and invention across multiple fields, with other specific systems openly available for drug discovery and biotechnology (Holzinger et al., 2023; Jumper et al., 2021), new materials (Chen et al., 2024; Zeni et al., 2023), and satellite-data applications (Jakubik et al., 2023). The rise of GenAI applications, which provide the capacity to create entirely new digital content for a significant portion of the global population, is automating a considerable part of the creation and innovation process (Marshall et al., 2024).

AI has the potential to increase inclusion and reduce disparities if intentionally designed with equity in mind. For instance, AI systems can help mitigate biases in hiring and lending practices, creating more equitable opportunities for marginalized groups.[8] AI can also personalize education, making learning more accessible for students with disabilities. In healthcare, it improves early disease detection and remote access to care.[9] AI can foster a more just and equitable society by targeting these areas. Furthermore, studies show that AI can help reduce performance disparities, as lower-skilled workers in activities such as law, software engineering, customer service, and professional writing, tend to experience greater productivity gains from AI than their more experienced counterparts (Brynjolfsson, Li, and Raymond, 2023; Manning, 2024).

Diffusion of AI comes with risks. As with every digital technology, the economic benefits that AI adoption offers also come with potential risks (World Bank, 2016). Following Agrawal, Gans, and Goldfarb (2022) classification of value propositions, these risks can be divided into “point risks” and “systemic risks.”

[8] In the financial sector, AI-powered tools offer personalized financial advice and improve credit scoring, making it easier for individuals with limited credit histories to access essential services.

[9] When paired with other technologies such as electronic health records, increased access to internet, and clinical decision support systems.

Point risks are those inherent in individual AI implementations, whereas systemic risks are related to those that may affect society due to the growing adoption of the technology. Based on the AI-specific risks included in the AI Risk Management Framework published by the United States National Institute of Standards and Technology (NIST), it is possible to divide implementation risks into technical risks and use case risks. Technical risks include those related to the development and maintenance stages of AI systems, such as those related to data privacy, biases (IDB and OECD, 2020) (includes a disaggregation of the different types of biases that can occur), AI system maintenance, and the potential impact of their proliferation on climate, among others. Use case risks include those related to the context in which AI systems are used. They include, among others, the opacity or lack of transparency (also known as the "black box" risk), potential side effects that can be generated through the application of AI—including, among others, the de-skilling of humans (as shown by Ahmad et al. 2023) the difficulty in determining the instances in which the system fails, and the unethical use of AI systems.

There are three distinct risks at the societal level that stem from AI adoption: control, concentration, and inequality. Control risk associated with AI systems is the potential for malicious actors to exploit AI technology to manipulate public opinion and influence behavior. This can be achieved through various means, such as deepfakes, targeted advertising, algorithmic bias, and social engineering.

The potential decline in competition in AI-driven markets is a growing concern for several reasons. High upfront costs associated with developing and deploying AI technologies can create barriers to entry for smaller firms, leading to concentration of market power and potential abuse of dominant positions. Access to data (including personal data) in low or unregulated contexts may result in advantages that may affect citizens' fundamental rights and create de facto monopolies in treating such data.[10] This can have significant implications for innovation, competition, and consumer welfare.

The impact of AI on inequality is dual. Just as AI can increase inclusion—as stated earlier in this section—it also has the potential to exacerbate existing gaps with low-income and vulnerable populations. Asymmetries in access to AI input, especially skills, place lower-income segments of the population at a disadvantage (Acemoglu, 2024). Furthermore, AI is increasingly being adopted to automate routine tasks across various industries, threatening jobs across the income spectrum. Moreover,

[10] As of the publishing of this paper, nine IDBG borrowing countries do not have personal data protection legislation. Out of the 17 that do, some have not fully ratified its legislation, and in many cases authorities have not been created and/or have low capacity to deal with AI-related challenges.

as stated above, the AI landscape is a game of few players who also invest significantly more than others to acquire and sustain advantages that may lead to a new "AI divide" (Ahmed et al., 2020; McElheran et al., 2024; Zolas et al., 2020).[11] Without concerted efforts to bridge the digital divide, address skills gaps, and mitigate the negative impacts of automation, AI may widen the gap between the wealthy and the poor, between and within countries.

Early evidence shows that young and highly educated men are using GenAI more intensively than the rest of the population, primarily for job-related purposes (Liu and Wang, 2024). Ghosh et al. (2024), in his systematic review of AI exposure and the labor market, finds that adopting AI technology, whether in a broad or narrow sense, impacts aspects of the labor market such as employment, occupations, earnings, and organization.[12] While AI can lead to increased productivity and economic growth, it may also contribute to job polarization,[13] thereby affecting inequality. Autor, Levy, and Murnane (2003) highlighted the role of technology in substituting routine tasks, typically those associated with middle-skill jobs, thus contributing to job polarization.

AI can intensify this phenomenon, as its capabilities extend beyond routine task automation to encompass more complex tasks traditionally performed by humans (Felten, Raj, and Seamans, 2019). The skewed nature of AI's impact on the labor market is also evident in the LAC region. In Mexico and Peru, 16 percent and 11 percent of jobs, respectively, have a task exposure to GenAI greater than 40 percent, with Chile a little better at 27 percent (Azuara, Ripani, and Torres, 2024; Ahmed et al., 2020; McElheran et al., 2024; Zolas et al., 2020; Gofman and Jin, 2024).

[11] Early evidence suggests that this is also the case in entrepreneurship since funding for startups increasingly depends on the educational level of the founders, with those holding PhDs more likely to secure financing (Gofman and Jin, 2024).

[12] The paper also highlights that the proxies of AI exposure in the literature are quite diverse, and the methodologies employed often yield contradictory and divergent conclusions.

[13] Refers to the growing divide between high-skill, high-wage jobs and low-skill, low-wage jobs, with a diminishing proportion of middle-skill jobs.

2.

Main Challenges in Transforming Artificial Intelligence Opportunities into Concrete Benefits for the Latin American and Caribbean Region

Artificial intelligence presents a unique opportunity for the LAC region to accelerate its economic, social, and technological development. By pursuing ambitious and flexible AI adoption strategies and by being open to experimentation and innovation, the region can potentially bypass traditional development pathways and achieve progress faster than would have been possible through previous technologies. The efficiency gains can help LAC industries catch up with global leaders in productivity levels. As AI spreads across the region, it can catalyze the emergence of locally tailored innovations that address specific regional challenges, potentially positioning LAC at the forefront of certain AI applications. Moreover, AI could significantly accelerate R&D in the region, helping to close the innovation gap (Crespi, Navarro, and Zúñiga, 2010; IDB, 2014. By applying AI to public services, LAC countries can address longstanding social issues more effectively, improving access to quality education, healthcare, and financial services for underserved populations. However, these gains are far from automatic. To seize these opportunities, the region needs to invest in developing the capacities that enable broad and rapid adoption.

There is a risk of falling behind when AI is being adopted globally at a fast pace. Although only a few companies have developed the latest significant AI push in even fewer countries, AI is already present in every country in the region (AlShebli et al., 2022; Dernis et al., 2019; Klinger, Mateos-Garcia, and Stathoulopoulos, 2021; Liu and Wang, 2024). Indeed, Comin and Mestieri (2018), studying the diffusion of 25 major technologies in the last 200 years, highlight that the lag in technology adoption between poor and rich countries has narrowed. However, the divergence in the intensity of use of these technologies has increased. This difference in the technological penetration rate explains nearly 75 percent of the current differences in income per capita between countries. The enabling conditions present in every country, region, sector, and organization, known as their absorptive capacities (Cohen and Levinthal, 1990), determine the intensity of technology use. These capacities enable economies to adopt new technologies and integrate and leverage them, significantly impacting performance. Countries with higher capacities will perform even better by adopting and developing AI technologies more intensively, thus increasing inequality between countries. Without developing adequate absorptive capacities for adopting AI, the wealth gap between the LAC region and high-income economies will increase (Freire, 2025; Verspagen, 1991).

The region needs to be ambitious to seize the benefits of AI. The starting point, however, is far from ideal. On average, LAC countries with the highest AI capacities are far below the global leaders, outpacing only Africa.[14] This context highlights the importance of strategic investments to advance significantly on two complementary and mutually reinforcing fronts:

"Do More": Boosting AI Enablers

The LAC region must invest in key AI enablers. Increasing regional capacities for AI adoption means ensuring access to HPC resources and expanding the availability of large and high-quality datasets, both of which are essential for training AI systems. This can be achieved through policies that optimize the use of local and cloud-based computing resources, support privacy-preserving open datasets, promote extensive data collection through different types of sensors across economic activities, and foster the building and management of robust sharable large databases. A strong skills and human capital pool is critical, with shortages in AI-related skills posing major hurdles for firms and government agencies. Concentrated in specific countries and sectors, AI top talent often comes from universities with strong research programs. Continuous investment in AI R&D from the public and private sectors is crucial. The presence of appropriate human capital and a conducive environment for general inventive activity played a crucial role in fostering crossover inventions and the diffusion of electrical technology, highlighting the importance of nurturing these factors for the case of AI as well (Lo and Sutthiphisal, 2010).

The LAC region faces significant challenges in the key factors behind AI adoption. According to the Global AI Index (Tortoise, 2023), LAC ranks sixth among nine analyzed regions in level of implementation, innovation, and investment in artificial intelligence. It averages 41.5 out of 100, far below the United States and Canada. Other indices, such as the IMF's AI Preparedness Index (AIPI) (IMF, 2024) and the Latin American AI Index (ILIA) (CENIA, 2023), further corroborate this gap. The size of these gaps varies, with weaknesses in innovation and human capital more pronounced than in infrastructure. Nevertheless, the heterogeneity within the region depicts countries with different combinations of challenges in developing their AI ecosystems. Within LAC, Brazil, Chile, and Uruguay lead in AI readiness, while Haiti, Venezuela, and Nicaragua lag far behind.

[14] The Global AI Index measures these capacities in three aggregated variables: (i) Implementation, which measures talent, infrastructure, and the operating environment; (ii) Innovation, which measures research and development; and (iii) Investment, which captures government strategies and commercial expenditures on AI. Only Argentina, Brazil, Chile, Colombia, Mexico, and Uruguay are included in this index.

