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Executive Summary

Artificial Intelligence in Government

In the midst of the COVID-19 pandemic, the strategic importance of Artificial Intelligence for governments around the world is more evident than ever before. From the pharmaceutical companies using AI to assist with the development of new drugs and treatments, to the use of AI to assist contact tracing with mobile phone and geolocation data, new technologies have helped governments manage the pandemic, and may well play a role in the economic recovery to follow.

These COVID-19 use cases are a few of many examples where AI can help governments. From healthcare to education to transportation, AI could improve the delivery of public services. But how can governments position themselves to take advantage of this AI-powered transformation? In this report, Oxford Insights and the International Research Development Centre (IDRC) present the findings of our Government AI Readiness Index to answer this question.

Government AI Readiness Index

The Government AI Readiness Index is now in its third edition. The 2020 Index has a new methodology, starting from the same 'exam question' as in 2017 and 2019: **How ready is a given government to implement AI in the delivery of public services to their citizens?** To answer that question, we draw on 33 indicators (three times as many as last year's Index) across 10 dimensions (up from 4 last year). This expansion of the Index gives a broader and deeper picture of government AI readiness.

However, it does make direct comparisons with last year's Index a challenge. Instead, we recommend that this year's Index be used as a tool to compare the current state of government AI readiness in countries and regions across the globe.

As in last year's Index report, we have included expert analysis for each region of the world to contextualise our findings. This year, we have split the world into 9 regions (up from 7 last year): North America, Latin America and the Caribbean, Western Europe, Eastern Europe, Sub-Saharan Africa, the Middle East and North Africa, South and Central Asia, East Asia, and the Pacific.

In this year's report, we have also included country profiles. We have selected 2 to 3 countries from each reason that are either established regional leaders or 'rising stars' in the field of AI readiness, and summarised their important features, policies and initiatives. In some cases (such as national AI strategies, or technology unicorns), what we describe has a direct effect on the country's Index score. In other cases (such as national data strategies or digital inclusion strategies), policies are not counted directly by the Index but we feel they contextualise why a country might score highly in a particular area, or why we might expect to see their score improve in future.

Our Findings

The United States of America comes top of this year's Index, with the rest of the top five places going to Western European nations (the UK, Finland, Germany and Sweden), reflecting the fact that North America and Western Europe are the highest-scoring regions overall.

The USA is renowned for its private sector innovation, with 'Silicon Valley' being almost synonymous with cutting edge technology, and this strength is reflected in its ranking this year. Meanwhile, although Europe does not yet have any technological hubs on par with the USA, Western Europe has a high concentration of national AI strategies, supported by the European Union's region-wide strategy as outlined in its white paper, 'On Artificial Intelligence - A European approach to excellence and trust', published this year.

"FOR THE MAJORITY OF THE WORLD'S GOVERNMENTS, WHERE THE USE OF AI IN PUBLIC SERVICES IS STILL IN ITS INFANCY, WE BELIEVE THAT UNDERSTANDING READINESS IS CRUCIAL."

China, which has ambitions to challenge the US for global leadership in AI, performs surprisingly low in the Index, ranked 19th in the world. China's score highlights the difference between government AI readiness and government AI implementation. Our Index measures the capabilities and enabling factors required for a government to be ready for AI implementation, but it does not measure the implementation itself. The Chinese government has made implementation a priority through its 'Next Generation Artificial Intelligence Development Plan', and is therefore making better use of its capabilities than many other countries who may score more highly for readiness but have not yet turned that readiness into concrete implementation.

For the majority of the world's governments, where the use of AI in public services is still in its infancy, we believe that understanding readiness is crucial. Building capacity to improve readiness will be an essential foundation on which implementation can be achieved, and the Index is a tool to understand gaps and strengths in order to do this. However, the case of China highlights the need for research into AI implementation as a complement to our work on readiness, and we hope to conduct such a study in future.

The lowest-scoring regions on average are Sub-Saharan Africa, Latin America and the Caribbean, and South and Central Asia. This reflects a persistent inequality in government AI readiness that was identified in previous iterations of the Index. Even with the updated methodology, it is clear that the Global South is lagging behind the Global North. In particular, few countries in the Global South have published national AI strategies to set a vision for the implementation of AI; in Sub-Saharan Africa, only Mauritius has a strategy, with Kenya in the process of developing one.

If inequality in government AI readiness translates into inequality in AI implementation, this could entrench economic inequality and leave billions of citizens across the Global South with worse quality public services. We hope that the findings of our Index alert governments across the Global South to the importance of building their AI readiness. We also hope that development organisations and the global community as a whole support governments in the Global South in their efforts, to ensure that the benefits of AI are shared by all.

Responsible Use of AI

In 2019, 42 countries signed up to the OECD principles on AI, agreeing to ensure that AI systems are designed in a way that is safe, fair and trustworthy. This year, 14 governments along with the EU joined together to create the Global Partnership on Artificial Intelligence (GPAI), an initiative to support the responsible development and use of AI. These, and other intergovernmental agreements, highlight the increasing recognition that it is not just enough to develop and implement AI. Governments must ensure that AI is used in a responsible manner.

The IDRC and the Canadian Government's interest in the responsible use of AI goes right back to 2017, when the Pan-Canadian AI Strategy set out Canada's ambition to be a global thought leader in this field. It is with a view to advancing global understanding of the responsible use of AI that this year we have piloted a new Sub-Index. The **Responsible Use Sub-Index** covers 34 countries, and measures 9 indicators across 4 pillars. It provides a first look at how governments compare on the issue of responsible use, and we hope in future to expand the Sub-Index to cover more countries and include more indicators.

Our findings from the Responsible Use Sub-Index show that Nordic-Baltic Countries currently lead in terms of responsible use of AI, with Estonia, Norway, Finland and Sweden all in the top 5. The US and the UK, both world leaders in government AI readiness, score noticeably lower in terms of responsible use of AI. Meanwhile, India, Russia and China all score near the bottom of the Sub-Index. We hope that in highlighting global best practice, as well as showing where countries that are otherwise leaders of government AI readiness have room to improve when it comes to responsible use, our Sub-Index will further this increasing global attention on the question of responsible AI.

Introduction

Artificial Intelligence and Government

From chatbots offering mental health advice to machine learning models identifying financial misconduct, Artificial Intelligence (AI) has a wide range of uses and potential applications within many areas of government, including:

- Prediction. Guessing outcomes such as which patients are most at risk of severe COVID-19 complications, based on large amounts of data.
- Detection. Identifying abnormal patterns or cases in large datasets.
- Image recognition. This can be used in many sectors, such as healthcare, transport, or policing.
- Natural Language Processing. Using AI systems to process human speech or text, such as through chatbots or through sentiment analysis.

