

Government

# Artificial Intelligence

Readiness Index

2019



# Government Artificial Intelligence Readiness Index

2019

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This project was commissioned by Canada's International Development Research Centre (IDRC) as part of its AI for Development (AI4D) initiative. The views in this report are those of the authors and do not necessarily represent those of IDRC or its Board of Governors.

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## INTRODUCTION

Artificial intelligence (AI) technologies are forecast to add [US\\$15 trillion](#) to the global economy by 2030. According to the findings of our Index and as might be expected, the governments of countries in the Global North are better placed to take advantage of these gains than those in the Global South. There is a risk, therefore, that countries in the Global South could be left behind by the so-called fourth industrial revolution. Not only will they not reap the potential benefits of AI, but there is also the danger that unequal implementation widens global inequalities.

AI has the power to transform the way that governments around the world deliver public services. In turn, this could greatly improve citizens' experiences of government. Governments are already implementing AI in their operations and service delivery, to improve efficiency, save time and money, and deliver better quality public services.

In 2017, Oxford Insights created the world's first [Government AI Readiness Index](#), to answer the question: how well placed are national governments to take advantage of the benefits of AI in their operations and delivery of public services? The results sought to capture the current capacity of governments to exploit the innovative potential of AI.

The 2019 Government AI Readiness Index, produced with the support of the International Development Research Centre (IDRC), sees a development of our methodology, and an expansion of scope to cover all UN countries (from our previous group of OECD members). It scores the governments of 194 countries and territories according to their preparedness to use AI in the delivery of public services.

The overall score is comprised of 11 input metrics, grouped under four high-level clusters: governance; infrastructure and data; skills and education; and government and public services. The data is derived from a variety of resources, ranging from our own desk research into AI strategies, to databases such as the number of registered AI startups on Crunchbase, to indices such as the UN eGovernment Development Index.

We divided the countries by region, principally following [UN groupings](#), with the chief exception of the Western European and Others Group, which we separated to allow more in-depth analysis of higher scoring governments. For this edition of the Index, we invited regional experts to give commentary for each grouping, to supplement our quantitative findings with their insights and local knowledge.

As might be expected, the upper rankings of this year's Government AI Readiness Index are dominated by countries with strong economies, good governance, and innovative private sectors. Singapore comes first for AI readiness, with the rest of the top 20 dominated by Western European governments, as well as Canada, Australia, New Zealand, and four further Asian economies. There are no Latin American or African countries in the top 20.

A surprising outcome is China's relatively low position of 20<sup>th</sup>, even though central and local governments are already implementing AI in public service delivery. This is largely a result of missing data points, something we discuss in depth in our methodology annex paper.

The best performing region, on average, is North America, while the worst performing regions are Africa and the Asia-Pacific. The Index highlights the current inequality in AI readiness between global governments, with higher income countries predictably faring better in the rankings than middle and lower income countries. Given that we are on the cusp of seeing widespread AI implementation across a number of sectors, including public services, this is a timely reminder of the ongoing inequality of access to AI.

Considering the disparities highlighted in this report, policymakers should act to ensure that global inequalities are not further entrenched or exacerbated by AI. Emerging technologies offer a unique opportunity to improve the governments of the future, and citizens' experience of government. As we enter the age of automation, governments must ensure that they are ready to capitalise on the potential power of AI.

Any action by governments, however, should be undertaken with great caution. If it is implemented without due care for ethics and safety, AI in public services could be at best ineffective, and at worst, very dangerous. The purpose of assessing and scoring governments' AI readiness is not to create or fuel a global race for AI. Rather, it is to help policymakers everywhere see where they are performing well, and in which areas they may wish to target their attention going forward. The age of AI is coming, and our intended contribution, through the Index, is to encourage all governments—whether in the Global North or South—to be as prepared as possible to help their citizens take advantage of the benefits of automation, while protecting them from its associated risks.

## TOP 10 RANKINGS FOR GOVERNMENT AI READINESS 2018/19

Rank	Country	Score
1	Singapore	9.186
2	United Kingdom	9.069
3	Germany	8.810
4	United States of America	8.804
5	Finland	8.772
6	Sweden	8.674
6	Canada	8.674
8	France	8.608
9	Denmark	8.601
10	Japan	8.582



# Regional Analysis



## AFRICA

**By Isaac Rutenberg**

The 2019 Government AI Readiness Index paints a familiar picture for the African continent in global indices of this nature. There are no African countries in the top 50 positions, and only 12 African countries (out of 54 in the list) are in the top 100. The top five placed African governments –Kenya, Tunisia, Mauritius, South Africa, and Ghana– reflects the well-documented developments in the technology sectors of these countries. Of the bottom ten countries, seven are classified as Least Developed Countries.

## AI AND THE AFRICAN TECH SCENE

One of the biggest challenges facing the characterisation of AI activities and readiness in Africa is a lack of systematic study on the topic. As a result, there is a relative lack of data, and much of the information about AI in Africa is anecdotal. Nevertheless, what evidence we do have points to a trend toward greater interest and activity around AI in the region. Over time, this should lead to better data and higher rankings for African governments in future editions of the Index.

There have been a number of developments over the past year that point to a growing AI scene across the region. Local AI labs and research centres are appearing throughout Africa, such as the announcement in June 2018 that [Google are to open their first African AI research hub in Accra, Ghana](#). Other examples include the University of Lagos, which launched [Nigeria's first AI hub](#) in June 2018 to develop the country's AI sector and skills. These AI labs and research centres appear to predominantly be connected with tech hubs (spaces designed to facilitate the development of digital or innovation ecosystems, and foster connections between innovators), either as specific projects or closely associated standalone units. The continued rapid proliferation of [tech hubs in Africa](#) is now a widely researched phenomenon, with a number of cities such as Cape Town, Addis Ababa, Kigali, and Nairobi all positioning themselves as regional centres for innovation. The potential for AI research and development which is contextually specific for Africa is vastly improved by this association with tech hubs.

Another aspect of the African tech community to watch closely is the role of SMEs and individual developers, and how they embrace AI. It remains to be seen whether AI tools are taken up by these groups and incorporated into, for example, startup companies, locally developed open source tools, and educational uses. Encouragingly, there are already numerous examples to show that AI is being applied to local problems. From [sexual and reproductive health monitoring chatbots in Kenya](#), to [smart farming in Nigeria](#), to the [tracking of illegal fishing in West Africa](#) by AI-powered drones, the potential for AI to aid localised technology solutions is emerging.

## MITIGATING THE RISKS

One of the topics central to national AI strategies, and occupying policymakers around the world, is the impact that it, along with other emerging technologies, will have on jobs. Whereas the harmful impacts of previous revolutions tended to be greatest for low-skilled labour, the current expectation is that AI will impact jobs comprised to a significant degree of repetitive or predictable tasks. The nature of the effects of AI on the job market is still highly speculative, but many predictions agree that jobs such as truck drivers, customer service representatives, financial analysts, and lawyers are at risk of being either replaced or dramatically altered by widespread automation.

The negative impacts of AI on employment will likely be substantially lower in Africa than it will in other regions, even if the adoption of AI is as widespread on the continent as in the rest of the world. A variety of factors will contribute to this phenomenon.