Infrastructure for AI in LAC needs to catch up to the top countries. This represents cost barriers for firms and entrepreneurs, especially for developing complex models relevant to the local and regional context. The AIPI scores LAC's digital infrastructure at 0.1 out of 0.25, notably lower than the 0.18 average in advanced economies. The ILIA's infrastructure dimension, which includes internet usage, download speeds, 5G implementation, mobile subscriptions, data centers, and supercomputers, shows an average score of 51.2 out of 100 for LAC. Chile (71.3), Brazil (62.3), and Argentina (59.3) lead the region, while Paraguay (32.9), Bolivia (33.4), and Ecuador (38.0) are behind. Specifically, the regional average for households with computers is 29.2 points, with Uruguay (68.7 points—representing 69.5 percent of households with computers), Argentina (61.5 points; 62.6 percent of households), and Chile (59 points; 60.2 percent of households) leading the region, while Honduras and El Salvador remain below 14 points. These figures are below the 83.1 percent of households with computers observed in the United States (CENIA, 2024). In the adoption of the IPv6, a more recent version of the internet protocol (IP) that allows for a growing number of internet-connected devices compared to its predecessor, the region is closer to top countries. The United States has 48.9 percent of its users accessing Google over IPv6, while Uruguay leads in LAC with 52.6 percent, followed by Brazil (50.6 percent) and Mexico (50.5 percent). Venezuela is at the bottom with 2.9 percent.

The HPC landscape highlights a significant challenge, as the region is far behind the global leaders. While Brazil leads with 8 out of the 41 HPC platforms identified in the region, the rest of the countries lag significantly behind (Barrios Hernandez, Wolowick, and Torres-Niño, 2024). This gap hampers regional collaboration and widens the distance between the region and global leaders in HPC, limiting advancements in scientific research, innovation, and economic development. Furthermore, the limited integration of regional HPC initiatives underscores the challenges in resource sharing and coordinated development. Only 11 out of 29 institutions in the region are connected to collaborative networks like the Advanced Computing System for Latin America and the Caribbean (SCALAC) (Barrios Hernandez, Wolowick, and Torres-Niño, 2024). Investments in HPC infrastructure are needed to bridge this divide, harness AI's transformative potential, and promote regional cooperation. Complementary to these investments, Chile leads in the presence of secure internet servers, with 12,791 secure servers per million inhabitants, followed by Argentina (3,686) and Brazil (3,078 servers), while the regional average is around 1,300 servers per million inhabitants.

Regarding the data ecosystem, the region is still at an early stage of development. Much information in the region is still paper-based, and ongoing efforts to digitize processes and historical records are expected to continue in the coming years. According to the ILIA, Brazil leads the region with a score of 53.6 out of 100, followed by Colombia (51.7) and Uruguay (50.8). However, countries like Bolivia (20.8) and

Costa Rica (30.5) are significantly behind. In the Government AI Readiness Index's data availability indicator, Brazil scores 71 out of 100, while the United States achieves 80.7, indicating room for improvement even for regional leaders. LAC countries included in the Global Data Barometer (2022) scored 34/100 in the Governance pillar, compared to 79 for Korea and 77 for Spain, reflecting the lack of clear institutional arrangements regarding data policies. An example of this is personal data protection, where out of the 26 IDB borrowing countries, 17 have passed personal data protection legislation. Not all legislation includes the provisions listed above: a study carried out by the IDB mapping all existing legislation to the Iberoamerican Personal Data Protection Standards[15] shows a broad range of alignment across countries, with only 5 of them containing specific provisions for automated decisions in their laws. Implementation of the law has been limited: not all countries have set up the authorities required by law, and some of them do not have enough technical staff to manage new technologies such as AI.[16]

Advanced human capital remains a critical challenge for the region. The ILIA reports an average score of 37 out of 100 for the region in this dimension, which evaluates the development of the necessary skills for the AI ecosystem through indicators such as early AI education, number of STEM graduates, technological skills in the workforce, and master's and PhD programs in AI. Based on LinkedIn data, the relative penetration of AI skills in the region averages 0.1 percent of the population, significantly below the global average of 0.32 percent. Only six countries exceed the regional average: Argentina, Costa Rica, Chile, Colombia, Mexico, and Uruguay. Only three countries offer PhD programs in AI at universities ranked in the QS World University Rankings: Brazil, Mexico, and Chile. Global disparities are also evident in the Global AI Index's talent indicator, which measures the availability of AI scientists, data scientists and engineers, and developers contributing to AI projects on GitHub, on which Brazil scores 12 and Argentina 7, compared to the United States' maximum score of 100.

The early and limited evidence on AI adoption in firms suggests gaps between the region and more advanced economies. In the manufacturing industry, the rate of adoption of AI was 12 percent in the United States in 2017, double the 6 percent adoption rate of Colombian firms in the same sector in the period 2019-2020 (Herrera Giraldo et al., 2024; McElheran et al., 2024). When the definition of AI is restricted to machine learning only, the figure was around 1 percent in Argentina and Colombia (Vargas, Pereira, and Molina, forthcoming), a third of the observed across all sectors in the United States in 2017. In addition to the differences in adoption between

[15] Available at: https://bit.ly/data_protection_LAC

[16] https://www.redipd.org/sites/default/files/2022-10/estudio-capacidades-institucionales-autoridades-de-datos-personales-y-privacidad.pdf

countries, firm-level studies are identifying significant disparities in adoption between sectors and regions based on capacities, such as the availability of human capital and other intangible assets.

"Do Better": Promoting Fair and Responsible Artificial Intelligence Deployment

The LAC region has spearheaded efforts within the international community to create awareness about the risks of AI and develop ethical and responsible principles and guidelines for implementation. In April 2019, the IDBG launched fAIrLAC, a pioneering partnership among the public and private sectors, civil society, and academic institutions, to promote the responsible and ethical use of AI across the region. The program produced several analytical pieces documenting best practices such as algorithmic audits and data governance reference frameworks, raised awareness on data biases in training models, and helped implement pilot AI projects, mainly in the social sector.

The OECD launched its AI principles in May 2019, with 46 countries committed to them (7 from LAC). United Nations Educational, Scientific and Cultural Organization, on the other hand, led in 2021 the adoption by all 194 member countries of its Recommendation on the Ethics of Artificial Intelligence and is currently carrying out a "Readiness Assessment Methodology" in several countries around the globe. The organization has also developed several tools to assist AI implementation teams in identifying opportunities to improve their projects. The Secretary-General of the United Nations convened an AI Advisory Body in October 2023, which will present its final report this year.

Despite these efforts, the region still needs to translate the high-level principles proposed by international organizations that most countries have endorsed and committed to into concrete and clear policies and guidelines. Current efforts in the region are still plagued with unclear but well-intended policy documents and national strategies that do not provide clarity considering conflicting or outdated regulations, nor do they fully reflect the specific challenges that low and middle-income countries in the region face. In fact, according to the Global Index on Responsible AI, a multidimensional tool measuring progress towards responsible AI in 136 countries (including 23 countries from the region), Brazil, Chile, Costa Rica, and Uruguay are more advanced, albeit with relatively low scores regarding global leaders.

It is important to reduce the skills gaps between and within countries. AI diffusion risks increasing wealth and income inequality by disproportionately rewarding individuals and companies with greater access to resources and skills. Additionally,

AI-driven automation could make certain tasks disposable and displace or alter jobs and companies that do not adapt. This can contribute to job polarization, affecting employment and earnings structures. The pervasiveness of AI may increase the vulnerability of sensitive systems to cyberattacks and international threats.

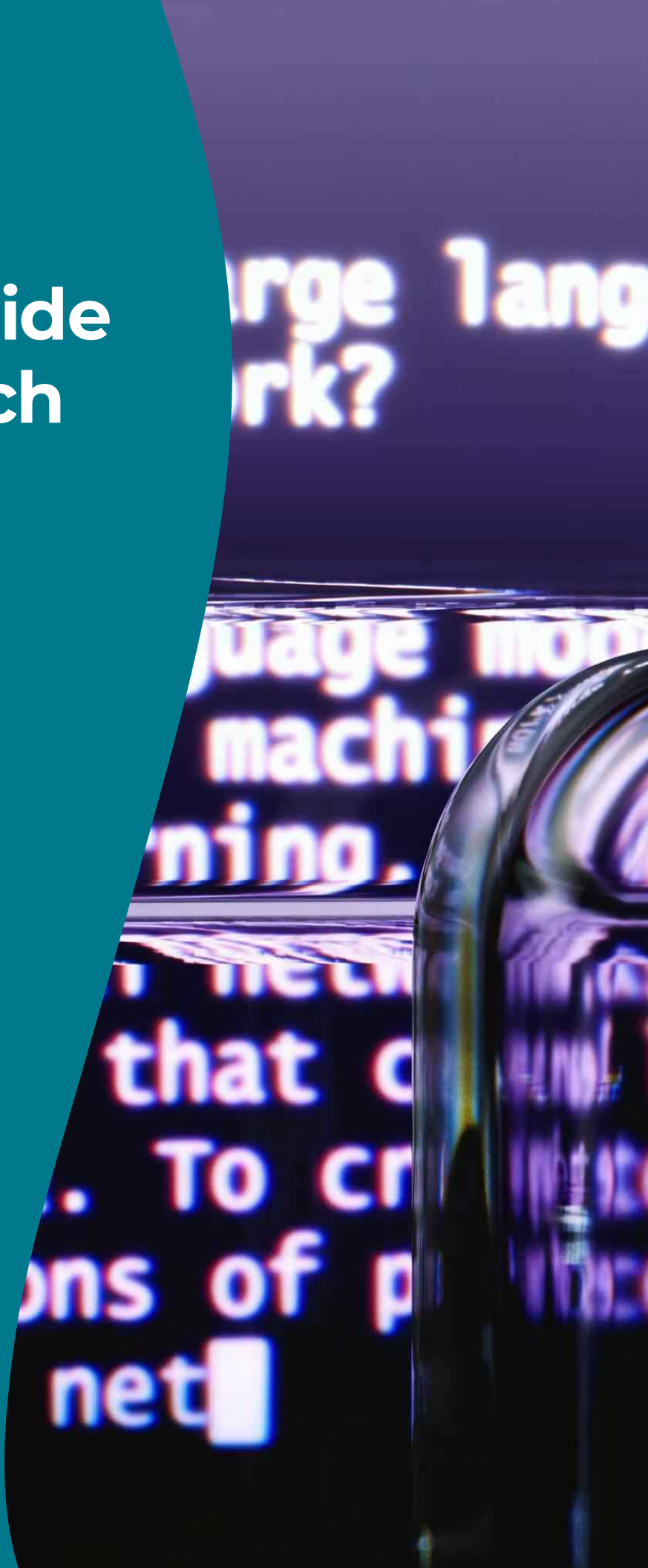
How can an ethical and responsible use of AI be assured while not hindering AI diffusion and innovation? Adequate regulation can be an enabler of innovation and competition if it is flexible and improves market certainty. Clear rules on personal data utilization, for example, may increase citizens' willingness to share their information and provide companies with clear guidelines on how to process and manage consent. Regulatory sandboxes, spaces where new technologies can be tested and scrutinized, can provide win-win environments for regulatory certainty and business innovation. For all this to happen, institutions in charge of AI regulation need technical staff that understand these tradeoffs, can enforce these regulations, and can monitor compliance.