With such a range of applications, the potential value of AI for governments is huge, as is the potential improvement in services for citizens. In order to unlock this potential, governments need to understand how ready they are to implement AI. To help them do this, Oxford Insights and the International Development Research Centre (IDRC) are proud to present the findings of the 2020 Government AI Readiness Index.

The 2020 Government AI Readiness Index

Now in its third iteration, the Government AI Readiness Index ranks governments around the world according to their readiness to implement AI in the delivery of public services to their citizens. Building on last year's Index, we knew there were a few methodological changes we wanted to make to make sure this year's version was as robust and comprehensive a measure of government AI readiness as possible.

New Pillars: The Building Blocks of Government AI Readiness

Last year's Index built on four hypotheses about government AI readiness. This year, we have changed our approach to try and get to the heart of what makes a government AI ready. We therefore developed three new hypotheses, each of which corresponds to a fundamental pillar of government AI readiness:

1. The **Government** needs to be willing to adopt AI, and able to adapt and innovate to do so;
2. The Government needs a good supply of AI tools from the **technology sector**; and
3. These tools need to be built and trained on high quality and representative **data**, and need the appropriate **infrastructure** to be delivered to and used by citizens.

Under each of these pillars are dimensions that further specify how each of these conditions is fulfilled, as summarised in the below. For a full description of the Index dimensions, refer to Annex 2: Methodology.

Government
The Government needs to be willing to adopt AI, and able to adapt and innovate to do so;

Technology Sector
The Government needs a good supply of AI tools from the technology sector; and

Data and Infrastructure
These tools need to be built and trained on high quality and representative data, and need the appropriate infrastructure to be delivered to and used by citizens.

New Indicators: A Broader Assessment of Government AI Readiness

Last year's Index measured 11 indicators. For this year's Index, we felt there were more indicators we could add to give a more complete picture of government AI readiness. As a result, this year's Index contains three times as many indicators (33 in total) across the 10 dimensions.

In particular, we wanted to address an area of growing concern within AI ethics: the issue of bias. From facial recognition to natural language processing, one of the significant causes of biased AI systems is data that is not representative. For this reason, we have included a new set of indicators in this year's index around **Data Representativeness**. By measuring proxies for the gap in Internet usage between men and women and between higher and lower socioeconomic groups, we hope to capture how ready governments are to use AI in a way that avoids bias.

New Inclusion Criteria: Making the Index Statistically Robust

Last year, the Index covered all countries regardless of the number of missing values. This year, we wanted to introduce criteria for inclusion in the Index, to ensure that, for the countries we do cover, we have enough data to be confident in the score we give them.

This year's Index therefore covers 172 countries for which we had more than 50% of values across the 33 indicators. The countries not included in the main Index were still given an estimated score, and can be found in Annex 4.

New Sub-Index: Responsible AI

From calls for greater regulation of facial recognition systems to policies designed to prevent AI-driven automation from exacerbating labour market inequality, a growing number of countries and organisations are trying to articulate principles by which we can prevent AI from doing harm.

In recognition of this trend, this year we are piloting a new sub-index. The **Responsible Use Sub-Index** ranks 34 countries according to how ready they are to use AI in a responsible way. The Index scores countries according to four clusters that correspond roughly to the OECD Principles on AI: Inclusivity, Accountability, Transparency and Privacy.

Many of the values and conditions needed for responsible use are hard to quantify, and global datasets are hard to come by. Nevertheless, we hope the pilot Sub-Index can frame the discussion around the kinds of data we need to collect in future to expand and iterate this sub-index in future editions.

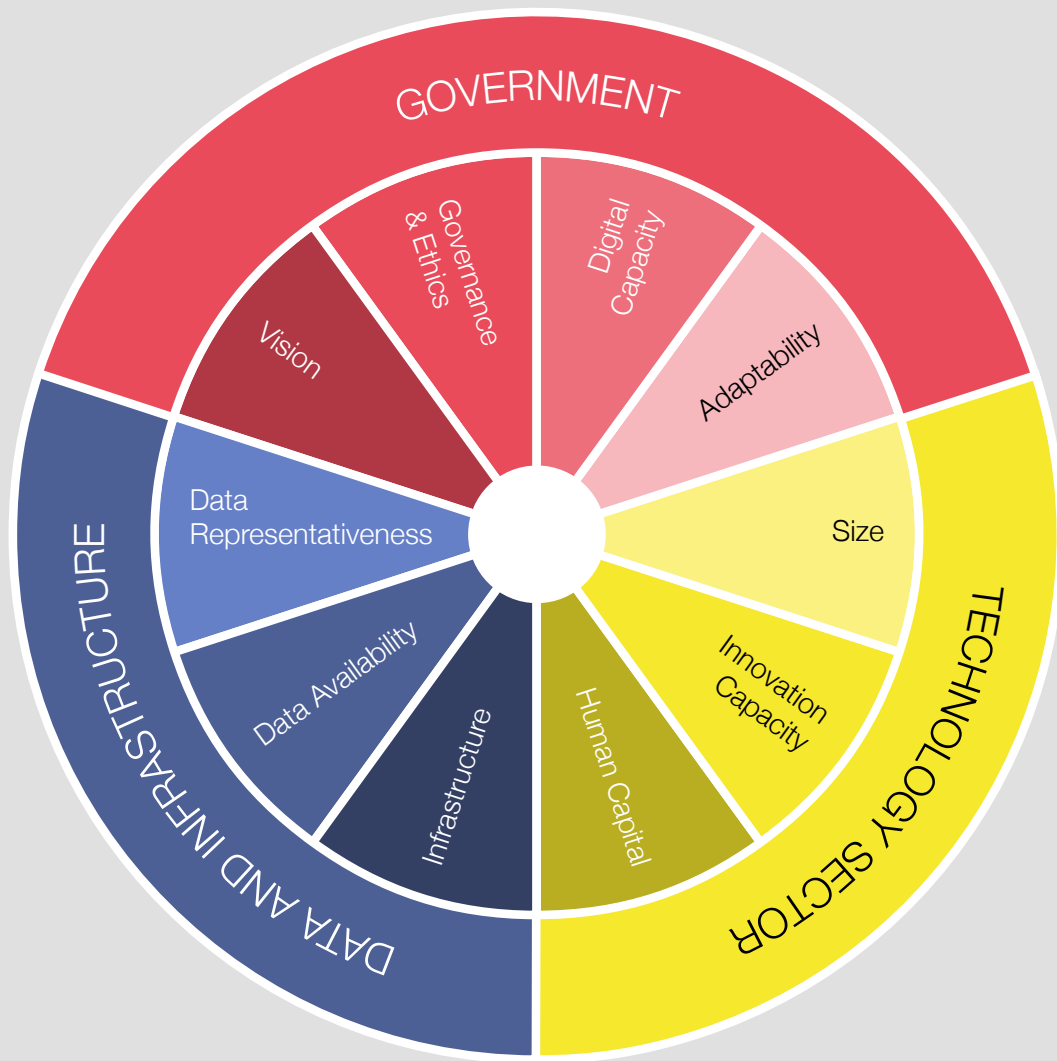"THE RESPONSIBLE USE SUB-INDEX COVERS 34 COUNTRIES, AND MEASURES 9 INDICATORS ACROSS 4 PILLARS"