First, the largest industries in Africa still rely on high numbers of low-paid workers. The typical daily wage for a worker in agriculture or construction is less than US\$10 per day. It is simply not economically practical to replace or augment such a low paid workforce until the cost of robotic labour is dramatically reduced from current levels. Second, the informal sector is substantially more important in Africa, and the impacts of AI on this sector will be minimal.

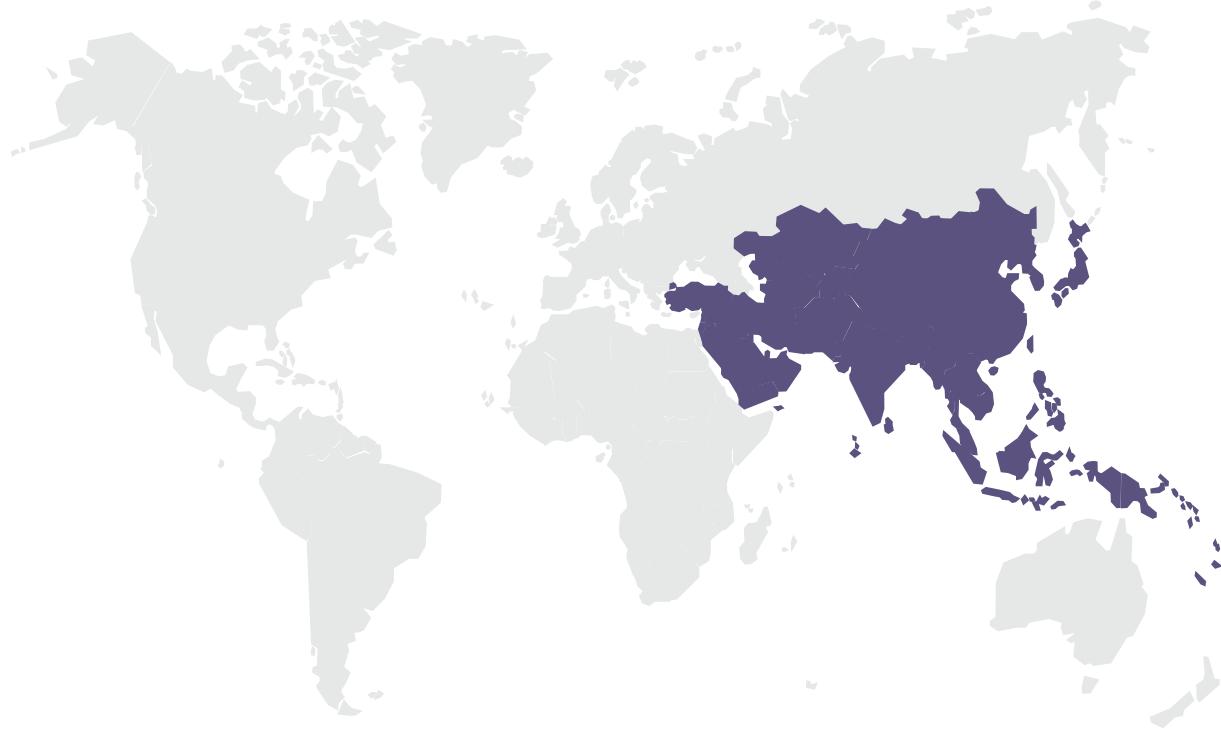
Third, there is still relatively little R&D in AI in Africa. This means that applications of AI developed in other regions will likely lack contextual relevance, particularly in regards to cultural and infrastructural factors, and will not be fit for purpose in Africa. For example, a lorry in the United States or Europe encounters substantially different challenges to a lorry in most of Africa. A self-driving lorry developed for the roads of developed countries is unlikely to be successful on the roads of developing countries without substantial adaptation.

As AI and related technologies improve, many of these challenges will eventually be addressed. By the time that this happens, the African continent will be able to learn from the mistakes and successes of pioneer countries (i.e., those in the top 50 positions of the Index). The [rapid and widespread implementation of mobile communication networks](#) across the region will help African countries capitalise on this late-mover advantage to adopt the most effective forms of AI in a contextually relevant manner.

## CONCLUSIONS

The levels of innovation in Africa are often discounted because traditional metrics (such as the number of patent applications filed) are not well suited to the local context, and as a result there is a lack of data to feed into indices such as this one. The Government AI Readiness Index presents a global look at AI that produces results consistent with other metrics for the state of technology in Africa. The outlook for AI in Africa is positive in that there is growing interest in the topic from formal research centres and informal developer communities. Future editions of the Index will show whether this trend is sustained. Governments across Africa will need to develop coherent and strong policies around AI if they are to capitalise on these recent developments, and ensure their citizens benefit from the advantages of AI whilst being protected from its potentially harmful impacts.

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## ASIA-PACIFIC

By **Sriganesh Lokanathan**

This edition of the Government AI Readiness Index covers 54 governments across the Asia-Pacific region. Two countries in the Asia-Pacific region are among the top ten globally for government AI readiness: Singapore (first globally) and Japan (second in Asia-Pacific and tenth globally). But the Asia-Pacific region also has two countries in the bottom ten globally: North Korea (last in Asia-Pacific and 193<sup>rd</sup> out of 194 globally), and the small Pacific island state of Micronesia (second last in Asia-Pacific and 186<sup>th</sup> out of 194 globally). This is indicative of the uneven progress in government readiness and adoption of AI across the Asia-Pacific region. However, many governments in the region are working to develop national plans for accelerating AI adoption.

## LESSONS FROM THE ASIA-PACIFIC CONTEXT

We should expect that China, while only placing fifth in Asia-Pacific and 20<sup>th</sup> globally in the current rankings, will rise in next year's rankings. The central government has placed a strong focus on investing in AI capabilities. While China may lag behind in fundamental research (i.e. pure scientific research, with not immediately applicable findings), it is catching up fast. For adoption and utilisation of AI in the current context, China's advantage lies in its abundance of data (and loose privacy laws), and its ever-increasing numbers of AI engineers, along with a strong and vibrant startup ecosystem. The abundance of data, in partic-

ular, will give China a clear competitive advantage for its AI industries that other countries will struggle to overcome.

Singapore is taking a different approach from China's, and is paying heed to managing community concerns around AI. It is one of the few governments that has created an [AI Ethics Advisory Council](#) as part of its [AI strategy](#), to "assist the Government to develop ethics standards and reference governance frameworks, issue advisory guidelines, practical guidance and codes of practice for voluntary adoption by businesses". While not necessarily going to the same lengths as Singapore, most other governments with AI strategies are also employing the language of ethics to foster the responsible use of AI. Singapore's lead in grappling with issues of explainable, transparent, and fair algorithms, as well as in practically incorporating considerations for competition, privacy, and ethics into its policy and regulatory frameworks, will be a useful resource for other governments as they formulate their own AI strategies.

In the Middle East, the oil-rich Gulf states looking to diversify their economies have given strong signals regarding the importance of AI to their futures: [the UAE have announced the world's first dedicated AI minister](#), while [Saudi Arabia recently gave citizenship to a robot](#). The UAE, Saudi Arabia, and Qatar have all shown strong commitment to developing their AI capabilities. They have been investing heavily in new technology, with governments serving as initial consumers. The UAE in particular has various AI-related strategies (around areas such as [smart cities](#) and [autonomous transport](#)) that may accelerate AI adoption. In the short- to medium-term, the Middle Eastern economies will need to focus heavily on attracting and retaining foreign talent (which is already in short supply) and companies. Oil price volatility can affect investment, but it also creates an incentive for the diversification of the Gulf economies beyond their traditional oil-based industries. While the focus so far has been on investment in AI adoption, much more will need to be done by these governments to prepare their societies both to take advantage of, and mitigate the potential disruptions from AI growth.