Data policies need to be in place and enforced. With the digitization of the economy, data created is unregulated in many countries, exposing individuals to harm and allowing incomplete databases with low-quality data to inform decisions that can seriously impact people's lives. Data protection legislation should be enacted across the region and reviewed constantly, while data governance practices should be implemented in the public sector and promoted in the private sector to increase the quality of data being used. In the public sector, open data needs to be seen as a potential tool to improve the quality of data for segments of the population with a relatively low digital footprint. Finally, data collaboration between the public and private sectors should be fostered to improve innovation and reduce potential harm.

While promoting AI diffusion and adoption, it is important to ensure fair and responsible use of the technology. There are different risks involved in the implementation of AI systems, at the "point" and "systemic" levels. Some AI implementations can, for instance, breach the privacy of citizens, amplify biases or outdated behaviors embedded in data, be unable to explain its recommendations, produce unexpected side effects, or be used unethically. Moreover, at a broader level, AI could enable market and societal control, inequality, and consolidation. To reduce these risks and lean toward better implementation of AI, governments and the private sector need to understand these risks while fostering, promoting, and adopting the technology, and prepare their institutions and officials to implement and enforce relevant regulations. For example, data needs to be assessed in terms of its relevance, representativeness, and potential implicit bias. Access to data and HCP needs to consider expanding its user base to reach all segments of society, and training and upskilling should also be accessible to all.

3.

Pillars to Guide the Approach to Artificial Intelligence



The IDBG's strategic focus will center on three pillars that enable rapid development and diffusion of AI in the region while mitigating the risks: (i) institutions and governance, (ii) data and infrastructure, and (iii) people. Recognizing the pervasive nature of AI, this approach prioritizes fostering innovation and public and private sector adoption through investing in key enablers and framework conditions. Initiatives will be tailored to each country's specific context and current conditions, ensuring flexibility to address specific challenges and allowing continuous adaptation to the evolving nature of AI technology.

Institutions and Governance

Robust institutional frameworks and governance mechanisms are essential to guide responsible AI use and promote investment. By establishing clear institutional and governance arrangements, rules, and guidelines, governments can create an environment that encourages innovation while upholding ethical standards and societal norms.

Recommended initiatives include comprehensive AI governance frameworks that align with national development priorities while following ethical standards. These frameworks should outline responsible AI development, deployment, and regulation principles, emphasizing data governance, algorithmic transparency, and fairness. They should incorporate guidelines to address critical issues such as mitigating algorithmic bias, ensuring explainability of automated decisions, and maintaining human oversight and control over AI-driven processes. Independent AI ethics boards may be necessary for providing ongoing oversight, offering recommendations, and ensuring that frameworks evolve with technological advancements. Regular reviews and updates are essential to maintain their relevance and effectiveness in guiding ethical and fair AI practices across the public and private sectors.

Clear institutional arrangements need to be in place. Even though most countries are still in the implementation phase, some models are starting to emerge. For example, to implement the AI Act approved in May 2024 and published in the *Official Journal of the EU* on July 12, 2024, European countries are following one of three models: (i) the creation of a new agency in charge of AI (Spain created the agency in 2023 and began operations in May 2024); (ii) distributing responsibilities among existing agencies (a draft law in Italy tasked the Digital Agency and the Cybersecurity Agency with this responsibility); or (iii) designating the Data Protection Authority as the institution in charge of AI (France). Other governments are also relying on existing institutions for the implementation of their AI strategies (United Kingdom) or are developing a sectoral framework where each sector will have more responsibilities (Singapore). Lastly, in some countries specific sectors have taken

the lead: in the United States, the Food and Drug Administration has published its approach to AI,[17] while other sectors, such as education, are facing growing demand for sector-specific regulation.[18] These myriad institutional arrangements show the importance of building entities capable of enforcing regulations to govern AI development and use. LAC countries could follow any of these or new institutional arrangements in accordance with their own needs and goals.

Regulatory frameworks for AI must balance fostering innovation and protecting individual rights and societal interests. These should encompass comprehensive privacy regulations governing data collection, storage, and usage in AI applications, alongside fair use policies to prevent discriminatory practices in sensitive areas. A clear liability framework is crucial to delineate responsibilities among AI developers, deployers, and users when autonomous systems fail or cause harm. Given the complexity and dynamism of the industry, new regulatory models that provide more agility and technical acumen to traditional government institutions could be explored.[19] Additionally, intellectual property laws need adaptation to address AI-generated inventions and creations, incentivizing innovation while guarding against monopolistic practices. The predictability of regulations and IPR laws can further enhance innovation by providing a stable framework for businesses and creators to operate with confidence, fostering a more dynamic ecosystem for AI-driven advancements. These interconnected regulatory aspects should provide certainty for businesses investing in AI technologies while safeguarding consumer rights and promoting ethical AI development and deployment. To reduce the regulatory burden on AI systems, some countries and regions (notably, the EU under its AI Act) are adopting a "risk-based" approach, cataloguing AI systems according to the potential impact they will have in terms of their point risks. In the case of the EU, AI systems can fall into one of four risk levels: minimal, limited, high, or unacceptable. deemed to be unacceptable (e.g., those aimed at manipulating or exploiting individuals) are prohibited, while those that fall under the "minimal" category can be deployed since they convey little or no risk to people's rights or safety. Limited and high-risk systems are subject to different compliance mechanisms that, while they may imply additional costs, are considered necessary to mitigate the potential harm.[20]

[17] Available at: https://www.fda.gov/medical-devices/software-medical-device-samd/artificial-intelligence-and-machine-learning-software-medical-device

[18] See for example https://www.unesco.org/en/articles/unesco-governments-must-quickly-regulate-generative-ai-schools and https://rm.coe.int/regulating-artificial-intelligence-in-education-26th-session-council-o/1680ac9b7c

[19] See, for example, Hadfield and Clark (2023). Additionally, BIDLab has recently approved a project to support the implementation of an industry-led certification standard for Responsible AI.

[20] A similar approach, for example, is currently being implemented by IDB Lab, whereas potential beneficiaries leveraging AI systems are first assessed in terms of the potential risks their tools convey, with different compliance requirements depending on the outcome of the evaluation.

To mitigate the risks of market concentration, policymakers should consider implementing measures to promote competition, such as antitrust regulations, data collaboration mechanisms (Kalkar and González Alarcón, 2023) such as open data initiatives, and investments in R&D to support smaller firms. This will help ensure that AI benefits society, rather than being concentrated in the hands of a few powerful companies.

Significant capacity building within government institutions is essential to implement and enforce these regulations and develop these guidelines effectively. Training programs for public officials should cover technical aspects of AI, ethical considerations, and policy implications. This will enable informed decision making, development of appropriate regulations, and effective oversight of AI initiatives across various government departments.

The LAC region would benefit from a united approach to AI governance and institutions by promoting coordination and collaboration and avoiding fragmentation. A coordinated strategy would enable countries in the region to pool resources, share expertise, and develop common frameworks to address the specific challenges that the region faces, driving innovation and enhancing competitiveness. By working together with other regional stakeholders, the region can harmonize regulations and create unified rules across borders, and governments can reduce regulatory barriers and foster a stable business environment. This includes aligning policies on data protection, intellectual property, and ethical AI use, as well as opening markets for AI-driven goods and services.

This regional approach should also account for the specific needs and cultural particularities of LAC. Tailor-made policies can ensure that AI applications align with local values, socioeconomic conditions, and key industries. At the same time, multilateral collaboration with regional and global partners and alignment with global AI standards are essential for ensuring safety, ethical development, and participation in the global AI landscape. Coordinating AI governance at the regional level while engaging with international frameworks will help the region secure its role in shaping the future of AI globally.

Data and Infrastructure

A robust data and digital infrastructure provide the backbone for AI technologies to function effectively. To accelerate AI diffusion, initiatives that contribute to developing conditions that promote the use of data collection technologies and efficient data sharing, including ambitious and comprehensive digitization of records and open data policies, should be prioritized. In the public sector, data governance

initiatives need to be put in place to ensure seamless integration of high-quality data across systems, establishing semantic and syntactic interoperability standards, and including cybersecurity policies to safeguard data integrity and protect against breaches. Policy should focus on creating a regulatory environment that encourages competition and innovation in digital infrastructure, such as reducing barriers to entry for new players in the data center and connectivity markets and ensuring fair access to essential facilities. The policy should also optimize data localization requirements, using cloud technologies and providing certainty on data transfer regulations, and establishing guidelines for cloud service providers. Governments need to ensure that critical areas such as health and education have access to proper infrastructure and equipment to deploy AI applications in an equitable manner geographically and socially.

It is critical to promote robust data management practices and spur domestic data-sharing ecosystems. The intangible nature of data and the potential for significant positive externalities calls for policy action. Public policy should prioritize the development of legal frameworks that clarify data usage rights and facilitate data-sharing agreements. This involves establishing standardized data protocols by developing universal data formats and implementing common APIs to ensure compatibility and seamless data exchange across industries. Encouraging the creation of industry-specific data pools and cooperatives allows companies to share non-competitive data to address common challenges, supported by legal frameworks that enable safe and compliant data sharing.[21] Creating incentives for organizations to share high-quality data through data collaboratives, such as reciprocal data access agreements or regulatory benefits for data-sharing participants, can help overcome reluctance to share valuable information. Establishing trusted intermediaries or data trusts can manage data sharing while protecting privacy and intellectual property rights (Kalkar and González Alarcón, 2023).

It is important to promote safe and seamless cross-border data sharing. Facilitating cross-border data can provide more diverse and large-scale datasets that enhance the accuracy and effectiveness of AI systems. Access to data from different regions allows AI to generate globally relevant insights, fostering innovation. However, the free flow of data must be balanced with the need to protect privacy, ensure security, and address ethical concerns. LAC countries should coordinate policies and establish complementary data protection, cybersecurity, and transparency standards, preventing regulatory fragmentation and ensuring globally competitive and ethically responsible AI development.

[21] The IDB and PAHO's 'Pan American Highway for Digital Health' initiative illustrates regional initiatives for this end.