Fig. 1: The pillars and dimensions of the Government AI Readiness Index

Key Findings

World Leaders

The United States of America comes top of this year's Index, with the rest of the top five places going to Western European nations (the UK, Finland, Germany and Sweden). All of these countries score highly across the three pillars of the Index: government, technology sector and data and infrastructure. Four of the top five already had published national AI strategies going into 2020, and the US launched the American AI Initiative in late 2019.

The US is renowned for its private sector innovation, with 'Silicon Valley' being almost synonymous with cutting edge technology. This strength is reflected in its ranking: it has the highest score in the technology sector pillar by almost ten points. In particular, the US scores highly for the number of technology unicorns (198 to China's 103) and its public technology companies have the highest collective market value. Although small startups and research institutions can absolutely produce major breakthroughs in AI, these large technology firms such as Google, Amazon, Facebook and IBM are critical for driving and commercialising AI research. Although the US also scores well in the government and the data and infrastructure pillars (ranked 2nd and 7th in the world respectively), it is in the sheer size and innovative power of its technology sector that it really has an edge in AI.

After North America, the highest-scoring region on average is Western Europe. Although the region does not yet have any tech hubs on par with Silicon Valley, Germany, the UK and Sweden are all in the top five for the technology sector pillar. Where the region performs particularly well is in terms of the data and infrastructure pillar, where the UK places first in the world, followed by Sweden, with Finland in fourth place.

Furthermore, not measured directly by the Index but of particular note in Western Europe is the extent of collaboration between countries to support the development of AI. In February 2020, the European Commission published its white paper 'On Artificial Intelligence - A European approach to excellence and trust', laying out an EU-wide strategy to make the region a global centre of excellence in AI. As Europe's regulatory approach develops, this may well have a positive impact on the scores of countries across the region, further cementing Western Europe's position as one of the leading areas for government AI readiness.

China: Readiness and Implementation

China, which has ambitions to challenge the US for global leadership in AI, performs surprisingly low in the Index, ranked 19th in the world. As such a large country with significant urban-rural inequalities, looking at China as a whole is likely to underestimate the strength of regional hubs such as Beijing and Shanghai. However, China's score also raises interesting questions about the difference between government AI readiness and government AI implementation.

We define government AI readiness as the raw materials and enabling factors needed to make AI implementation possible. China lags behind many Western nations on some of these indicators, especially for its technological infrastructure, with lower Internet and mobile phone penetration and uneven broadband coverage. However, in terms of implementation, we would argue that China is making better use of the capabilities it has than many other countries in the top 20 of the Index.

While the case of China does not completely break the correlation between government AI readiness and implementation - it is still among the top 20 countries in the world, and a lower-ranking country would struggle to achieve a similar level of implementation - it does show how some governments are pushing AI implementation more than others. We hope that in future research we are able to compare differences between government AI readiness and implementation around the world.

Fig. 2: Government AI Readiness Index Scores Worldwide

15-20 20-25 25-30 30-35 35-40 40-45 45-50 50-55 55-60 60-65 65-70 70-75 75-80 80-85