Although covered in separate regional analysis, it is worth considering the role Australia and New Zealand play for this region. Australia in particular has a strong connective role to the rest of Asia-Pacific with their tertiary education system that attracts top students from the rest of Asia, moulding and feeding the human resource needs for the AI industry for the region as a whole. Strong cross-border academic collaborations between China, Singapore, and Australia would facilitate the growth of fundamental and application-driven AI research for the region.

## REGIONAL PRIORITIES

Improved skills and data will be needed for widespread AI adoption and utilisation in government. Fostering fundamental research is important, but may not be the solution to short-term needs. Rather, it is in applied R&D that countries will have to significantly increase their AI capabilities. Those countries that already have strong STEM education systems will have an advantage, but others will need to import these skills in the short term, which means they have to create strong incentives for attracting top foreign talent. This also means that they will have to loosen their labour regulations to facilitate the import of needed skills. Similarly, for AI industries to succeed, governments will have to pay particular attention to increasing both the ‘datafication’ (or ability to capture data) of their economies, and the availability of data.

Fostering the responsible use of AI and managing its societal impacts: in the rush to publish AI strategies, governments in the Asia-Pacific region will need to pay particular attention to the responsible use of AI. At the same time, these governments have to prepare their societies to adapt to potential disruptions resulting from widespread AI adoption.

Fostering healthy competition: the benefits of AI will be maximised by the largest companies and governments who are ready to invest heavily. Fostering healthy competition through appropriate regulatory mechanisms will be critical if countries are to build dynamic innovation ecosystems in AI. This would mean enabling the free flow of data beyond existing silos, but in a responsible manner that protects data privacy.

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## AUSTRALIA AND NEW ZEALAND

By Emma Martinho-Truswell

Australia and New Zealand both rank relatively well in the 2019 Government AI Readiness Index at 11<sup>th</sup> and 13<sup>th</sup> places respectively, with almost identical scores. Both countries' high scores are at least in part a result of being wealthy economies with well-educated populations and digitally savvy governments. Each government has shown greater interest in AI through increased investment and related policies, but both will need to do more to break into the top ten next year.

### AUSTRALIA

The Australian Government announced its intention to increase government investment in AI in the [2018-19 Budget](#), in which it committed US\$21 million (AU\$29.9 million) to AI projects including research funding, more PhD places, and educational programmes in schools and at the undergraduate level. It also put aside funding to develop a national AI Ethics Framework, though almost one year later there has been limited public progress on this commitment. This is a very small commitment of funds in contrast to other comparable countries (Canada, for example, is investing more than ten times as much in AI programmes, with a population less than 50 per cent larger than Australia's and a smaller GDP per capita).

Some state governments, such as [Queensland](#) and [South Australia](#), have also declared their intention to develop AI capabilities, often within innovation pre-

cincts. This is an area in which there could be substantial growth over the coming year as state capitals compete for AI talent. And while government efforts have been relatively small thus far, Australia has some outstanding AI experts and multiple centres of AI research, including [Data61](#) and the [3A Institute](#) (at the Australian National University).

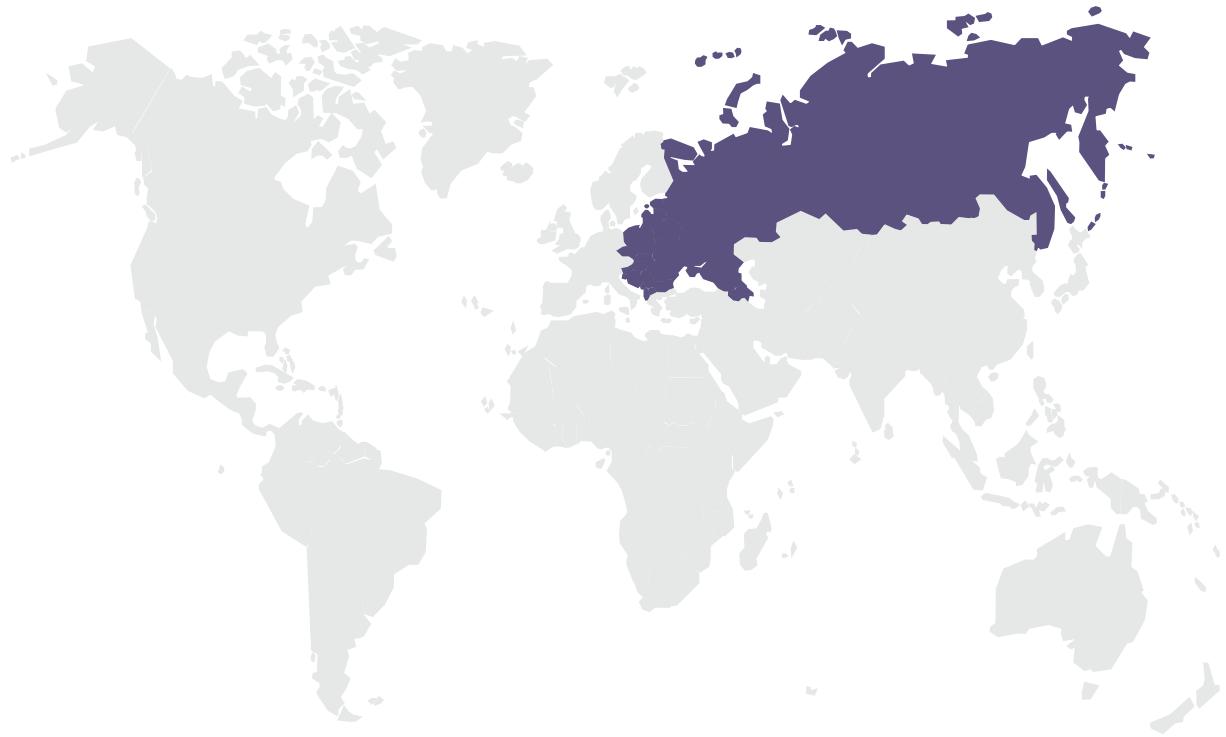
Australia's ranking suffers from its relatively small number of AI startups compared with other countries, as many Australian entrepreneurs look overseas for greater opportunities and funding (and a more convenient time zone). While government efforts cannot do much about the time zone, they could help encourage more technology startups through greater tax concessions, export support, visa assistance, or even funding. Australia is set to publish an AI strategy later this year, a move which should see it move up the rankings in future editions of the Index.

## NEW ZEALAND

New Zealand has a very active AI community which is helping to drive efforts towards a national AI strategy, with NGO the AI Forum producing a report [Artificial Intelligence: Shaping a Future New Zealand](#) in partnership with the New Zealand Government which was launched in May 2018. While New Zealand does not yet have a formal AI strategy, its government has an ambitious approach to digital technology, with the goal of making ICT the second-largest contributor to GDP by 2025.