The role of the public sector should be to provide high-quality datasets in activities with extensive public data collection and sufficient capacity. Through the publication of data with open licenses (or through ad-hoc collaborations when needed), the use and reuse of public data can create innovative solutions. Moreover, governments can improve the representation of vulnerable populations by publishing data that includes them. However, to do this, the public sector needs to create data governance mechanisms and invest in increased digitalization that guarantees data quality and promotes a data culture within public institutions. Implementing a tiered approach to government data, making non-sensitive public sector data openly available, and creating controlled access mechanisms for more sensitive datasets can set a positive example for the private sector.

Providing affordable access to HPC resources for academic research and early-stage technology development has high potential for widespread positive externalities. Public-private partnerships can facilitate the provision of HPC capabilities oriented toward projects with high societal impact, such as climate modeling and drug discovery for neglected diseases. Implementing grant and prize programs can lower the cost of HPC utilization for researchers and startups, encouraging more widespread use in fields that contribute to the public good. Financing shared HPC facilities and promoting collaborative platforms can also enhance accessibility, allowing multiple organizations to benefit from advanced computing power without significant individual investment.

Closing the connectivity gap in LAC is critical for widespread AI adoption and its shared benefits. The digital divide in the region presents a significant barrier to AI implementation and risks exacerbating existing socioeconomic inequalities. Public policy should prioritize expanding high-speed internet infrastructure, particularly in rural and underserved areas. Implementing regulatory frameworks that promote competition in the telecommunications sector can help reduce costs and improve service quality. Creating community-based internet access points and supporting the development of local digital content can further drive adoption. Increasing connectivity is critical for enabling more people to use AI applications, expanding the market for AI firms and ensuring equitable access to AI-enhanced services such as education and healthcare.

People

Nurturing human capital is essential for developing AI systems and facilitating their adoption. A comprehensive strategy to increase the availability of skills at different levels is critical for ensuring widespread integration of AI technologies into the private and public sectors and for fostering AI-driven innovation. This begins with

strengthening early education, building a strong foundation for future STEM skills, and developing critical thinking capacities. At the K-12 level, curricula should more intensively promote basic data literacy and problem-solving skills. Continuous learning opportunities should be provided for adults to adapt to the evolving demands of an AI-driven economy.

Investing to increase the pool of advanced human capital is critical. This involves strengthening educational programs in data sciences, mathematics, and other STEM fields at the vocational, undergraduate, and postgraduate levels, establishing and funding domestic PhD programs and dedicated research centers focused on AI that can develop the required high-level expertise within the country, and encouraging tertiary educational institutions to develop interdisciplinary programs that combine AI technical skills and domain expertise. Collaboration between academia and industry can ensure that curricula remain relevant to real-world AI applications. Attracting international AI talent through diaspora engagement strategies and initiatives incentivizing global collaboration can expand the domestic talent pool. Offering grants for international research projects, streamlining visa processes for AI professionals, and fostering innovation hubs with advanced technological environments can make the country more attractive to local and international experts.

Retraining and enhancing the existing workforce can promote widespread AI adoption. Governments should incentivize large-scale training programs that allow workers to acquire AI-related skills, focusing on practical applications within their industries. These programs should cover technical skills and emphasize critical thinking and problem-solving abilities that complement AI technologies. Developing management skills for AI adoption is often overlooked but crucial for AI implementation. Tailored training programs for business and government executives should be implemented to help them understand AI capabilities, limitations, and strategic implications. By encouraging better-informed decision making at this level, these organizations will be more able to integrate AI and manage the needed organizational change effectively. For information and communication technology (ICT) and e-commerce exporters, specific training programs can improve their ability to utilize AI for process automation, customer personalization, and market expansion. Small and medium-sized enterprises (SMEs) should be empowered with the necessary skills and knowledge to ensure they can compete globally and drive innovation in their respective sectors.

AI literacy across the population is needed for the widespread adoption and effective use of AI technologies. This goes beyond awareness to include a basic understanding of AI concepts, capabilities, and limitations. Educational initiatives at all levels should

introduce appropriate AI concepts and hands-on experiences with AI tools to highlight the opportunities and pitfalls, emphasizing those that provide a friendlier interface to everyday tasks such as large language models (LLMs).

These three pillars form a comprehensive foundation for accelerating AI adoption and fostering innovation in LAC. They are interdependent and mutually reinforcing: (i) strong institutions and governance provide the regulatory framework and ethical guidelines necessary for responsible AI development; (ii) robust data infrastructure enables the collection, sharing, and utilization of high-quality data essential for AI applications; and (iii) a skilled workforce is crucial for developing, implementing, and managing AI technologies across various sectors. Each of these pillars addresses a specific domain of AI implementation and supports the others, creating a dynamic and integrated system that promotes effective and sustainable AI adoption. The IDBG will focus on these pillars to target three key objectives: promoting the integration of AI in the public sector to improve efficiency and service delivery, accelerating AI adoption into the private sector to boost efficiency and productivity, and fostering an innovation ecosystem that encourages the development of novel AI solutions tailored to local and regional needs.

Artificial Intelligence Framework for the Inter-American Development Bank Group

Table 1. **Framework for Specific Interventions: Pillars and Focus Areas**

Focus areas \ pillars	Institutions and governance	Data and infrastructure	People
Public sector adoption	- Support AI legislation ensuring accountability. - Enhance institutional frameworks for AI strategies. - AI for streamline trade and investment processes. - Enhance regulation to expand broadband coverage.	- Personal data protection legislation for AI systems. - Improve public data quality via digitization. - Support data acquisition to feed policies. - Enhance public sector data management. - Promote access to cloud data and HPC services. - Ensure public services access to AI infrastructure.	- Educate decision-makers on AI potential and risks. - Training on using AI across the policy-making cycle. - Build skills for public sector AI implementation. - Foster trust in AI tools among stakeholders. - Train officials to use AI in their specific sector.
Private sector adoption	- Promote standards and regulatory compliance. - Support certification for transparency and fairness. - Identify and develop sector-specific regulations. - Coordinate regional AI regulations. - Facilitate adoption of AI standards. - Fix sectoral coordination failures hindering AI adoption. - Improve regulation for faster, affordable connectivity.	- Develop trustworthy digital public infrastructure. - Ensure access to HPC and expertise. - Promote data governance and protection literacy. - Encourage private investment in AI infrastructure and connectivity. - Harmonize data governance through trade agreements.	- Tailored AI training for entrepreneurship ecosystem actors. - Upskill exporters to integrate AI technologies. - Expand AI training supply through partnerships. - Train firms in navigating AI regulations. - Retrain workforce to leverage AI applications. - Introduce AI concepts in early education.
Innovation	- Sandboxes to develop AI regulation with stakeholders. - Encourage PPPs and engagement with civil society. - Review IP rules for AI content. - Address AI innovation financing obstacles. - Remove sectoral entry barriers for AI-driven startups.	- Share public data through Open Data. - Ensure reliable access to HPC resources. - Develop participatory multi-stakeholder data initiatives. - Enable multimodal data generation conditions. - Create public data lakes for AI. - Incentivize data sharing ecosystems for innovation. - Implement data sharing mechanisms for proprietary data. - Provide digital infrastructure for advanced AI research.	- Strengthen AI research centers training scientists. - Foster participation of civil society in AI projects. - Invest in domestic PhD programs for AI. - Finance international mobility programs for AI talent. - Support programs to develop general AI skills. - Engage skilled diaspora for regional AI projects.

Source: Authors' elaboration.

4.

Determinants and Lessons for Artificial Intelligence Adoption: Insights from the Literature and Lessons from Experience

Challenges in generating evidence on AI adoption and impacts. Despite the growing importance of AI for economic development, there is a lack of rigorous evidence on both the determinants of AI adoption and its impacts, especially in countries that are not at the forefront of AI. Key challenges in generating knowledge on AI diffusion include: (i) the absence of standardized, reliable, and comparable data on AI adoption and use across sectors and countries; (ii) the early stage of the technology, making it difficult to conduct long-term impact studies; and (iii) limited data availability capturing AI implementations in firms. While some evidence on AI adoption and impacts has emerged from high-income countries, local evidence is crucial for effective policies. The region possesses challenges related to technological readiness, skills gaps, and regulatory environments that may limit the direct applicability of lessons from contexts closer to the technological frontier. This section presents evidence from related policy domains and draws lessons from IDBG projects aimed at improving framework conditions, as well as from projects implementing AI technologies, offering insights for AI policymaking.[22]

Enablers of Technology Adoption

Investing in relevant infrastructure plays a crucial role in technology adoption. Studies have shown that better infrastructure conditions enhance a region's absorptive capacity for new technologies, leading to faster convergence and growth (Alexiadis and Tomkins, 2010). In the electric vehicle market, the availability of charging stations significantly impacts adoption rates, highlighting the importance of early infrastructure provision (van Dijk et al., 2022). For agricultural technologies, infrastructure such as irrigation systems network, accelerates adoption among farmers (Astorga-Rojas, 2024, Salazar and Lopez, 2017). Good quality digital infrastructure drives business digital transformation. Indeed, having fiber optic broadband is a prerequisite for the adoption of cloud services or AI (Calvino and Fontanelli, 2023; DeStefano et al., 2023).

Better connectivity promotes the adoption of digital technologies. Both penetration rate and average speed access are related to a higher use of GenAI globally (Liu and Wang, 2024). Empirical evidence in high-income countries is clear: the increase in broadband adoption and its speed between 2002 and 2014 contributed to a 5.5 percent increase in GDP in OECD countries (Koutroumpis, 2019). In general, the benefits of high-speed broadband internet access policies in terms of economic growth and productivity are substantial although subject to diminishing returns beyond a

[22] IDBG lessons learned are primarily drawn from projects in the Social and Infrastructure sectors, as well as collaborations with startups through the IDB Lab. Additionally, the IDBG has extensive experience supporting governments in improving the availability of public goods and creating better framework conditions, with lessons that can be applied in the context of AI policy.

certain level of broadband quality (Briglauer et al., 2024). There is also evidence that promoting competition in telecommunications markets leads to a reduction in prices paid by end users. Genakos et al. (2018) show that in mature OECD markets, an additional competitor is linked to an 8.6 percent reduction in price (ranging from 7.9 percent to 15.9 percent). While the region has made progress, broadband access remains limited, leading to an adoption pattern where advanced technologies coexist with obsolete ones (Garcia-Murillo and Rendón, 2009). This digital divide exists both between and within countries, with large firms generally having better access than SMEs (Gallego, Gutiérrez, and Lee, 2015). Implementing telecommunications reforms and regulatory policies effectively can improve connectivity by reducing costs and improving access. Government initiatives and public-private partnerships are necessary to close this gap (OECD and IDB, 2016).