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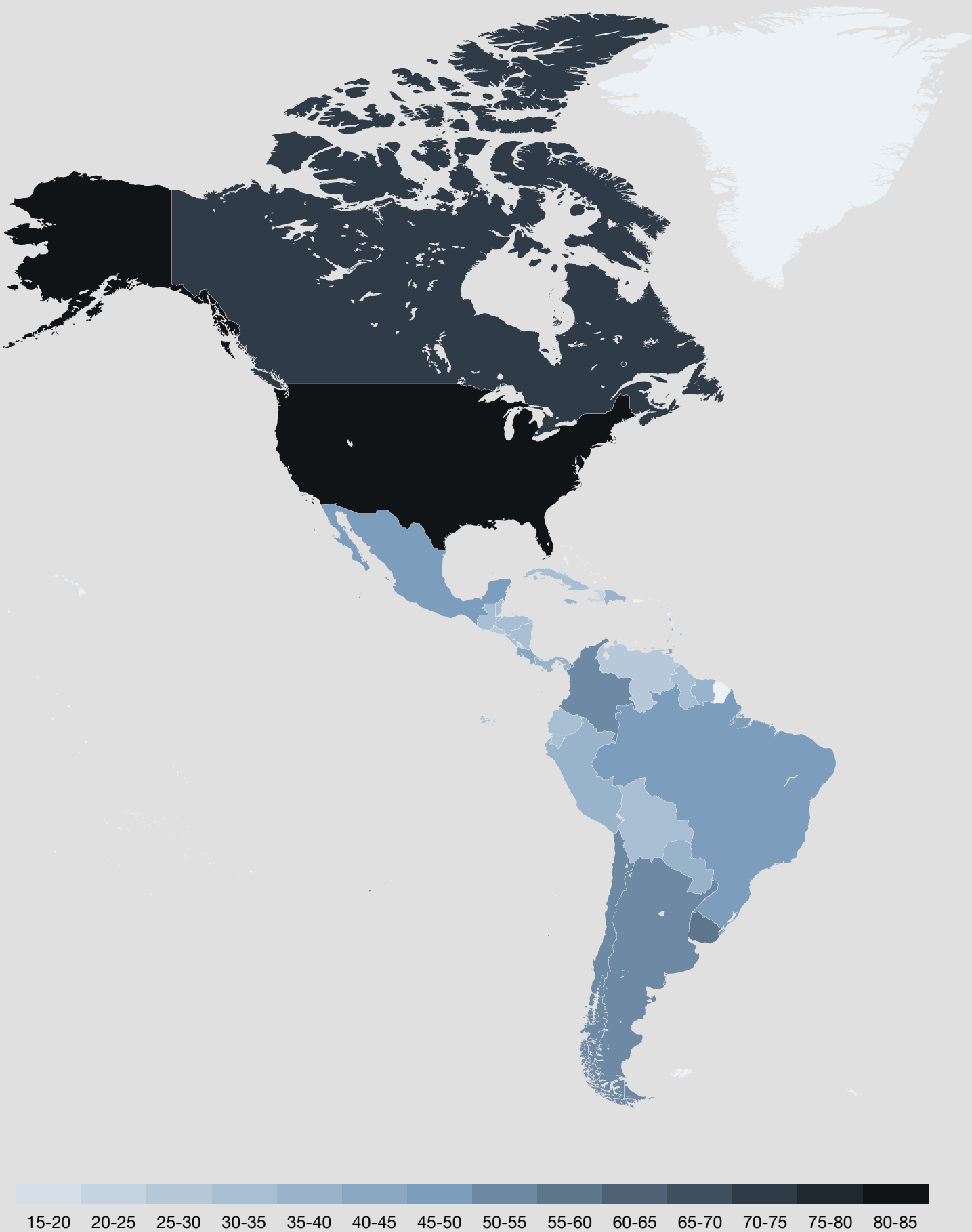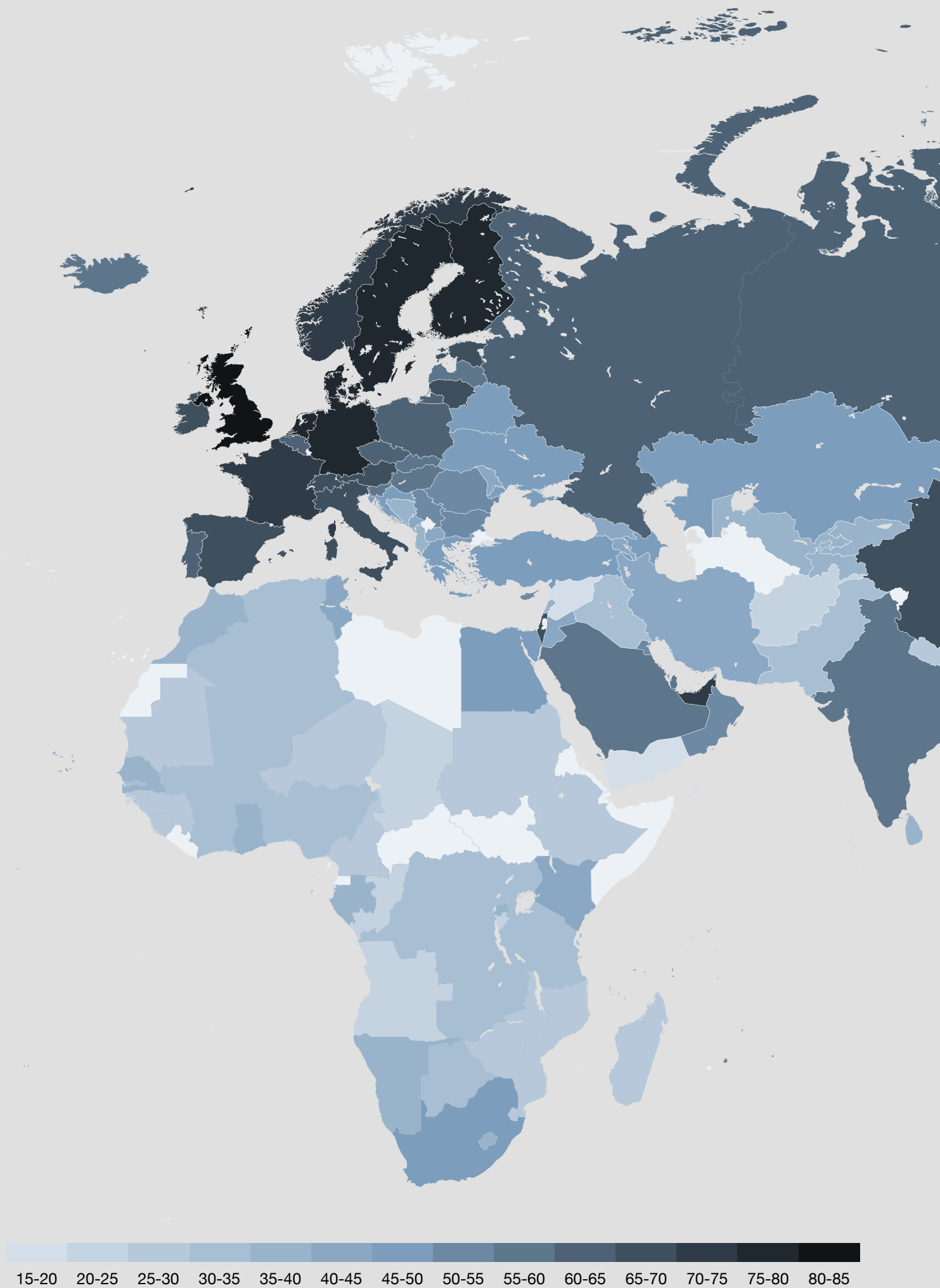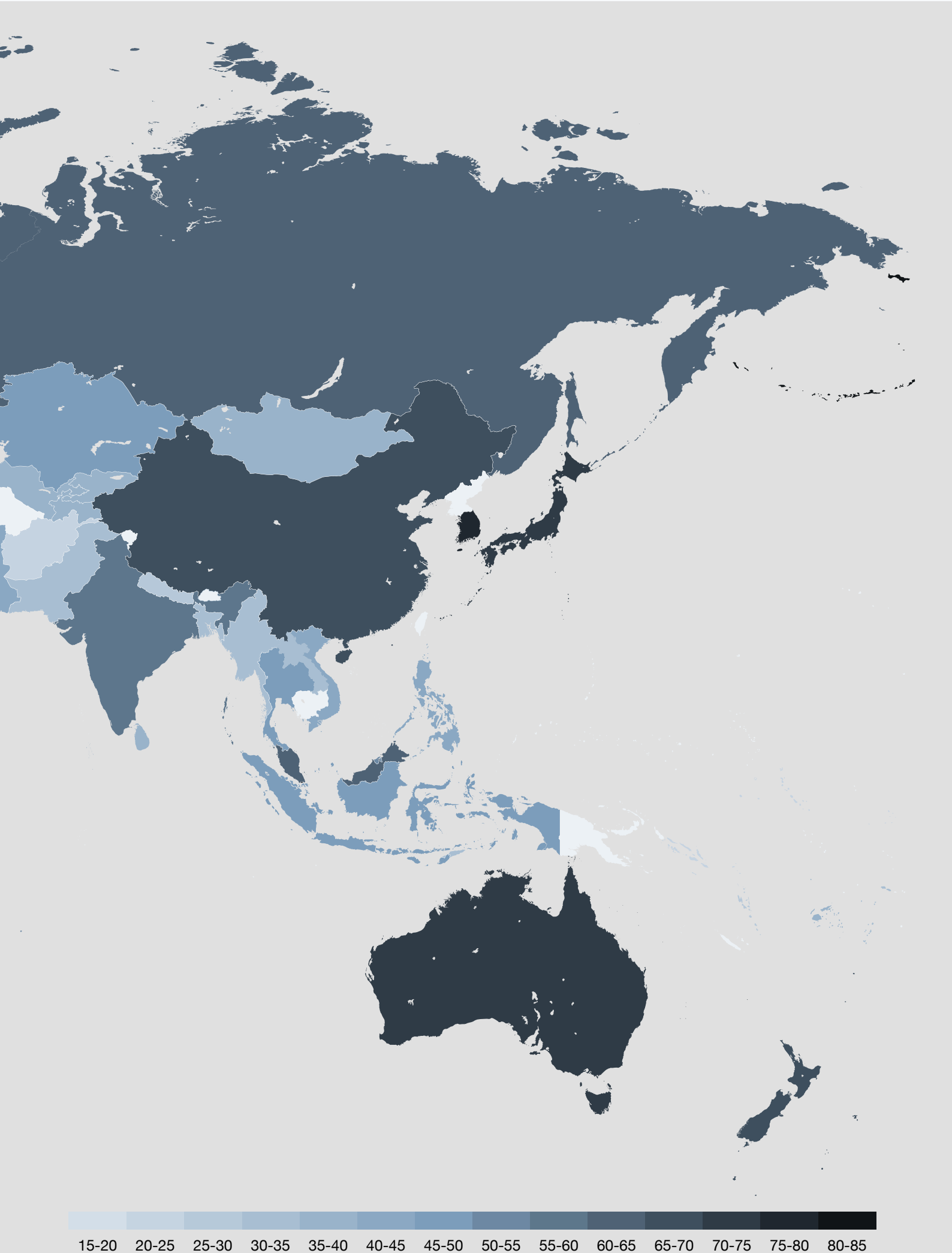
Global Inequality