New Zealand, with a population that is about one fifth the size of Australia's, suffers even more than Australia from a relatively small startup ecosystem. It also lags behind Australia in Index metrics such as the number of AI startups and the innovation capability of its private sector. Nonetheless, its strong performance in the Index is partly due to a central government that ranks very highly on international measures, with sophisticated joined-up service delivery creating opportunities for effective digital services. New Zealand's continued strong performance in the Index depends on its Government producing a strategy (or in the words of its Government, Action Plan) for artificial intelligence. The strategy should take advantage of New Zealand's small size and efficient government to create a niche for itself globally, perhaps in piloting innovative AI applications in government.

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## EASTERN EUROPE

By Yaera Chung

This year's Government AI Readiness Index for Eastern Europe covers 23 countries across the region. The region's overall average score is 5.52, which is higher than the global average of 4.03. The top five ranked governments in the region—Estonia, Poland, Russia, the Czech Republic, and Latvia—are already making advances in AI policy, as they have either adopted national AI strategies or announced plans to do so in the near future. Their strengths also include good data capability in government, technology skills among the general population, and private sectors capable of innovation.

All of the top ten ranked countries in the region are EU member states, with the exception of Russia (third in the region). There are increasing examples of cross-national initiatives and cooperation on AI among EU member states in Eastern Europe. In April 2018, the European Commission presented their [strategy](#) to increase the coordination of investment for research and innovation for AI, with an aim of reaching at least US\$22.5 billion (€20 billion) by the end of 2020, and more than US\$22.5 billion per year over the following decade. Estonia, Latvia and Lithuania released [the Declaration on AI in the Nordic-Baltic Region](#) in May 2018, and the Visegrad Group—the Czech Republic, Hungary, Poland and the Slovak Republic—published a [Joint Declaration on Future Cooperation on Industry 4.0 Projects](#), with the emphasis on AI, in 2018.

Estonia is ranked first in the region (and 23<sup>rd</sup> globally), which is little surprise given the way it has embraced digital technologies in recent years, as seen through its high score in indices such as the UN eGovernment Development Index. The Estonian Government has already started applying machine learning in its operations and public service delivery, through initiatives such as integrated government data exchange portal X-Road. It is looking for other ways to capitalise on the vast amounts of data held by the government to improve public services through AI, such as detecting icy roads using satellite imagery, or improving the E-Tax system.

Russia is also actively prioritising investment and research in AI, and in March 2018 hosted a conference on AI with the Ministry of Defence, the Ministry of Education and Science, and the Russian Academy of Sciences. Although the Russian Government has not yet officially released a comprehensive AI strategy, the conference concluded with ten policies that lay the foundation for a national strategy. It is estimated that Russia currently spends US\$12.5 million a year on AI research, mostly focused on education and military operations.

Among the non-EU countries in the region, one of the major reasons for their lower rankings—especially in the Western Balkans and South Caucasus—is the lack of an adequate innovation ecosystem to nurture AI skills and advanced technologies, as reflected in the Crunchbase data. To some extent, these countries have government buy-in for using data and incorporating ICTs into policies and public services. However, the main challenges to nurturing an AI-friendly innovation ecosystem are stagnant economic growth and brain drain, caused by high emigration of the skilled labour force.

Nevertheless, the countries in the Western Balkans and South Caucasus are joining forces and working together on national action plans to incorporate advanced technologies in government operations. In October 2018, leaders from the Western Balkans agreed to establish an affiliate Center for the Fourth Industrial Revolution, focusing on emerging technologies such as AI. In Armenia, the first innovation and technology park for the CIS region has been announced, which will host more than 6,000 innovators and technicians working on ICT.

The government of Belarus scores poorly overall for AI readiness due to a number of missing data points in the Index. This does not fully reflect the efforts of the government to foster and apply new and emerging technologies, through programmes such as the creation of 'hi-tech parks', in a bid to become the Silicon Valley of Eastern Europe. The government has also recently signed a deal with China to cooperate on technology R&D, including creating a Belarusian-Chinese centre for AI and smart technologies. These developments point to a more advanced level of government AI readiness in Belarus than the Index might suggest.

The varying scores of governments in Eastern Europe shows the uneven pace of AI-related development across the region, including between EU member states and non-EU states. The Index data shows that the areas which need the most improvement in the region are building a better data infrastructure, including making data open and available to the public, and fostering a strong innovation ecosystem to help local tech communities thrive and ultimately contribute to government AI readiness.

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## LATIN AMERICA

**By Fabrizio Scrollini**

The rise of artificial intelligence poses several promises and risks for Latin American governments and societies. As in other regions, AI technologies could help to enhance government effectiveness, improve transparency, and revolutionise the economy. Nevertheless, this could come at the cost of significant social consequences, considering the structural inequality and democratic deficit in the region. Latin America faces three key challenges in harnessing the use of AI for the common good: policies, capacity, and adequate resources.

To date, only two Latin American countries (México and Uruguay) have developed, or are developing, AI policies and strategies. These are important milestones for structuring the use of AI in the public sector, as well as for signalling to the private sector where investments should be directed. As a region, Latin America does not have a coherent strategy or approach to AI. To some degree, this situation is not unusual and follows a similar path as has been seen in other related fields such as open data and digital government. Usually, a few governments take the lead in terms of policy making and agenda setting, and then other countries in the region later follow their example. The absence of clear policy and ethical frameworks around AI allows for experimentation without proper guidance, as noted by the Latin American Open Data Initiative (ILDA) in

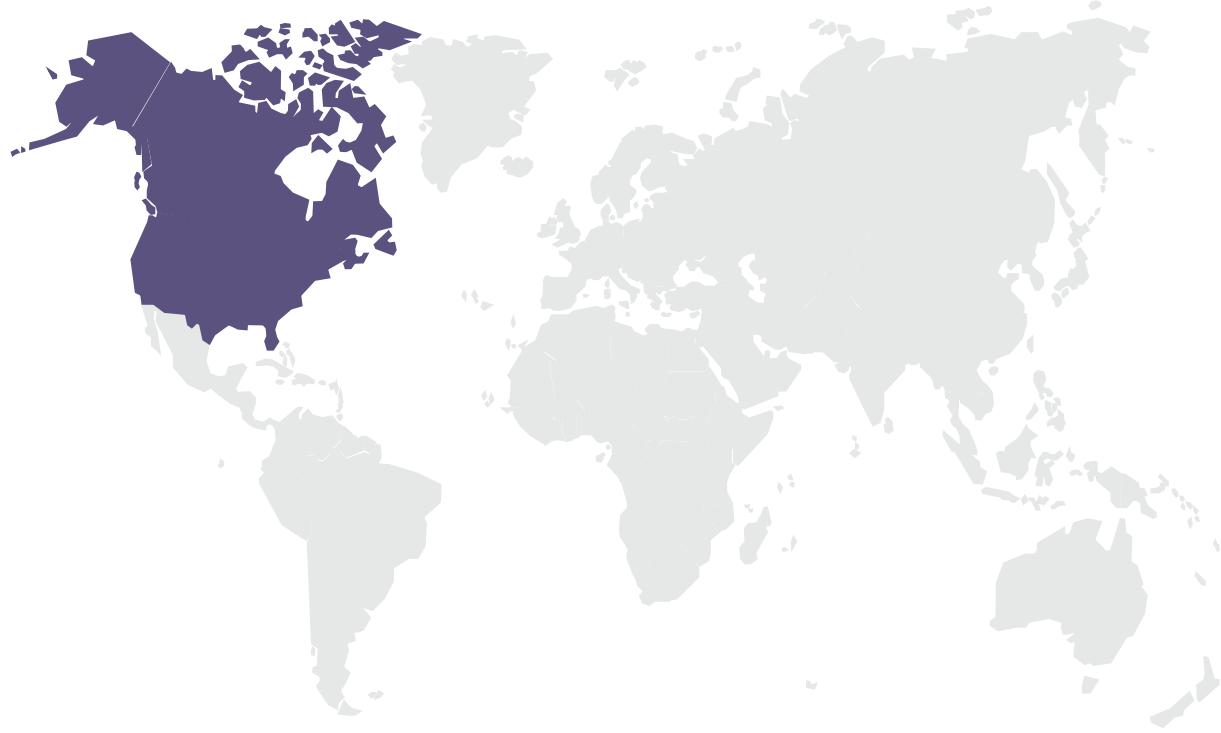
the research paper “[Automating with Caution](#)”. It is important for policymakers to engage more thoughtfully with this field to prevent unforeseen or unwanted consequences when implementing AI in public service delivery. Finally, while more countries in Latin America are considering privacy laws, following the example of the EU’s GDPR, there is still much to discuss about how these types of regulation will be implemented in the Latin American context.