The availability of data is crucial for the adoption of emerging technologies. The importance of data is particularly evident in AI, where substantial volumes of high-quality data are essential for effective training and inference. The rise of data as a critical input has prompted firms to engage in data-driven innovation, requiring them to adopt ICTs, invest in intangible assets, and incorporate relevant skills. A significant trend in recent years has been the shift toward digital and connected products, which provide a direct link to users and create opportunities for firms to leverage user-related data for continuous innovation. Empirical evidence from France, Italy, the Netherlands, and Sweden underscores the positive correlation between firms' use of big data analysis and their innovation in product, process, marketing, and organization (Gierten, D. et al., 2021). Indeed, firms that benefit from open government data policies tend to show higher product diversification (Farhadloo et al., 2024).

Increased human capital availability facilitates technological development, innovation, and growth. STEM graduates positively impact GDP growth and patent intensity in U.S. states and metropolitan areas (Winters, 2014). The number of STEM graduates in a country correlates with its GDP growth rate and patent output (Podobnik et al., 2023). Insights from the electricity diffusion process highlight the importance of human capital in promoting the adoption and integration of electricity into new inventions (Lo and Sutthiphisal, 2010). Babina et al. (2023) have explored the link between STEM workers and AI adoption and find that companies that initially have a higher share of skilled workforce and a greater emphasis on STEM workers are more likely to invest in AI. At the same time, firm-level growth in AI investments is associated with an increase in the proportion of workers with university and advanced degrees and a greater increase in the proportion of workers with STEM background. Recent evidence for Argentina (Vargas, Pereira, and Molina, forthcoming) shows that AI adoption in manufacturing firms is positively associated with the proportion of STEM workers.

Regulation and Obstacles to Technological Development

The development of robust and adaptable regulatory frameworks is essential to foster the responsible and effective adoption of AI. These policies seek to establish clear rules for the development, implementation, and use of AI systems, addressing issues such as data privacy, algorithmic responsibility, transparency, and fairness. The expectation is that well-designed regulatory frameworks will contribute to increased confidence in AI technologies, potentially increasing their adoption and economic impact. However, there are also warnings that overly restrictive regulations could reduce AI adoption in some sectors. In the case of ICT, a 10 percent increase in the ITU Regulatory Tracker, a measurement of good regulatory quality, leads to a 0.37 percent increase in the Digital Ecosystem Development Index in North America and 0.31 percent in LAC (Katz and Callorda, 2019).

Data privacy regulations can have unintended consequences. Implementation of personal data protection and its effect on the market could provide interesting lessons for future implementation of AI-focused regulations. Moreover, most personal data legislation includes provisions for human intervention in automatization that affects individuals, the need for explainability of automatized decisions, and the security of personal data, all strictly related to AI systems.[23] Some studies show that the General Data Protection Regulation (GDPR) has reduced firms' ability to collect (non-personal nor sensitive) consumer data, impacting profitability, especially for smaller companies (Aridor et al., 2020; Frey and Presidente, 2024). It has also increased the value of previously collected data from consumers to advertisers (Aridor et al., 2020). Privacy regulations can affect consumer behavior, potentially exacerbating digital exclusion for marginalized groups in advertising campaigns (Dube et al., 2024). The development of privacy-enhancing technologies is shaped by regulatory definitions of privacy, which can impact identity management and social categorization (Phillips, 2004). Economists have identified market failures in privacy-related decisions, including information asymmetries and cognitive biases, which regulations attempt to address (Brown, 2016). More recently, with little understanding of the implications of data collection by companies, a study on American citizens showed that 72 percent of respondents supported more regulation of what companies can do with people's data (Pew Research, 2023). Overall, balancing privacy protection with data-driven innovation remains a challenge (Liu et al., 2020).

[23] The European Union's General Data Protection Regulation (GDPR) (https://eur-lex.europa.eu/eli/reg/2016/679/oj) includes these provisions, which are also reflected in the Iberoamerican Personal Data Protection Standards (https://www.redipd.org/es/documentos/ estandares-iberoamericanos).

The impact of liability regulations on innovation is mixed. While some studies suggest that increased liability risk can hinder innovation, particularly in medical implants and high-risk industries (Ashford and Stone, 1991; Galasso and Luo, 2022), others find that moderate levels of liability can stimulate product safety improvements and R&D intensity (Viscusi and Moore, 1993). Imposing stricter regulations can also promote innovation. For instance, environmental regulations can drive eco-innovation, potentially benefiting firm performance, though effects vary across sectors (Doran and Ryan, 2012; Rennings and Rammer, 2011). Reducing managerial liability has increased corporate innovation outputs, especially in firms facing higher litigation risk (Guan et al., 2021). Regulatory reforms like licensing deregulation can also boost innovation rates (Seker, 2011). The relationship between liability regulation and innovation is complex, with its effects varying based on the industry, the specific regulations in place, and the degree of liability risk involved.

Market failures related to innovation and knowledge are relevant for AI, potentially leading to suboptimal adoption rates. Among the most important are those related to several factors, including (i) the appropriability of the returns; (ii) coordination failures; (iii) information asymmetries; and (iv) semi-public good characteristics of critical inputs. Since new technologies tend to produce spillovers, firms may not be able to fully protect their gains to ensure profitability. This failure may be particularly pronounced in AI due to the intangible nature of models and the potential for replication with adequate data, exacerbating the risk of free riding. In several activities, the returns to AI are higher when all actors involved in an economic activity (as in a value chain) invest in AI but fail to do so because they do not believe others will do the same.[24] This dependence on private returns in others' actions increases uncertainty and risks, decreasing aggregated investments. Information asymmetries about AI's complexities, advantages, and operations can hinder its adoption. Financing organizations will have less information about AI technology than companies pursuing those projects, leading to fewer projects receiving funding than what would be socially beneficial. Furthermore, potential users' lack of knowledge about AI capabilities can contribute to under-adoption. Finally, semi-public good characteristics of critical inputs for AI, especially human capital and other intangibles such as data and knowledge, tend to produce suboptimal levels of investment in these factors.

[24] For instance, utilizing AI for demand forecasting and enhancing production flexibility can be costly. If only a minority of a supplier's clients employ AI for managing inventory, the investment may not pay off. The supplier's benefits from AI hinge on reaching a substantial number of AI-empowered customers within their supply chain, underscoring the need for widespread adoption to justify the initial costs. This dynamic creates a "chicken-and-egg" problem. Suppliers are hesitant to invest in AI for a limited number of AI-using customers. Buyers, in turn, are hesitant to invest in AI without suppliers' capabilities to match.

There are lessons learned about obstacles to previous GPTs adoption. One crucial aspect is the role of switching barriers, as highlighted by the case of steam engine adoption in the United States in the 19th century. The presence of established technologies with lower fixed costs, such as waterpower, created an incentive for new entrants to stick with the older technology, even if newer options like steam power were more efficient in the long run. This phenomenon, known as technological lock-in, can significantly slow down the diffusion of superior technologies (Hornbeck et al., 2024). The diffusion process is also heavily influenced by the cost of adoption, which tends to decrease over time due to factors such as technological advancements and economies of scale. As the cost of a technology falls, it becomes more accessible to a wider range of firms, leading to more widespread adoption (Stokey, 2020). This pattern is consistent with the observation that early adopters of new technologies are often those with more favorable characteristics, such as larger firms with more resources (Manuelli and Seshadri, 2014; Stoneman and Battisti, 2010). The capacity to learn from early adopters and the presence of knowledge spillovers are vital. Firms can gain valuable information about a technology's performance and implementation challenges by observing early adopters, reducing uncertainty and accelerating diffusion (Lo and Sutthiphisal, 2010; Soete, 1985).

Lessons Learned from Projects Implementing Artificial Intelligence Systems

The adoption of responsible AI practices in LAC requires significant support. Substantial disparities between countries regarding technological advancement and regulatory frameworks characterize innovation ecosystems in LAC. No country in the region is globally competitive in AI development and implementation. This gap underscores the need for robust support to build trustworthy and competitive AI-based products. fAIrLAC has supported the responsible adoption of AI across the region, facilitating knowledge exchange, providing technical assistance, and funding pilot projects that have demonstrated the potential of AI to address development challenges.

AI ecosystems in the region face several interconnected challenges that hinder their growth and effectiveness. Scaling AI solutions beyond pilot stages remains problematic, often due to end-users' limited capacity to integrate and maintain these technologies. There is a notable gap between the rapid adoption of AI in the private sector and the implementation of responsible AI practices, with few regional players integrating ethical approaches. Companies developing AI products frequently encounter trade-offs between ethical principles and competitiveness, struggling to balance algorithmic justice and accountability with profitability. Efforts to include historically excluded communities in AI projects have raised ethical concerns, particularly regarding surveillance and data scraping practices. These challenges

collectively point to a complex landscape where technological advancement, ethical considerations, and inclusivity often conflict, highlighting the need for a more holistic and balanced approach to AI development and implementation in the region.

The increasing demand for capacity building in AI across the region has underscored the necessity for training programs that emphasize responsible and ethical use. The rapid advancement and proliferation of diverse AI tools have created an imperative for comprehensive educational initiatives to ensure that users are prepared to address the ethical considerations and technical challenges associated with this technology. It is important for both public and private sectors to invest in digital capabilities to effectively bridge this knowledge gap. Moreover, it has become evident that ongoing upskilling is essential for navigating the evolving landscape of AI, thereby enabling individuals to adopt AI solutions in a responsible and effective manner.

The LAC region faces substantial limitations in accessing essential resources for AI development, including funding, high-performance computing capabilities, quality data, and skilled talent. This resource gap hampers the region's ability to effectively develop and scale AI-based innovations. However, there are signs of positive change in the investment community. Investors are beginning to recognize the importance of responsible AI practices, with some aligning their due diligence efforts with environmental, social, and governance principles to identify and mitigate AI-related risks, mainly operational and reputational ones. Despite this progress, many entrepreneurial support organizations and investors still lack the multidisciplinary expertise to effectively assess and mitigate the complex risks associated with AI investments.

Enhancing digital infrastructure is essential for closing the digital divide and fostering AI development in the region. Evidence indicates that investment in broadband and data platforms—areas in which LAC currently lag other global regions—is imperative for facilitating AI-driven solutions and improving access, particularly in underserved communities. Reliable connectivity, secure infrastructure for data analytics, large datasets, and robust cybersecurity measures constitutes the foundational components of digital infrastructure necessary for effective AI development. Additionally, public-private partnerships are increasingly important for financing and expanding access to these resources, as well as cloud services that provide scalable computing power and storage solutions, thereby promoting AI adoption, especially in smaller countries within the region.