The lowest-scoring regions on average are Sub-Saharan Africa, Latin America and the Caribbean, and South and Central Asia. This reflects a persistent inequality in government AI readiness that was identified in previous iterations of the Index. Even with the updated methodology, it is clear that the Global South is lagging behind the Global North. In particular, few countries in the Global South have published national AI strategies to set a vision for the implementation of AI; in Sub-Saharan Africa, only Mauritius has a strategy, with Kenya in the process of developing one.

Latin America has a higher number of countries with or developing national AI strategies - Argentina, Colombia, and Uruguay have published a strategy, and Brazil, Chile and Mexico all have one in development. However, like Sub-Saharan Africa, most countries in the region have small technology sectors. Regions in the Global South also have weaker technology infrastructures and a lower availability of data.

If more countries across the Global South published AI strategies, this would go some of the way to addressing this global inequality in government AI readiness. However, developing a technology sector, improving infrastructure and improving the availability of data are all more intractable problems that simply publishing a strategy may not fix.

If inequality in government AI readiness translates into inequality in AI implementation, this could entrench economic inequality and leave billions of citizens across the Global South with worse quality public services. We hope that the findings of our Index alert governments across the Global South to the importance of building their AI readiness, even in areas such as infrastructure where investment now may not come to fruition for a few years. We also hope that development organisations and the global community as a whole support governments in the Global South in their efforts, to ensure that the benefits of AI are shared by all.

Proliferation of AI Strategies

Compared to the 2019 Index, we can see a clear increase in the number of countries developing or publishing AI strategies, as shown in the maps below. National AI strategies are still overwhelmingly concentrated in the Global North, but there has been a noticeable growth in the number of strategies published or in development in Latin America.

The proliferation of AI strategies shows how many governments across the world are moving to try and set the agenda when it comes to the development and use of AI. Although strategies differ in their scope and aims, most make some mention of the significant economic and social benefits AI may bring, and governments want to ensure they do not miss out.

Governments may also use strategies to direct attention and investment towards particular AI applications in which they have a clear interest or competitive advantage. For example, the

Republic of Korea, with its ageing population, has a particular interest in the development of AI for health and social care. Meanwhile, the Government of Mauritius, the other country in Sub-Saharan Africa thus far to have published an AI strategy, proposes that Mauritius focuses on the intersection of AI and the ocean economy in a 'maritime Internet of Things'.

International Collaboration

Even as more countries are trying to find their niche to capitalise on the economic and social benefits of AI, there are also numerous examples of growing international collaboration. Already mentioned above, the EU published its white paper on AI this year, and the European Commission is driving a Europe-wide approach to the governance and regulation of AI. In addition, this year, 14 countries along with the EU founded the Global Partnership on AI to guide the responsible development and use of AI.
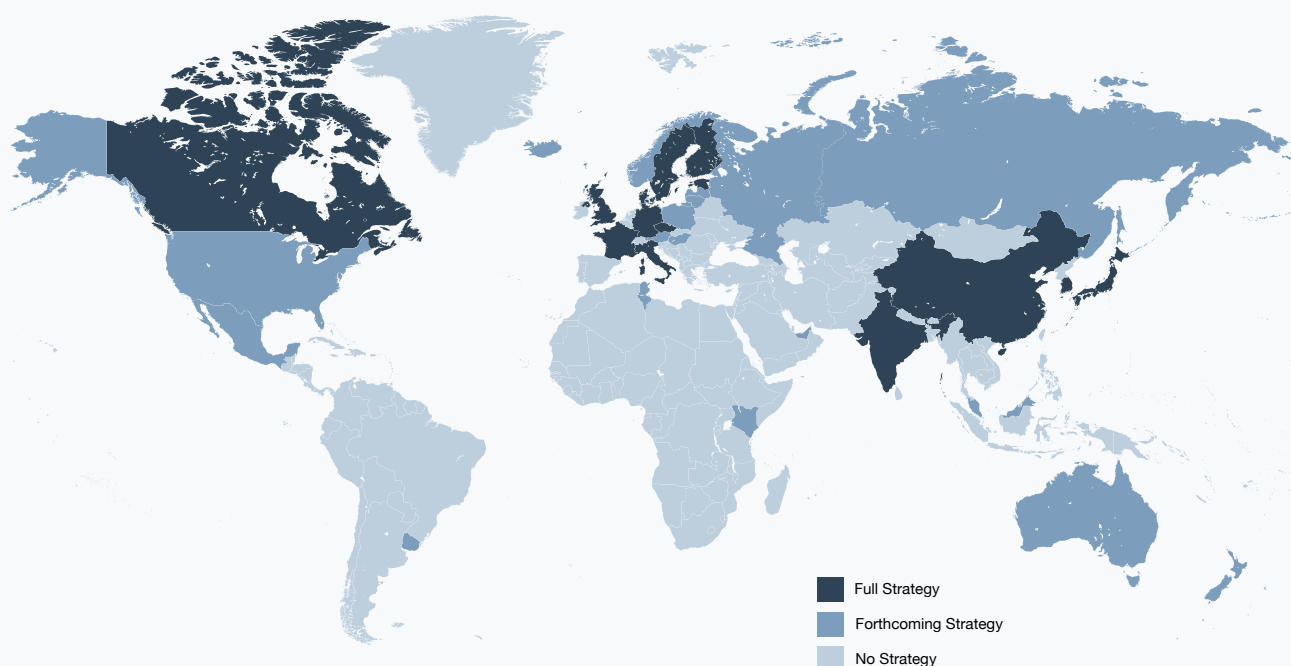
Fig. 3: National AI Strategies in the 2019 Government AI Readiness Index