Capacity is also a challenge for Latin American countries, and in particular for their governments. To date, it has been difficult for them to identify local technical, knowledge and social partners to develop AI projects with. While there are some businesses, academics and social enterprises working in the field, they are unlikely to be familiar with the unique context and challenges of the public sector. Furthermore, there is a challenge (similar to other parts of the world) in terms of helping citizens to understand how data algorithms and AI work, in order to protect their own rights. This is particularly important if AI technologies are to scale and be applied in social services, tax administration and justice, where the issue of ‘algorithmic due process’ is most pressing.

As shown by the Index, some governments in the region score well below the global average for AI readiness, which leads to the question of what kind of strategies could work to help them be better prepared for the AI revolution. Unlike global leaders in the field such as Canada, the US or the UK, countries in Latin America and the Caribbean have not yet connected their academic resources with public and private capital to enable the establishment of AI centres. AI centres could help to foster much of the innovation and networking required to address social and economic issues through new applications of these technologies.

The way forward is still uncertain. Areas to explore include how to structure better AI policies, test and examine relevant AI solutions, as well as build a network of practitioners to enable relevant and timely knowledge in this area. In the short run, the region needs more investment tailored for the Latin American context, and the right ethical and policy framework to kickstart an inclusive AI development cycle.

**Fabrizio Scrollini** is the Executive Director of the Latin American Open Data Initiative (ILDA). He also serves as a board member of the International Open Data Charter, and is a member of the Open Data for Development Network.



## NORTH AMERICA

By Joshua New

The United States and Canada are ranked fourth and sixth in the world for government AI readiness, making North America a highly competitive region for AI. Both countries boast skilled workforces, innovative private sectors, good data availability, and effective governance, which are all key factors for determining whether a government can take advantage of AI quickly and effectively. Additionally, both countries have identified AI as a national policy priority area, with Canada publishing its [Pan-Canadian Artificial Intelligence Strategy](#) in 2017, the first country to launch a national AI strategy, and the United States publicising a series of initiatives since 2016 devoted to increasing AI readiness, culminating in the current administration's national AI strategy, the [American AI Initiative](#), presented in February 2019. Despite these countries' leading positions, both have opportunities for improvement.

## CANADA

Whereas many countries are pursuing policies to boost investment and leverage AI for national competitiveness, the Pan-Canadian Artificial Intelligence Strategy is unique among national AI strategies in that it focuses almost exclusively on establishing Canada as the human capital leader in AI by cultivating and attracting highly skilled AI talent. This is a valuable niche for Canada to occupy, given the high demand for AI talent globally. However, Canada lags among

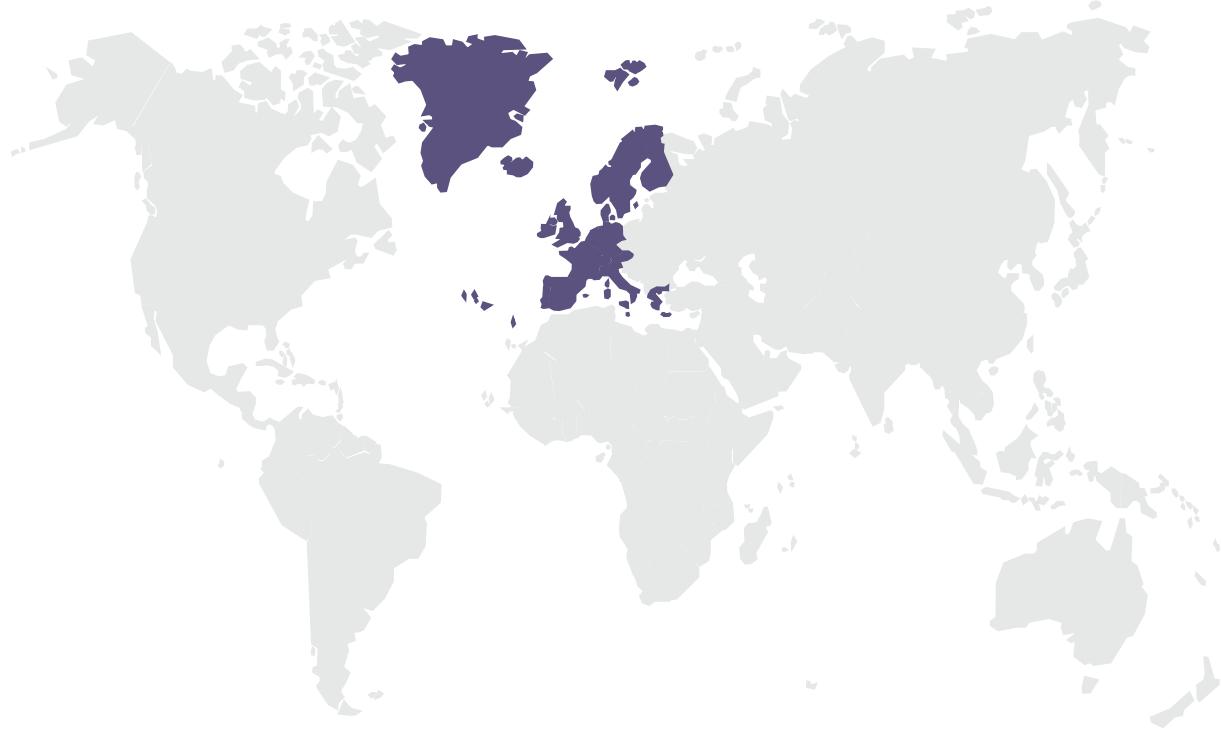
other leading nations in the number of AI startups located in the country. This is not necessarily a bad thing for Canada given that a country will benefit far more from robust AI adoption than simply having successful AI companies. But, given how aggressively Canada is courting high-skilled AI talent, the country will likely see a considerable growth in its domestic AI industry in the coming years.