Organizations across the region face obstacles in accessing the large volumes of high-quality data required to support complex AI systems. Even when open data options are available, these often lack the quality and granularity that may be required, and may even contain regional and cultural biases, highlighting the need

for more representative datasets specific to LAC contexts and the need for better data governance arrangements in government and the private sector. Thus, the challenge extends beyond data availability to data management and understanding. A widespread lack of literacy in data privacy and governance principles across the region affects both organizations developing AI and the public. This knowledge gap hinders the effective and responsible use of data in AI applications.

Agile development and innovation methodologies have proven crucial for facilitating rapid iterations and flexible adaptations in AI projects. The importance of starting small and scaling gradually is evident, with proofs of concept, prototypes, and pilot projects serving as essential steps before large-scale implementation. This approach allows for better adjustment of solutions to specific needs. In model selection, beginning with more straightforward options and progressively increasing complexity has been found to optimize performance and resource utilization. Financial viability assessments, considering both short-term and long-term costs, are critical for ensuring the sustainability of AI models. These lessons underscore the need for a methodical, step-by-step approach to AI development that balances innovation with practicality and sustainability.

Incorporating ethical, privacy, and security principles from the outset is crucial in preventing biases and protecting personal data. Establishing robust data architecture and governance frameworks has proven essential for ensuring data quality, security, and availability. The importance of assessing data representativeness and obtaining necessary consent cannot be overstated, with data augmentation techniques employed where needed. On the technical side, prioritizing flexible and scalable solutions, such as cloud computing, while avoiding vendor lock-in, has been key. Regular performance monitoring, algorithmic audits, and the implementation of clear performance indicators have been vital in assessing solution effectiveness and preventing unintended consequences.

Lessons Learned from Improving Framework Conditions

The IDBG's experience in developing connectivity highlights several important lessons that can be applied to fostering AI adoption. First, improving connectivity is critical to unlocking the full potential of digital transformation, both for individuals and businesses. Strategic interventions in infrastructure development and regulatory updates have had a catalytic effect in boosting digital access and services across various sectors. To maximize these benefits, projects must account for social and productive demand, ensure that policies and regulations support infrastructure rollout, and adopt technologically neutral approaches that facilitate international connectivity. Additionally, fostering digital skills is essential for leveraging digital

infrastructure, particularly in sectors like AI, which rely heavily on high-speed, reliable connectivity and robust data infrastructure. The IDBG's efforts underscore the importance of aligning regulatory frameworks with technological advancements to create an enabling environment for digital innovation.

The IDBG has financed several programs that develop advanced human capital in STEM fields. The implementation of this type of supply-side innovation policy underscores the importance of (i) increasing collaboration with third parties, including the private sector, for financing and eventually fostering cross-pollination (i.e., university-industry collaboration); (ii) establishing agreements with agencies that are specialized in scholarship management, especially for larger scholarship programs that can become unexpectedly burdensome; (iii) designing selection mechanisms for scholarship programs that take country-specific factors into account; (iv) having a job placement strategy for graduates through agreements with companies and institutions in priority sectors; and (v) return conditions for programs supporting international training that do not restrict research mobility, since such return policies may not be the most effective way to foster scientific collaboration (a form of knowledge transfer). Deliberate actions to encourage participation of women in the application process has been successful in achieving achieve gender balance in enrollment in AI bootcamps. Operational experience points to the importance of monitoring and evaluating these programs and of identifying the best timing for performing the evaluations. It also suggests that more analytical work is needed to isolate the impacts of these programs to capture their broader contributions to technological development, innovation, and productivity.

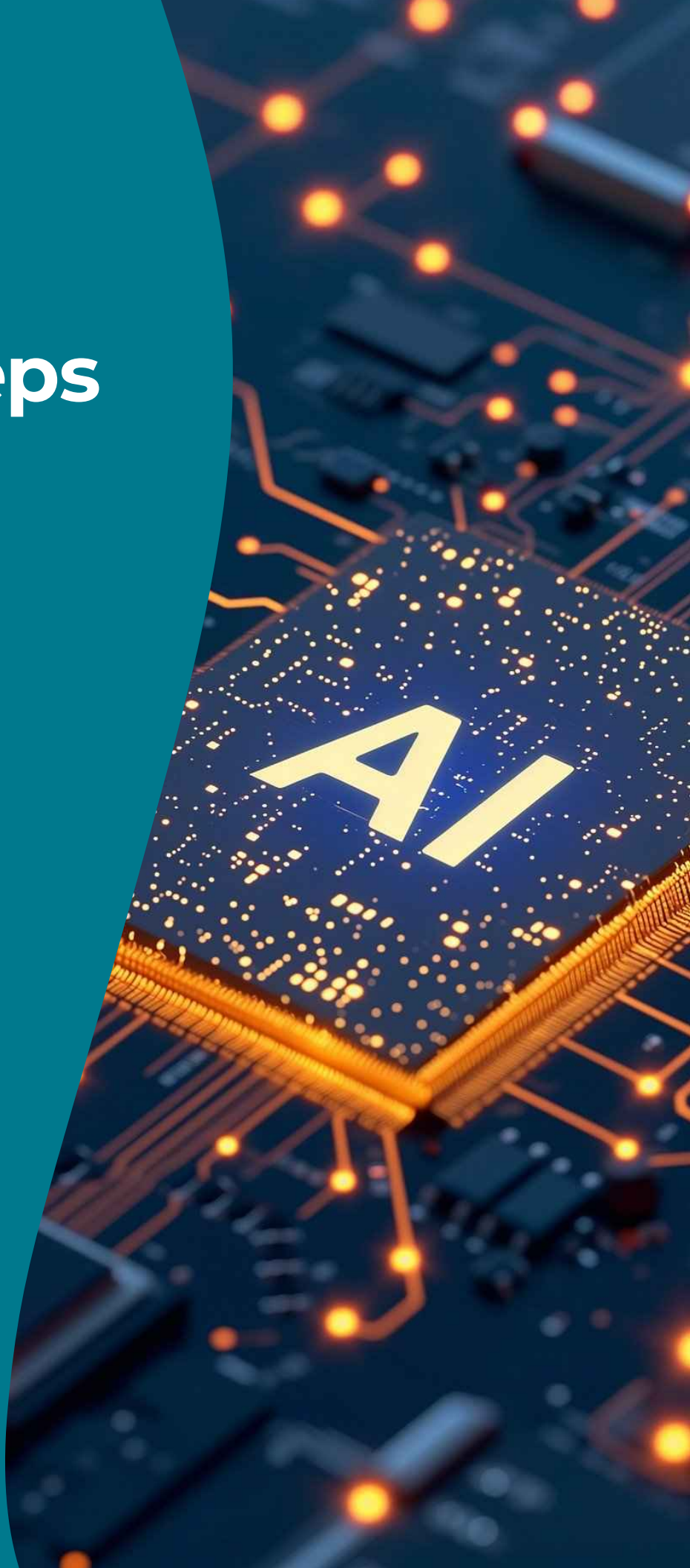
Private sector involvement is key to effective skills development programs. The IDBG's experience shows that engaging employers in the design, delivery, and evaluation of training initiatives ensures that the skills being developed align with labor market demands, leading to better employment outcomes. In several countries of the region, public-private partnerships, such as sectoral skills councils, have been effective in identifying and addressing specific skill gaps. These collaborations have improved the relevance of training by allowing the private sector to lead in designing competitive schemes that meet real industry needs, which is particularly important for AI adoption. Moreover, the IDB Group's work with private educational institutions through IDB Invest demonstrates the importance of financing high-quality institutions, as they can foster competition and drive improvements across the education sector. However, it is essential to carefully select private institutions with strong governance and reputable accreditation to ensure educational quality.

In terms of institutional governance, the implementation of digital transformation and public sector reform projects has provided several valuable lessons. First, successful digital transformation in public administration requires a well-defined

governance structure that involves all relevant stakeholders, with specific roles and responsibilities assigned and a clear roadmap and strategy. The design of digital solutions for public management should encourage participation of government agencies in strengthening the operational and institutional framework. Additionally, merely making government services available online does not guarantee their use; it is essential to promote these services to raise public awareness. The procurement of ICT products and services is complex due to their evolving nature and high technical standards. Thus, it is critical to have robust technical support throughout the procurement process.

High-level leadership and ownership of reforms are crucial for the success of public sector transformation programs. Change management and communication strategies are vital elements of public sector reform programs to mitigate resistance, especially in human resources-related activities. Solid technical documentation and actuarial analysis are also necessary to support these reforms. Additionally, the Bank's extensive sector knowledge, operational experience, and presence in countries have been instrumental in accompanying sector reforms, which involve multiple actors and require institutional strengthening, solid legal and regulatory frameworks, financial sustainability, and operational efficiency.

5. **Next steps**



The IDBG will pursue a research agenda that will continue to improve the approach to AI in the LAC region.[25] Beyond the transformational opportunities that AI adoption presents for the region and the inherent risks that it entails, several pressing questions arise (Agrawal, Gans, and Goldfarb, 2019). Addressing these questions is crucial to monitoring the patterns of AI adoption and understanding its real consequences. The priorities in the AI research agenda will tackle significant knowledge gaps that currently hinder informed decision making. Despite global advancements, the region faces unique barriers, such as limited data availability, insufficient infrastructure, and regulatory challenges, that require targeted research and actionable insights to maximize AI's positive impact in the region.

This research agenda prioritizes three key areas: impact, obstacles, and governance. It will focus on (i) evaluating the development impact of AI, particularly its effects on employment, inequality, economic growth, and its potential to improve public service delivery and firm productivity; (ii) identifying obstacles to AI adoption, including market and government failures and deficiencies in framework conditions; and (iii) advancing AI governance, with a focus on assessing the relevance of various risks, evaluating the effectiveness of existing regulations in addressing them, and analyzing their intended and unintended consequences. These priorities will strengthen IDBG's ability to assist policymakers, businesses, and other stakeholders with evidence-based strategies to harness AI responsibly, ensuring that its benefits are equitably distributed across the region. To carry out this ambitious agenda, a Bank-wide coordination mechanism is required. fAIrLAC+ will build on the achievements made by fAIrLAC and will continue the efforts to mainstream AI across the Bank, following the principles and priorities stated in this document. Its main areas of work will include the following:

- Lead regional policy dialogues to promote innovation and responsible AI adoption in the region, including efforts for regional initiatives.
- Provide technical support for the implementation of AI solutions in the region.
- Strengthen sectors with cutting-edge technical resources, knowledge products, and the identification of good practices across the Bank.
- Promote and coordinate multisectoral collaboration.