Outside Europe, the IDRC's AI for Development (AI4D) initiative supports regional initiatives across Sub-Saharan Africa and Latin America. Collaborative efforts in the Global South may well be a way to share knowledge and expertise and boost nascent technology sectors or improve the availability of data, both of which would help improve government AI readiness. In 2019, AI4D held workshops in Sub-Saharan Africa and Latin America to bring together burgeoning AI communities in both regions. But there are several more initiatives harnessing AI to create a positive impact in the Global South, including the GIZ's (*Deutsche Gesellschaft fuer Internationale Zusammenarbeit*) Fair Forward program, the Lacuna Fund, but also the U.S. National Institute for Health (NIH) Harnessing Data Science for Health Discovery and Innovation in Africa Program.

Furthermore, while few Sub-Saharan African countries have not yet started developing AI strategies, the African Union AI Working Group met for the first time in 2019, and aims to develop a regional approach to AI and exchange expertise between countries. Collaboration in this manner could help countries develop AI strategies, identify other regulatory and governance issues, and learn from regional best practice.

The Index, which by its nature compares countries rather than regions, does not always reflect the full nuance of this international cooperation. Rather than seeing our rankings as an invitation to an 'arms race' of competition within countries, we hope that collaboration at the regional and global level is seen as a way of boosting government AI readiness through the sharing of expertise, tools and data.
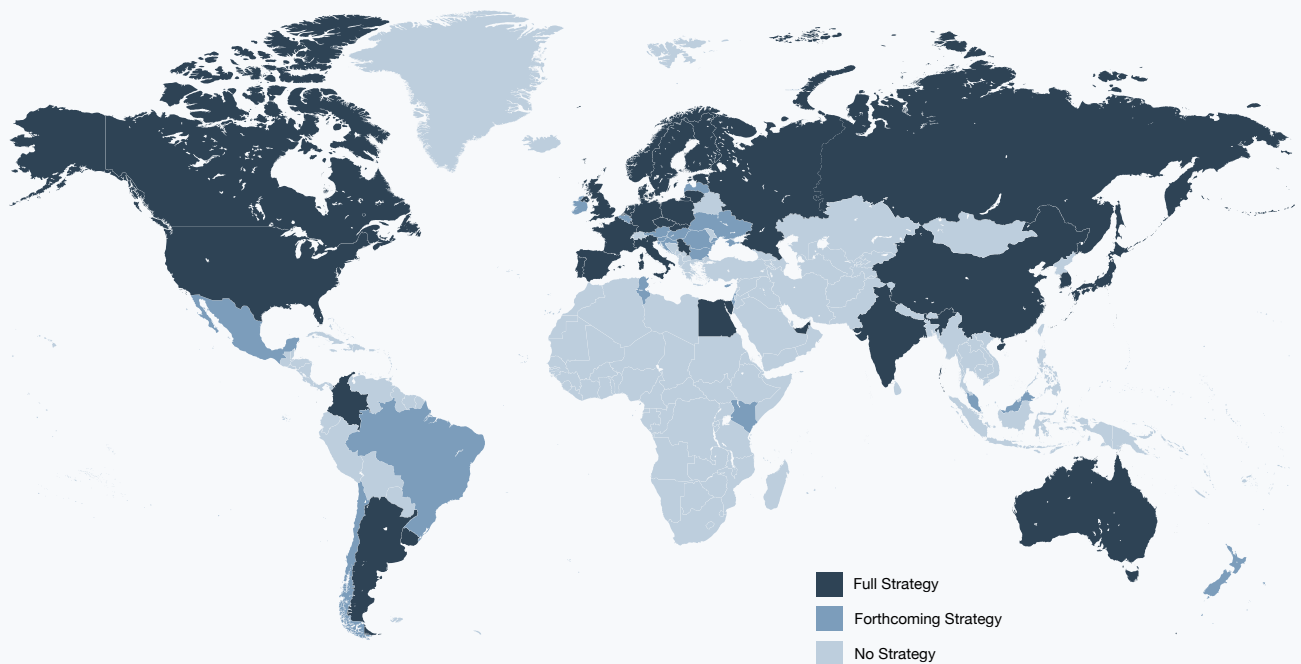
Fig. 4: National AI Strategies in the 2020 Government AI Readiness Index

Report Structure

The rest of this report covers the findings from our Responsible Use Sub-Index pilot, before going into more depth on the findings from the main Index.

Regional Analyses

We have divided the world into 9 regions, based on a combination of the <u>UN</u> and the <u>World Bank</u> regional groupings:

- North America
- Latin America and the Caribbean
- Western Europe
- Eastern Europe
- Sub-Saharan Africa
- Middle East and North Africa
- South and Central Asia
- East Asia
- Pacific

For each of these, an expert has written an analysis of major trends and important factors for government AI readiness in the region as a whole.

Country Profiles

As well as the regional analyses, this year for the first time we have included a selection of country profiles. For each region we have selected two to three countries that are either regional leaders (ranked first or close to first in the region) or 'rising stars', who may not yet score especially highly but we feel have exciting developments that may lead them to become significant AI players in the future.

The purpose of these profiles is to add qualitative richness to these countries' Index scores. We highlight a selection of policies, initiatives and trends that reflect possible reasons for a country's high scores to benchmark regional best practice. We also point to gaps and shortcomings that these countries may look to address in future to improve their government AI readiness.

Responsible Use Sub-Index

To reflect growing interest in the field of responsible AI, we have created a pilot for a Responsible AI Sub-Index.

This is the first quantitative assessment tool measuring how responsibly governments make use of AI.

At present, it covers only 34 countries, but we hope to expand it and iterate its methodology in future years.

Responsible Use Sub-Index

Introduction

As more governments implement AI in the delivery of their public services, there is growing awareness of the need to develop and use these technologies in a responsible manner. The positive economic and social potential of AI has been clearly recognised by governments, with increased policy attention and investments being channeled to the development of national and transnational AI ecosystems. A substantial amount of research and advocacy work, however, has been conducted in uncovering unintended consequences or even malicious use of AI.