## UNITED STATES

The United States has lagged behind most leading nations in developing a national AI strategy, but its government has been working to advance AI development and adoption since 2016, most notably with the launch of its [Artificial Research and Development Strategic Plan](#). The strategy shapes national AI R&D priorities to emphasise high-impact research such as AI safety and a common environment and resources for AI development. Since then, despite the lack of high-level strategic initiatives to support AI from the current administration, the federal government has nonetheless made important strides in AI. Most notable among these is a US\$2 billion investment in the Defense Advanced Projects Research Agency's [AI Next campaign](#), which aims to develop the next wave of AI technologies while advancing research into key governance concerns about AI, particularly explainability. The American AI Initiative is a sign of the Government's continued interest in AI and emphasises the importance of AI for national competitiveness. However, the American AI Initiative is considerably less comprehensive than the AI strategies of other leading nations, lacking new funding and with few tangible policy objectives. To be maximally effective, US policymakers should build on the American AI Initiative with concrete policies to advance AI, such as spurring public sector AI adoption and allocating new funding for AI R&D, rather than simply repurposing existing funds.

The United States leads the world in innovative industries, thanks in part to its highly skilled workforce, innovation-friendly regulatory environment, and access to technological infrastructure and data. And though the United States was one of the first countries to develop a comprehensive open data policy with [Obama's 2013 Executive Order](#), it only passed [legislation](#) mandating government agencies treat their data as open by default in January 2019 (prior to which Obama's policy looked to be in jeopardy). This has led to the United States falling behind other nations in terms of data availability, but this new legislation could make the United States even more competitive in the coming years.

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## WESTERN EUROPE

By **Oxford Insights**

Western Europe dominates the top 20 places of the 2019 Government AI Readiness Index, as might be expected due to the strong economies of the majority of Western European nations. 11 of the top 20 governments in our rankings are Western European, with the top ranking government among this group being the UK (second globally), followed by Germany (third), and interestingly Finland (fifth) and Sweden (sixth), demonstrating that AI readiness is not necessarily exclusively dictated by economic might. Larger economies, such as France and Italy, lagged behind in eighth and fifteenth places respectively.

The high rankings of many Western European governments reflect the generally efficient governance and innovative private sectors across the region, as well as the existence of a number of national AI strategies. The development of a number of AI strategies and policies over the last year demonstrates a growing recognition among these governments that AI must be a priority policy area. This has prompted governments to invest more heavily in areas including AI education and R&D, in order to stay at the forefront of global and regional developments. By designing comprehensive policy strategies, governments are helping to enable their citizens to take advantage of the benefits of AI, and mitigate any potentially harmful impacts.

## MAJOR DEVELOPMENTS

The UK's position as regional leader has been cemented in part through a concerted policy effort around AI over the last year. The government produced a number of reports and papers explaining the national approach to AI in 2018. The [AI Sector Deal](#) was released in April 2018, and is designed to keep the UK at the global forefront of AI research. It aims to increase R&D investment in AI to 2.4 percent of GDP by 2027, and improve the pool of in-country AI talent by funding 1,000 PhDs in AI at Imperial College London. Both the Sector Deal, and the [House of Lords' report on AI in the UK](#) (published in April 2018) emphasise the importance of robust thinking and policy around AI ethics.

Finland's high score is partly explained by the Finnish Government's stated goal of becoming a global leader in AI. They have pursued this aim by setting up a dedicated governmental steering group to work on AI in Finland, which published a [national AI strategy](#) in 2017 - the first country in the EU to do so. The government followed this with a [second report](#) in June 2018, focusing on the future of work and skills needed to thrive in the age of artificial intelligence, as well as a section on AI ethics. A third report is expected in April 2019, centred on the challenge of including SMEs in the AI revolution. The country also launched a global online course called '[Elements of AI](#)' in 2018, intended to teach people about AI for free. So far, over 130,000 people have signed up. It is innovative measures like these which help account for Finland's high ranking, despite its relatively small economy.

Other developments of note in the region include France publishing a [national AI strategy](#) in March 2018, including a US\$1.7 billion (€1.5 billion) investment into AI research. This ties into the Macron administration's broader aim of transforming France into an innovative '[start-up nation](#)', reversing a trend of historic brain drain in the investment sector through a US\$11.2 billion (€10 billion) innovation fund and a tech visa scheme. Germany also published an [AI strategy](#) in 2018, as part of a broader plan to spend around US\$3.4 billion (€3 billion) on ensuring the country remains a global leader in AI. The key priority areas in the strategy are boosting R&D, and ensuring AI development is socially responsible.

## COLLABORATION, NOT COMPETITION

Despite talk of a global race for AI, developments in the region have often been characterised by collaboration, rather than competition. There have been a number of multilateral initiatives on AI R&D and related policy, both at the EU level and below. France and the UK, for example, [co-hosted a tech conference focused](#)

on AI in early 2018, and also announced a research alliance between Imperial College London and the French National Centre for Scientific Research to work together on AI-related subjects. With the spectre of Brexit on the horizon, the UK would do well to ensure it builds more of these bilateral relationships around AI research and policy, to help maintain its strong position.

In May 2018, the governments of the Nordic-Baltic region released a [joint declaration](#) on collaboration around AI, pledging to work together on developing skills needed to use AI, improving data access and creating ethics guidelines and standards. Finland is also working with Estonia and Sweden to test trial AI applications, in an effort to become [Europe's 'No. 1 'laboratory' for AI](#). The European Commission also announced a [European AI strategy](#) in April 2018, aimed at increasing annual investment in AI by 70 percent, ensuring that people have the skills they need to thrive in a future with more automation, and building the necessary ethical and legal frameworks for widespread AI adoption. In the same month, the EU member states signed a [Declaration of Cooperation](#) on AI, pledging to work together to share research and findings.

This collaborative approach has served the governments of Western Europe well so far, as demonstrated by their predominantly high scores in the Index. If 2019 sees as much progress in AI-related research, development, and policy as 2018, the top positions in the Index next year will likely remain dominated by this region. These governments should now focus on maintaining this momentum, and building on the strong progress they have made so far.

**Oxford Insights** are a UK-based consultancy working internationally to help governments make the most of opportunities arising from artificial intelligence and digital transformation.



The Government AI Readiness Index is a quantitative toolkit designed to provide an overview of any government's readiness to use AI. The Index incorporates a wide range of data, from desk research on the presence of AI strategies, to Crunchbase statistics on AI startups, to UN indices, and distills it into a single number. This facilitates global comparisons, as well as the ability to track a government's progress in this area over time.

Like all indexes, however, it does not capture the full complexity of the picture on the ground. Ghana's relatively low score, for example, does not acknowledge developments such as Google recently choosing to open the first AI research facility in Africa there. Belarus similarly fares poorly in the rankings, but has been making strides in opening up tech hubs and working with China on AI R&D. The nature of the indicators mean that some of these details will be excluded; something we have tried to compensate for through our regional analysis, contributed by local experts to bring additional context to the quantitative findings.

## APPROACH AND STRUCTURE

To start the process of designing our 2019 Government AI Readiness Index methodology, we set out our ‘exam question’: how ready is a given government to implement AI in the delivery of public services to their citizens? From this, we devised a number of working hypotheses around what makes a government ‘ready’ to use AI in public service delivery.

### CLUSTER HYPOTHESIS

**Governance** Governments need to implement AI in a way that builds trust and legitimacy, which ideally requires legal and ethical frameworks to be in place for handling and protecting citizens’ data and algorithm use. A coherent national AI strategy is a good proxy for measuring the strength of AI-focused governance.