[25] While existing indicators across the region predominantly focus on readiness and enabling factors, they fall short in capturing the actual implementation of AI technologies. Developing a comprehensive methodology to measure AI adoption would provide a crucial metric for tracking its evolution.

An initial mapping shows more than 80 projects and initiatives that directly involve or support AI solutions across all sectors. fAIrLAC+ will strengthen this knowledge bank and actively promote collaboration between teams that are already exploring the use of AI in their activities to better assist governments across the region in tackling the legal, regulatory, and implementation challenges. A regional policy dialogue on AI is expected in 2025.

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Annex I.
Policies Impacted by Artificial Intelligence

As AI becomes more integrated into the economy, it could lead to significant shifts in the labor market, increased inequality, and changes in competition. While not directly related to AI, other policies, such as those addressing labor, education, antitrust, and the social safety net, can significantly impact the diffusion of AI, or may need to be adjusted to manage its consequences. As AI becomes more integrated into the economy, these policies will play a crucial role in addressing potential shifts in the labor market, rising inequality, and new forms of market power concentration. Adapting these policies is essential to mitigate negative outcomes and ensure that the benefits of AI are widely and equitably distributed across society.

Innovation

AI is increasing the returns to innovation, thereby increasing the opportunity cost of suboptimal innovation policies. This shift provides a renewed urgency to address the innovation gap in the region since potential gains generated by AI will only materialize if the national systems provide the resources to introduce AI-powered innovation projects into the market. In essence, if AI can increase the flow of new ideas to the innovation process, the lack of investment later in transforming those ideas into products will create an innovation bottleneck that will hinder the gains from AI adoption.

Adapt R&D incentives to prioritize AI-driven research, focusing on areas that address local societal needs, such as climate change adaptation or healthcare improvements. This could involve increasing funding for AI-specific research grants, establishing incentives for companies investing in AI R&D, and creating centers of excellence that foster collaboration between academia and industry. It is crucial to ensure that these R&D efforts are multidisciplinary and collaborative to maximize the potential for breakthrough innovations.

Tailor financial and technical support programs for SMEs to adopt AI in their operations. This could include offering adequate financing to cover the cost of switching technologies, establishing AI consultancy services to guide implementation, and creating knowledge-sharing platforms among SMEs. Additionally, implementing innovative public procurement strategies incentivizes AI adoption and development.

Entrepreneurship

AI promises to significantly impact entrepreneurship by improving innovation and operational efficiency. As businesses increasingly adopt AI, the landscape of entrepreneurship is shifting toward more data-driven, automated, and scalable models. Some startups entirely created around the capacities provided by AI will find new business models inherently superior to those not aided by AI that can disrupt existing industries.

Fostering responsible AI-driven innovation among startups and investors. By increasing access to tailored financing options to mitigate the costs associated with AI adoption, supporting access to complementary resources, besides HPC and data, such as multidisciplinary expertise and knowledge, and creating platforms for knowledge sharing among entrepreneurs. Strengthening entrepreneurial support organizations, investors, and funders for responsible AI funding is essential, especially during their due diligence and stewardship processes.

Provide targeted training and support to startups and SMEs. In critical sectors with high social impact, such as financial inclusion, talent and employment, health, essential infrastructure services, and agriculture and natural capital, startups can make significant contributions. By offering training that provides startups and SMEs with the necessary tools for responsible AI transformation and supporting investors in funding reliable and impactful technologies, the IDBG can foster a prosperous balance between social impact and long-term financial sustainability.

Eliminate artificial barriers to entry for AI-driven startups in traditional industries and promote experimentation with AI-based business models. Policies should facilitate the creation of new firms that fully utilize AI technologies by providing access to funding and managerial support. Additionally, policies should encourage the development of new organizational structures around AI, enabling businesses to explore and adopt more efficient models. This approach would allow startups to compete with established firms and accelerate integration of AI into various sectors.

Labor Markets

The impact of AI on the job market is already evident, and it has different elements. First, it will automate tasks and create new jobs and industries with the corresponding increase in the demand for new skills. Workers must embrace continuous learning in the coming years to remain competitive in an evolving economy. AI will accelerate automation by replacing routine tasks, both manual and cognitive. In other words, automation will be deeper, as it will affect more industries compared to what was initially contemplated for over a decade (Frey and Osborne, 2017). At the same time, advancing AI technologies will create new job opportunities mainly focused on machine learning and data science. AI-based healthcare diagnostics, smart manufacturing, and logistics are some new industries that will require workers with new skill sets. In other cases, AI will complement jobs rather than replace them, resulting in hybrid roles where workers collaborate with AI systems. Many industries will be in this area. Consequently, there will be room for policy interventions to facilitate the upskilling or reskilling of workers in hybrid AI-job interactions. The evidence also points out an increase in labor productivity due to these technological changes that, with the right policies, could lead to better jobs and income.

These changes will require governments, businesses, and educational institutions to adapt to the new needs of AI, facilitating smooth transitions and mitigating the harmful effects of AI-induced changes. Since the size and timing of these transformations are specific to each labor market, it will be important to understand the effects of AI in each country to provide policies tailored to their specific needs. In terms of social security, the effect is twofold. On the one hand, any changes that improve productivity and income will translate into higher contributions and more savings for retirement. On the other, AI has the potential to improve regulation and supervision of pension systems such as through enhanced inspection mechanisms (reducing evasion), facilitate saving options, and reduce the time needed to obtain a pension once the person retires.

Countries should evaluate how AI will affect their workforces by considering factors like gender, education, and regional differences. This analysis will highlight occupations (and groups) most vulnerable to automation, guiding the design of reskilling and upskilling programs to better support affected workers. This targeted approach ensures efficient resource allocation and tailored solutions for at-risk sectors.

Countries should use AI to align training programs with labor market needs, improve job matching, and introduce innovative learning methods. AI can help firms find workers with skills, develop new ways for quality assurance in training provision, find new ways to provide training (e.g., microlearning, hybrid methods) and ultimately

improve labor intermediation policies to better match workers with vacancies. Attention should be given to ethical algorithms that reduce biases against women, people with disabilities, elderly workers, and other diverse groups.

Countries should integrate AI into social security systems and develop a governance model to define rules, practices, and processes. They should develop critical routes to introduce AI as a tool to increase contributions and reduce gender gaps (by providing insights and personalized recommendations to individuals, employers, and policymakers), promote savings, and manage the financial needs of their social security systems, including data analysis to identify options for sustainable investments.

Social Protection

One potential outcome of massive AI adoption is significant job displacement and increased unemployment across various sectors. As AI technologies automate tasks and processes, many workers may find their roles reduced or eliminated, leading to economic insecurity and widening social inequality. This shift underscores the urgent need to strengthen social safety nets to support those affected by technological change. By proactively addressing these challenges, society can better navigate the transition and ensure that the benefits of AI are equitably shared.

Improving the effectiveness of social safety nets by using AI to identify populations excluded and marginalized. Combining population maps (created using predictive models and satellite images among the inputs) with poverty maps and looking at the gaps in coverage to ensure poor households are not invisible to social safety nets. The Bank has been combining this information with other types of vulnerabilities such as natural disasters to further guide information gathering on households and to make social registries more sustainable (e.g., in El Salvador by narrowing the focus of enrollment exercises into areas that are both poor and disaster-prone).

Classification of poor households. Traditional AI is based on classification algorithms. These techniques can be used to help classify households in need of social assistance to ensure that help reaches those who need it the most or those with profiles consistent with the objectives of different social programs.

Trade and Investment

AI is expected to significantly influence international trade in LAC, shaping key areas such as productivity, value chains, competitiveness, and labor markets. As AI advances, it has the potential to drive economic growth by enhancing productivity, which in turn opens new trade opportunities. For instance, AI can help exporters

manage supply chains more effectively, enhance service delivery in ICT, and refine customer interactions in e-commerce, thus opening new market opportunities and improving global competitiveness. Additionally, government agencies can incorporate AI into their operations to streamline administrative processes and facilitate smoother trade and investment procedures. For LAC, this could mean improved integration into regional and global markets. However, while AI offers new prospects for economic growth, it also raises concerns about job displacement, particularly for low-skilled workers in industries like manufacturing and agriculture.

AI's impact on global value chains (GVCs) is already being felt, with technology enabling more efficient supply chain management and better risk predictions. For LAC, AI-driven improvements in logistics and production management can strengthen its position in GVCs. However, there is also the risk of onshoring in developed economies due to AI-enabled automation and 3D printing, which could reduce reliance on low-cost labor in developing regions. This poses a challenge for LAC economies that have traditionally competed through lower labor costs, pushing them to invest in innovation and skilled labor to stay competitive.

In terms of competitiveness, AI can lower trade costs by optimizing logistics and improving customs operations, enabling faster responses to change in consumer demand. This could make LAC firms more competitive globally, enhancing their access to new markets. Additionally, AI can help reduce trade barriers through improved language translation and regulatory compliance, further facilitating cross-border trade.

The shift toward more service-oriented economies is another potential effect of AI adoption. As AI accelerates automation in traditional manufacturing sectors, the region could see a greater emphasis on high-skill jobs in services and technology, which would contribute to a broader economic transformation. However, this shift may exacerbate income inequality unless governments and businesses invest in reskilling workers displaced by automation.

AI's spillover effects may also contribute to broader policy goals, such as environmental sustainability. By optimizing logistics and supply chains, AI can reduce greenhouse gas emissions, supporting efforts by LAC countries to balance economic growth with environmental stewardship.

Health

Various types of AI are already being widely adopted and accepted in the health sector. It is being used to classify medical images, provide recommendations to providers on treatment plans, make billing processes more efficient, identify potential

disease risks, and create epidemiological models to predict disease outbreaks. New applications with generative AI can improve text-to-type applications in medical dictation or increase access for providers to research in practice. However, many LAC countries are still building the necessary foundations required to take advantage and regulate the use of these technologies to provide them at scale inclusively.

The health sector needs to accelerate its path to increase investment in digital transformation by ensuring digitalization of key data, such as individual clinical data, using proper interoperability and cybersecurity standards, as well as digital literacy among healthcare workers and the population to access and use their data. Training for specialists to apply technologies—such as radiologists and epidemiologists—is needed to ensure constant updating to keep up to date with rapidly changing technologies. Intentional efforts must be continued to ensure universal connectivity of the health sector to avoid widening inequality. Additionally, AI needs to be specifically applied to the healthcare worker shortage to improve digital task-shifting within the sector and improve quality of care. The IDBG should continue to provide tailored technical assistance to identify strategic areas for the application of AI in the sector, as well as support to integrate the technology into existing workflows and support evidence generation in the region.