Issues in this area include algorithmic bias unintentionally locking-in social inequalities, but also more intentionally harmful uses such as applying facial recognition systems for mass surveillance, or developing DeepFakes to spread misinformation.

Initially, this led to the emergence of the field of 'AI ethics', which sought to apply insights from ethical and moral theory to address issues around the development and use of AI. Often this led to organisations developing sets of ethical AI principles to which they promised to adhere, to - commonly in the form of 'AI ethics' frameworks, guidelines or principles. To date, over 100 of these frameworks have been created.

Whilst the field of 'AI ethics' has advanced understanding of some of the risks around the use of AI, recent initiatives such as the Global Partnership on AI (GPAI) speak of **responsibility** more than of ethics. Canada, one of the founding members of the GPAI, has also demonstrated interest in this field of responsible AI: in 2017, the Université de Montréal launched the Montréal Declaration on Responsible AI, which has now been signed by over 100 organisations.

In the GPAI's own words, their aim is to 'bridge the gap between theory and practice'. A shift in emphasis away from ethics towards responsibility may therefore mark a move away from stating and restating various ethical commitments, and actually put in place the relevant policies to bring those principles to life.

"AS MORE GOVERNMENTS IMPLEMENT AI IN THE DELIVERY OF THEIR PUBLIC SERVICES, THERE IS GROWING AWARENESS OF THE NEED TO DEVELOP AND USE THESE TECHNOLOGIES IN A RESPONSIBLE MANNER."

The Responsible AI Sub-Index

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The Responsible AI Sub-Index measures 9 indicators across 4 dimensions: **Inclusivity**, **Accountability**, **Transparency** and **Privacy**. These dimensions were selected to cover the OECD Principles on Artificial Intelligence. A full methodology for the Sub-Index can be found in Annex 3.

The Sub-Index comprises the top 20 countries from the Government AI Readiness Index, along with any other countries featured as a regional leader or a rising star in this report.

Rankings

Rank	Country	Score
1	Estonia	79.852
2	Norway	77.201
3	Luxembourg	76.526
4	Finland	76.172
5	Sweden	72.975
6	Portugal	72.436
7	New Zealand	68.262
8	Denmark	66.873
9	Senegal	66.381
10	Uruguay	65.205
11	Canada	65.005
12	Netherlands	64.472
13	Mauritius	64.099
14	Switzerland	63.653
15	Japan	60.872
16	Germany	59.723
17	Romania	58.997
18	Australia	58.771
19	Singapore	57.548
20	France	56.666
21	Republic of Korea	56.479
22	United Kingdom	54.566
23	Israel	52.027
24	United States of America	50.008
25	Kazakhstan	46.771
26	United Arab Emirates	46.658
27	Egypt	45.520
28	Colombia	44.763
29	South Africa	42.699
30	Brazil	42.358
31	Turkey	42.255
32	India	41.190
33	Russia	39.124
34	China	34.475

Analysis

World Leaders

The top of the Responsible Use Sub-Index is dominated by the Scandinavian countries, who all score favourably in terms of accountability and transparency, as well as having low levels of social inequality compatible with adopting AI in an inclusive manner. Estonia, ranked first, is notable for its long history of digital government, which may give it a good regulatory environment for the adoption of new technologies.

USA and UK: AI Ready but not Responsible? Many of the top scorers in the Government AI Readiness rank considerably lower on the Sub-Index. In particular, the USA and the UK, ranked 1st and 2nd respectively in the main Index, are here ranked 24th and 22nd.

There are a number of possible factors behind this gap. The USA and the UK both have significant technology sectors in which a number of companies score poorly on the Transparency International Corporate Political Engagement Index. There is therefore a risk of regulatory capture, where government policy reflects the interests of tech companies more than those of citizens. For example, the USA and the UK both have major surveillance industries, and in the UK the Metropolitan Police faced criticism for their trialling of facial recognition.

In addition, the USA and the UK have higher levels of inequality than responsible use leaders such as Sweden and Finland - this increases the risk that AI will be implemented in a manner that is not inclusive. In the UK, a most recent example includes the application of a grading algorithm awarding grades of A-level pupils, which predicted higher grades for pupils from private schools as opposed to those from state schools.

Both countries, along with others such as Singapore, the UAE and Israel who also score significantly lower in the Sub-Index than in the main Index need to make the responsible use of AI a priority, or else their implementation of AI may undermine important rights and freedoms.

Russia and China

Russian and China score the lowest in the Responsible Use sub-index AI. Both have developed a reputation for mass surveillance and restrictions on Internet freedoms.

In the case of China, perhaps the most concerning developing is the country's exportation of AI surveillance technologies to other countries. As China's geopolitical influence grows, there is a risk that it will become an 'irresponsible AI' leader that other countries seek to emulate.

Fig. 5: Responsible Use Sub-Index Scores Worldwide

30-35 35-40 40-45 45-50 50-55 55-60 60-65 65-70 70-75 75-80

Government AI Readiness Index 2020
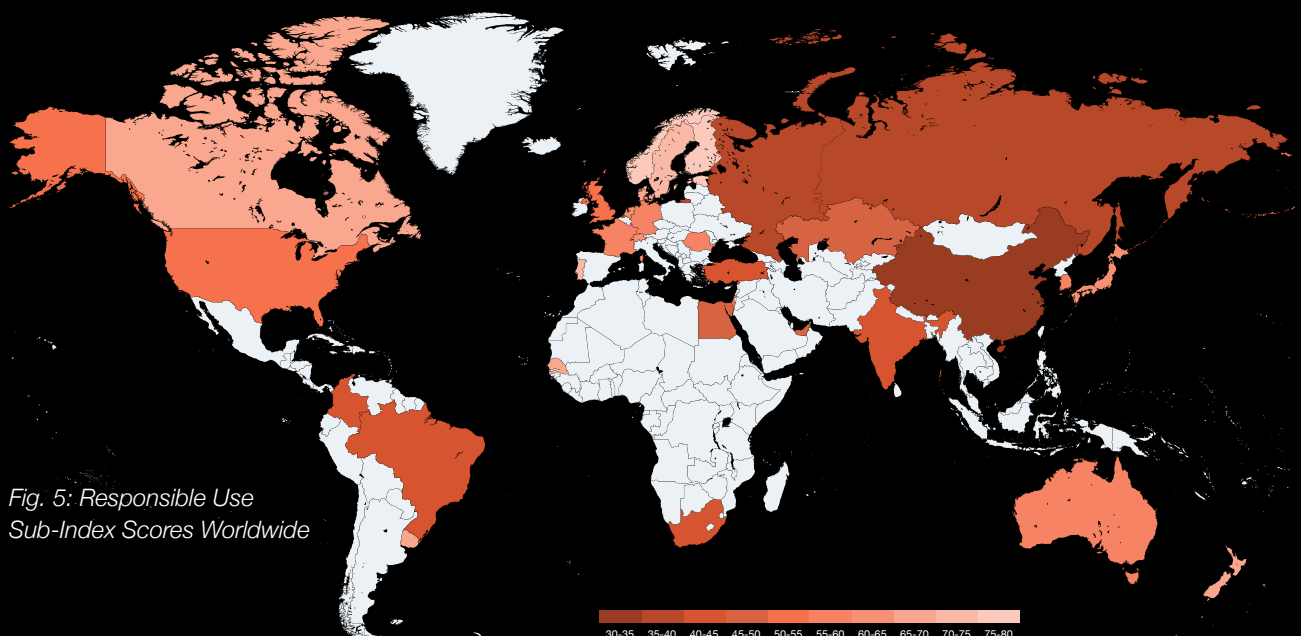
Limitations