**Infrastructure and data** Artificial intelligence systems are built on data. Therefore the quality and availability of data, as well as the ability of a government to work with it effectively, are critical.

**Skills and education** In order to develop and implement AI in public service delivery, there is ideally a strong pool of in-country talent, which can be measured both through AI skills/education and the strength of the AI sector (which can be measured through a proxy such as the number of start-ups).

**Government and public services** An AI-ready government will display both strong political will and capacity to push for innovation. This can be measured through the proxies of general effectiveness of the government, and the degree of innovation already in place through digital public services.

The approach and hypotheses for our 2017 Government AI Readiness Index formed the basis of our thinking about 2019’s Index. We also knew that there were a number of changes we wanted to make this time round, based both on our own ideas and helpful feedback from around the world that we received last year.

As a starting point, we wanted this year’s Index to be more globally representative than the previous group of OECD governments, so we have included all UN countries, plus Taiwan. This was important in guiding our data selection, as we needed to find data sets which covered as many of these as possible (some of the last Index’s datasets were OECD-specific).

We followed a similar structure to last time of high-level ‘clusters’ containing multiple indicators or proxies for measuring government AI readiness. This time, we added a fourth cluster that we felt was missing from last year’s Index: governance, to measure a government’s AI-related vision, policies, and ethical and

legal frameworks, all of which are vital prerequisites for widespread AI implementation in public service delivery.

We added new indicators and removed some from our last Index, and have ended up with 11 indicators in total, up from nine in 2017:

CLUSTER: GOVERNANCE		
INDICATOR	SOURCE	WHAT SOURCE SHOWS
Data protection/privacy laws—yes/no	UN data protection and privacy legislation	Existence of data protection or privacy laws which shows whether a government has put in place legislation to protect citizens' data (as this data is the cornerstone of widespread AI implementation in public services)
National AI strategy—yes/no/pending	Desk research, consulting: <a href="#">Gartner paper</a> , <a href="#">Medium article</a> , <a href="#">Nesta article</a>	Existence (or otherwise) of a comprehensive national AI strategy which shows a concerted policy effort by a national government to make the most of AI, and mitigate the associated challenges

CLUSTER: INFRASTRUCTURE AND DATA		
INDICATOR	SOURCE	WHAT SOURCE SHOWS
Data availability	OKFN Open Data Index 2016/2017	Scores for open government data publication, which is a proxy for the availability of open government data at large. This suggests how much government data might be available to train algorithms on
Government procurement of advanced technology products	(Sub-indicator in) <a href="#">WEF Networked Readiness Index 2016</a>	Score out of seven in response to the question 'in your country, to what extent do government purchasing decisions foster innovation?', from the WEF Executive Opinion Survey. This is a proxy for both government innovation, as well as technical capacity to build and run AI tools

Data/AI capability (in government)	UN eGovernment Index 2018	A composite measure of three dimensions of e-government: online services, telecommunication connectivity and human capacity. This measures governments' e-capability, so acts as a proxy for in-government tech/AI skills. It should be noted that this double counts the UN online service index (used as an indicator of digital services), but this does not significantly affect the rankings
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## CLUSTER: SKILLS AND EDUCATION

INDICATOR	SOURCE	WHAT SOURCE SHOWS
<b>Technology skills</b>	Sub-indicator in <a href="#">WEF Global Competitiveness Report 2018</a>	Score out of seven for perceptions of the extent of digital skills among the active population from the WEF Executive Opinion Survey. This measure is included as a proxy of AI skills in the general population, which is important both as an indication of skills in the public sector, and the available pool of local talent
<b>Private sector innovation capability</b>	Pillar in <a href="#">WEF Global Competitiveness Report 2018</a>	Combined measure of: diversity of workforce, state of cluster development, international co-inventions, multi-stakeholder collaboration, scientific publications, patent applications, R&D expenditures, research institutions prominence, buyer sophistication, and trademark applications. This is a measure of private sector innovation capability, which is a proxy for how ready the private sector is to develop the AI tools needed by government
<b>Number of AI startups</b>	<a href="#">Crunchbase</a>	Number of AI startups per country as registered on Crunchbase, as a proxy for the size of a country's AI sector. Similarly to the previous indicator, this is included to measure how ready the private sector is to develop AI tools and solutions for government

## CLUSTER: GOVERNMENT AND PUBLIC SERVICES

INDICATOR	SOURCE	WHAT SOURCE SHOWS
Digital public services	UN online service index from UN eGovernment Survey 2018	Scope and quality of online services. This is a proxy for both will and capacity to innovate in government and public service delivery
Effectiveness of government	Word Bank Government Effectiveness 2017	Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. An effective government, in theory, will be more capable of delivering change in public service delivery
Importance of IT to government's vision of the future	Sub-indicator in WEF Networked Readiness Index 2016	Score out of seven in response to the question 'to what extent does the government have a clear implementation plan for utilising ICTs to improve your country's overall competitiveness?', from the WEF Executive Opinion Survey. This also acts as a proxy for the level of innovation in government, and desire to use new technologies as part of a vision for the future

## OVERALL RANKINGS FOR GOVERNMENT AI READINESS 2019

Rank	Country	Score
1	Singapore	9.186
2	United Kingdom	9.069
3	Germany	8.810
4	United States of America	8.804
5	Finland	8.772
6	Sweden	8.674
6	Canada	8.674
8	France	8.608
9	Denmark	8.601
10	Japan	8.582
11	Australia	8.126
12	Norway	8.079
13	New Zealand	7.876
14	Netherlands	7.659
15	Italy	7.533
16	Austria	7.527
17	India	7.515
18	Switzerland	7.461
19	United Arab Emirates	7.445
20	China	7.370
21	Israel	7.348
22	Malaysia	7.108
23	Estonia	6.968
24	Belgium	6.859
25	Luxembourg	6.857
26	South Korea	6.839
27	Poland	6.835
28	Iceland	6.809
29	Russia	6.748
30	Portugal	6.693

Rank	Country	Score
31	Czech Republic	6.673
32	Mexico	6.664
33	Latvia	6.548
34	Ireland	6.542
35	Uruguay	6.522
36	Spain	6.332
37	Lithuania	6.288
38	Slovenia	6.232
39	Chile	6.190
40	Brazil	6.157
41	Taiwan	6.152
42	Qatar	6.035
43	Malta	5.961
44	Colombia	5.945
45	Slovakia	5.923
46	Turkey	5.879
47	Bulgaria	5.806
48	Hungary	5.794
49	Greece	5.760
50	Philippines	5.704
51	Argentina	5.684
52	Kenya	5.672
53	Cyprus	5.668
54	Tunisia	5.652
55	Romania	5.540
56	Thailand	5.458
57	Indonesia	5.420
58	Serbia	5.364
59	Oman	5.321
60	Mauritius	5.318
61	Republic of North Macedonia	5.284
62	Croatia	5.273
63	Ukraine	5.266
64	Azerbaijan	5.244