LAC is lagging other regions in regulating technological changes in the health sector. For example, no countries regulate software as a medical device, nor are they prepared to regulate AI as a medical device, among other applications. To foster the scale-up and investment of effective and ethical applications of AI within the sector, certification and regulation must be accelerated. The health sector is currently reviewing global examples and exploring how to leverage regional economies of scale, such as regional certification and regulation, to accelerate progress (RG-T4392). As countries continue to digitalize their health information, they should also explore harnessing this data as an asset, as high-quality data to inform generative AI models could become an important asset for the region. The health sector should also be prepared to monitor the impacts of AI on health and society, such as mental health (especially in children), loneliness, and misinformation in health, and should take proactive steps to support population health in this regard.

Education

AI holds the potential to revolutionize education by reshaping the ways students learn, and educators teach. AI-powered tools, such as intelligent tutoring systems, can tailor learning experiences to individual students, enhancing personalized education. These systems can monitor student progress, adjust lesson plans, and provide timely feedback, allowing for a more adaptive and efficient learning process.

In this context, AI's transformative potential for teaching and learning stems from its ability to support two key practices for personalized education: delivering content, activities, and resources that are tailored to each student's unique needs and providing instant feedback to students and teachers. AI can also enhance accessibility for students with disabilities through tools like text-to-speech, speech-to-text, and image recognition, making education more inclusive. Furthermore, AI's ability to automate tasks such as grading and plagiarism detection can free up educators' time, enabling them to focus on higher-level tasks such as fostering critical thinking and creativity. AI can significantly improve educational management by automating routine administrative tasks such as scheduling, resource management, and tracking student progress. This automation can help school leaders make more informed decisions, thereby enhancing overall school performance. Indeed, AI can greatly enhance educational management information systems by streamlining the processing and organization of large volumes of data. This leads to accurate, timely information that supports better decision making. AI-driven learning analytics can also identify patterns and trends in student interactions, while automation optimizes resource allocation, further boosting overall efficiency.

The integration of AI into education also presents challenges and risks. While they may be promising for creating personalized content, generative AI tools raise concerns about authenticity and academic integrity. Students might become too dependent on AI-generated work, which could undermine their learning and hinder the development of critical thinking skills. Excessive reliance on technology can also reduce human interaction, impair the development of technical skills, and hinder the acquisition of essential problem-solving abilities. It is important to address ethical considerations around data privacy, the fairness of AI-driven assessments, and the impact on teaching role. As AI continues to evolve, it is crucial to strike a balance between harnessing its benefits and mitigating its risks to ensure that it serves as a tool for enhancing, rather than detracting from, the educational experience.

To ensure the successful integration of AI in education, it is crucial to prioritize teacher training that focuses on understanding and effectively using AI tools like generative AI. The IDBG is supporting countries to assess and equip educators with the skills they need to leverage AI-driven platforms for personalized learning experiences while maintaining pedagogical oversight (Gottlieb et al., 2024). Training should include not only the technical aspects but also strategies for fostering higher-order thinking and creativity in students, ensuring that AI enhances, rather than diminishes, the role of the teacher in shaping critical and ethical thinkers.

As generative AI becomes more prominent in education, there is a need to establish ethical guidelines and safeguards to address the risks of bias, misinformation, and privacy concerns. The IDBG could enhance knowledge exchange between education

policymakers, AI developers and educators to create frameworks that ensure the responsible use of AI in the classroom. In addition, technical and financial assistance could support the development of guidelines that focus on maintaining trust in educational content, protecting student data, and preventing the perpetuation of biases. These guidelines could also guide education systems in ensuring that national curricula that integrate AI tools also put a strong emphasis on human values such as empathy, creativity, and collaboration.

To fully leverage AI's potential in education, it is crucial to generate robust, region-specific evidence. By concentrating on evidence-based practices, it is possible to better understand how AI can be effectively integrated into educational systems to meet diverse learning needs and promote equitable opportunities for all students. By partnering with ministries of education and the private sector, the IDBG can help generate evidence that can guide the responsible and impactful use of AI in education, ensuring that it enhances educational outcomes while addressing the region's unique contexts and needs.

Infrastructure (Energy, Transport, and Water and Sanitation)

The development and adoption of AI offers significant opportunities to drive digital transformation in the economic infrastructure sectors. These sectors share common characteristics. They are composed of complex systems, organized through network architectures involving multiple stakeholders, and capital-intensive in both physical infrastructure and data generation and consumption. Organizations in these economic areas face common challenges where AI is becoming a fundamental tool, such as forecasting supply and demand, conducting asset inspection and maintenance, detecting network losses, monitoring project construction, ensuring system sustainability, and improving infrastructure resilience to climate change and natural disasters.

As AI becomes more integrated into the infrastructure sector, it is set to transform various aspects of the industry, including planning, construction, asset management, and operations. The integration of AI can lead to significant improvements in efficiency, predictive maintenance, project management, and sustainability.

However, as in other sectors, the introduction of AI in infrastructure presents challenges. In LAC, the key obstacles to implementing AI include insufficient technological infrastructure, such as sensors and smart networks, and low investment in R&D, which delays its adoption for efficient resource management. Additionally, a shortage of specialized AI talent and poor-quality data hinder the deployment of advanced solutions in these sectors. Resistance to change within organizations

further complicates the digital transformation process. The absence of clear regulatory frameworks creates uncertainty around AI use, particularly regarding privacy and security. Moreover, the fragmentation and outdated state of existing systems make it difficult to integrate intelligent technologies. Lastly, while AI holds the potential for improving energy efficiency and sustainability, its adoption remains limited due to high initial costs and a lack of appropriate incentives. Addressing these challenges requires strategic investments, talent development, system modernization, and the establishment of proper regulations.

Deploying AI with a focus on equitable access is essential to avoid increasing inequality. Developing ethical frameworks for AI in infrastructure, prioritizing sustainability, safety, and inclusivity, is crucial. Additionally, advancing digital transformation requires a legal and regulatory framework that guarantees privacy and data protection, with key areas of focus such as transparency (informed user consent for data use), security (sharing only necessary data and ensuring its protection), and governance (determining who controls the data and how it is audited).

Governments and private companies must work together to standardize AI practices and ensure widespread access to AI technologies, especially in underserved areas. This collaboration fosters knowledge-sharing and open innovation, maximizing resources and the impact of AI solutions. The use of open-source foundational models, such as pre-trained or general-purpose neural networks, can reduce development time, optimize resources, and enhance scalability and adaptability through fine-tuning, promoting community growth and innovation.

Strengthening data collection, storage, and transparency is critical. Organizations must define the necessary data, utilize smart sensors and meters, and establish robust data architectures and governance frameworks. Ensuring the quality, security, and availability of data is essential for reliable AI models, decision-making optimization, and compliance with sector regulations. It is important to distinguish data without privacy implications from user-specific data, where data protection and cybersecurity are critical. Additionally, governments should create incentives for data-sharing through the development of interoperability standards and digital security measures. They also need support in developing AI applications and building capacity through pilot projects, which will enable the testing and refining of AI-driven infrastructure solutions and ensure they are scalable and effective for broader use.

Annex II.
Taxonomy of AI Risks

The following tables include a detailed description and categorization of points and systemic risks. It is important to note that as technology continues to evolve and its applications grow, new risks may appear.

Table A2.1. **Point Risks**

Type of risk	Risk	Description	Example
Technical risk	Privacy breach	Data used to train algorithms can include personal and/or sensitive data that could be used as classifiers by the AI system, leading to potential unfair treatment or discrimination. This information could also be misused for purposes not intended when collecting the data. Additionally, potential breaches of the actual training data could expose personal and sensitive information.	Using camera feeds to collect and store citizens' faces to carry out facial recognition. Using individuals' voices and images from social media to create deepfake videos.
	Bias	Perpetuation of bad behaviors reflected systematically in the training data and/or implicit in the way AI models are built.	Facial recognition systems have been shown to be less accurate for people of color, particularly women and darker-skinned individuals.[a] A facial recognition system might incorrectly identify a person of color as a criminal, leading to wrongful arrest or detention.
	Alignment	Potential of AI systems to become misaligned with human values or goals.	An AI system tasked with maximizing a company's profits might neglect other important factors such as ethical considerations or long-term sustainability.
	Security	AI systems can be breached; data (training or input) or the actual recommendations can be accessed / leaked / modified.	Hackers can breach an AI system so that personal data required as input to get recommendations may be visible to them.
	Maintenance	Not taking into consideration updated data that could change recommendations from AI systems.	Updated medical data that can improve AI-based diagnostics not being used to retrain algorithms.
Use case risk	Opacity	Training models and algorithms are sometimes so complex that it is hard to explain recommendations made by them, including the identification of failed recommendations.	An algorithm denies an individual access to a service (loan, social service, etc.) but cannot explain the reasoning.
	Side effects	Implementation of AI systems may cause non-anticipated effects like de-skilling or changes in the skillset of people involved in the workflow affected by the AI system.	Use of automated vehicles may impact the ability of human drivers to react to extreme situations. Using GPS apps affect the capacity of people to find their way without them.[b]
	Unethical use	The use case for the AI system may be unethical or may cause harm to individuals.	Voter manipulation through analysis of personal and sensitive information.

Source: Authors' elaboration

[a] Buolamwini and Gebru (2018) find that for some systems, the error rate for light-skinned men is 0.8 percent, compared to 34.7 percent for darker-skinned women.

[b] Dahmani and Bohbot (2020) showed that people who used GPS more in their lifetimes did not call on their memory as much for navigation.

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Table A2.2. **Systemic Risks**

Risk	Description	Example
Control	Potential use of AI systems to create false or fallacious content to control citizens.	A deepfake video of a political candidate saying something harmful or offensive could be used to sway public opinion and damage their reputation.
Inequality	Unequal access to resources to develop AI (data, computational power, skills), and potential job displacements due to automation of repetitive tasks	AI-powered automation could lead to job losses in industries like manufacturing and transportation, disproportionately affecting low-income workers.
Concentration	Economies of scale by (few) global providers' cost structure may create barriers for competition. Limited or restricted access to data can contribute to market dominance.	A few large tech companies could come to dominate the AI industry, reducing competition and limiting consumer choice. For example, if a few companies controlled most of the AI infrastructure and tools, smaller firms might struggle to compete.

Source: Authors' elaboration.


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