Rank	Country	Score
65	Kazakhstan	5.236
66	Costa Rica	5.202
67	Montenegro	5.195
68	South Africa	5.152
69	Panama	5.136
70	Vietnam	5.081
71	Peru	5.076
72	Iran	5.049
73	Trinidad and Tobago	5.038
74	Jordan	4.927
75	Ghana	4.888
76	Georgia	4.863
77	Dominican Republic	4.804
78	Saudi Arabia	4.779
79	Kuwait	4.725
80	Morocco	4.717
81	Armenia	4.716
82	Ecuador	4.646
83	Albania	4.614
84	Pakistan	4.570
85	El Salvador	4.566
86	Moldova	4.534
87	Jamaica	4.476
88	Nepal	4.400
89	Bolivia	4.399
90	Seychelles	4.397
91	Uganda	4.370
92	Zambia	4.319
93	Senegal	4.235
93	Tanzania	4.235
95	Bosnia and Herzegovina	4.183
96	Honduras	4.135
97	Kyrgyzstan	4.125
98	Tajikistan	3.991

Rank	Country	Score
99	Rwanda	3.973
100	Bahrain	3.962
101	Cape Verde	3.943
102	Paraguay	3.873
103	Bangladesh	3.808
104	Côte d'Ivoire	3.807
105	Sri Lanka	3.795
106	Benin	3.730
107	Nigeria	3.612
108	Gambia	3.602
109	Mali	3.573
110	Zimbabwe	3.511
111	Egypt	3.492
112	Lebanon	3.487
113	Namibia	3.422
114	Malawi	3.403
115	Guatemala	3.385
116	Bhutan	3.305
117	Nicaragua	3.280
118	Lesotho	3.266
119	Cameroon	3.232
120	Botswana	3.210
121	Brunei Darussalam	3.143
122	Belarus	3.095
123	Mongolia	3.008
124	Burkina Faso	2.859
125	Cambodia	2.810
126	Ethiopia	2.777
127	Mozambique	2.753
128	Chad	2.712
129	Angola	2.666
130	Liechtenstein	2.619
131	Madagascar	2.570
132	Gabon	2.549

Rank	Country	Score
133	Bahamas	2.527
134	Venezuela	2.476
135	Monaco	2.430
135	Barbados	2.430
137	Laos	2.314
138	Liberia	2.304
139	Andorra	2.290
140	Guinea	2.251
141	Algeria	2.246
142	Saint Kitts and Nevis	2.230
143	Dominica	2.191
144	Antigua and Barbuda	2.099
145	Guyana	2.094
146	San Marino	2.071
147	Niger	2.055
148	Burundi	2.054
149	Saint Vincent and the Grenadines	2.052
150	Haiti	2.034
151	Mauritania	2.024
152	Yemen	1.955
153	Saint Lucia	1.901
154	Eswatini	1.889
155	Suriname	1.769
156	Iraq	1.657
157	Sao Tome and Principe	1.481
158	Uzbekistan	1.412
159	Myanmar	1.385
160	Sierra Leone	1.344
161	Equatorial Guinea	1.278
162	Togo	1.139
163	Congo	1.093
164	Grenada	1.086
165	Maldives	1.055
166	Tonga	0.996

Rank	Country	Score
167	Fiji	0.993
168	Vanuatu	0.837
169	Palau	0.829
170	Samoa	0.764
171	Belize	0.745
172	Cuba	0.709
173	Timor-Leste	0.694
174	Afghanistan	0.684
175	Syria	0.645
176	Kiribati	0.644
177	Tuvalu	0.600
178	Marshall Islands	0.584
179	Papua New Guinea	0.550
180	Djibouti	0.532
181	Solomon Islands	0.525
182	Turkmenistan	0.497
183	Libya	0.481
184	Democratic Republic of the Congo	0.470
185	Nauru	0.464
186	Micronesia	0.461
187	Sudan	0.392
188	Central African Republic	0.367
189	Comoros	0.331
190	Guinea-Bissau	0.265
191	South Sudan	0.233
192	Eritrea	0.217
193	North Korea	0.216
194	Somalia	0.168

## CALCULATING THE RANKINGS

In most cases we worked with existing indexes which have cleaned data. In those cases we took the data sets for each indicator and normalised the scores for each country between zero and one to make them comparable. For AI startups we mined the [Crunchbase](#) database. This database skews towards Silicon Valley and the USA. To mitigate the impact of this we have applied a logarithmic scale (base 10) to the scores before normalising to provide a fairer sense of the relative intensity of private sector capacity in each country. We then added the numbers for each indicator together to get our final scores for government AI readiness. We decided to weight each indicator equally based on the feedback we received when consulting on our methodology, as it was felt that each was of equal importance.

## LIMITATIONS

Our methodology has certain limitations, which we outline here. **We greatly welcome any feedback and ideas for how we can improve next year's index: see below.**

## MISSING DATA POINTS

As we started with the aim of including all UN governments, we were faced with the problem of trying to find high quality datasets containing as wide a sample of countries as possible. Some datasets, such as the UN's eGovernment Development Index, are complete and cover all countries in our survey. Others are not, and contain much smaller samples of countries, such as the OKFN Open Data Index. Where we have included a dataset which contains gaps such as this one, it is only after a thorough search for better indicators or proxies to capture what we are trying to measure. In the absence of any alternative, we reverted to less comprehensive datasets we still judged to be of a high quality.

We did not attempt to estimate missing data points as we did not feel able to carry out the interpolation sufficiently accurately, and we felt that the absence of this data from the Index was itself revealing. This does mean, however, that the scores of governments who have missing data points have suffered as a result. Unfortunately, this tends to benefit countries with stronger economies, which were generally better represented in the data.

In the case of China, which is not represented in the OKFN Open Data Index, the Government received a lower score for AI readiness than we feel reflects reality. China has prioritised implementing AI in public service delivery, and already has widespread use of AI in a number of public service programmes. As a result, we would expect China to be at the top, or very near to the top, of our rankings. Its actual place (20<sup>th</sup>) can therefore be attributed at least in part to missing data points. However, we felt that data availability was too vital of a precondition for widespread AI implementation to leave out, as it is both necessary for training and powering algorithms, but can also indicate good governance, transparency and accountability. As we could not find a more complete dataset or proxy to sufficiently capture data availability, we made the decision to use the OKFN dataset, despite the missing data points.

### OTHER LIMITATIONS IN THE DATA

While most of our datasets are from 2018, some (the WEF Networked Readiness Report and the OKFN Open Data Index) are from 2016 or 2017. We have decided to include these, in the absence of any recent high quality datasets that capture these vital aspects of our rankings. Given that our Government AI Readiness Index is the first of its kind in the world, and that we are not comparing results with last year's Index due to the changes in scope and methodology, we judged that these were acceptable to include this year. For next year's Index, however, we will need to reconsider including these indicators if more up-to-date data is not available, due to the problems it will cause for comparability.

### FUTURE RESEARCH AND THE LIMITS OF THE QUANTITATIVE METHOD

There is the risk that indices such as these create a global race for AI. Higher rankings are predominantly held by countries from the Global North, which highlights the risk of cementing the global dominance of countries with a history of funding scientific and technological research and development.

We are well aware that the Government AI Readiness Index does not show a complete picture; rather it simply shows one specifically quantitative way of viewing a government's AI readiness. There are a number of things that might make a government AI ready that are unquantifiable, and therefore out of the scope of our study. Further qualitative studies would hopefully draw out more of these less tangible elements, to produce a more balanced view of global government AI readiness.

If you have any feedback or recommendations for next year's Index, please get in touch with us at [research@oxfordinsights.com](mailto:research@oxfordinsights.com).

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