This pilot was limited by the availability of relevant data - ideally, we would have liked to include more indicators to get a more comprehensive picture of, for example, the role of the private sector in stifling regulation, or the extent of mass surveillance. Instead, we had to rely on proxies such as the number of 'surveillance companies' headquartered in a country - records that tend to over-represent the West and under-represent other areas of the world.

In addition, some useful indicators such as Freedom House's Freedom on the Net ranking and the Economist Intelligence Unit's Automation Readiness Index do not yet include all countries. Therefore, until we can identify more comprehensive alternatives, we felt it was best to limit the Sub-Index to a smaller set of countries.

We hope that the Sub-Index can shape a conversation about the sorts of data needed to further the study of responsible use. Where there are gaps in our methodology, we hope they can be filled in future iterations, and that the Sub-Index can develop into a global ranking.

NORTH AMERICA

North America

Regional Analysis

by Jessica Newman

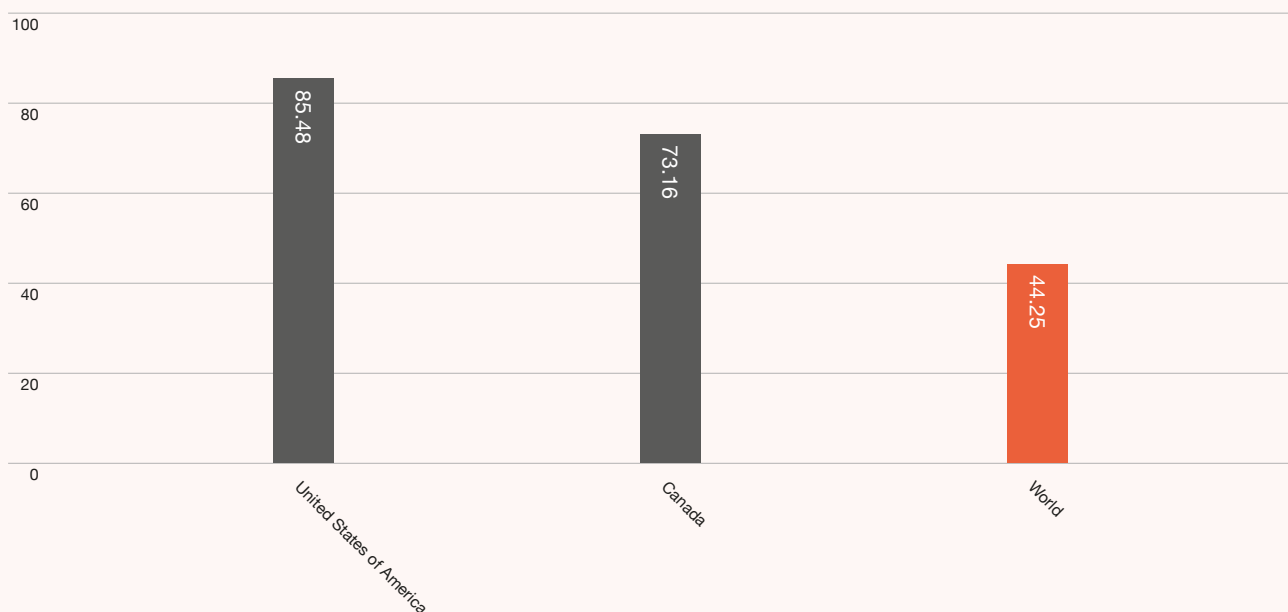North America continues to be a regional leader in government artificial intelligence (AI) readiness. The United States is now ranked first in the world according to Oxford's Insights' methodology, meaning that the U.S. government is comparatively well prepared to implement AI in the delivery of public service to its citizens. Canada also remains near the top, ranking 14th out of 172 countries. Both countries score well across the three considered pillars of government, the technology sector, and data and infrastructure. They have both articulated a vision for implementing AI, have established policy and ethical frameworks for AI, have large and highly capable technology sectors willing to supply the government with AI technologies, and have high quality data and technological infrastructure. Despite the region's relatively high scores on this index, there are some reasons for concern and significant room for improvement in government AI readiness in both Canada and the United States.

AI Strategies in North America
The U.S. government has led numerous AI initiatives since 2016, with notable examples including the Defense Advanced Projects Research Agency's AI Next Campaign to invest $2 billion USD in state-of-the-art AI research, and the American AI Initiative, launched in a February 2019 presidential Executive Order that outlines roles and responsibilities for different government agencies as well as overarching AI objectives. Also influential was the National AI Research and Development Strategic Plan, which was

updated in June 2019 and includes eight strategic priorities for the country. These initiatives have advanced U.S. AI R&D and facilitated follow-on policy efforts including a plan for federal engagement in the development of technical standards, led by the National Institute of Standards and Technology (NIST), and a draft White House Memorandum with guidance for AI regulation.

Canada, on the other hand, was one of the first countries to release a national AI strategy. The Canadian government launched the Pan-Canadian Artificial Intelligence Strategy in 2017 and began the implementation of several goals that have secured Canada's position as a global leader in AI. These goals included increasing the number of AI researchers and graduates in the country, establishing interconnected AI centers of excellence, developing global thought leadership on the economic, ethical, policy and legal implications of AI, and supporting a national AI research community. The strategy has stood out for its focus on cultivating and attracting highly skilled AI talent. An important element of the strategy is the National Program of Activities, which has included a national training program and a grants program. Other key AI policy initiatives include Canada's Advisory Council on Artificial Intelligence, and the Digital Charter, which defines ten principles to guide the use of data and digital technologies throughout the country.

One Region, Two Visions
There are also divergent priorities throughout the region. Canada and the U.S. have both invested heavily in AI R&D, infrastructure, and governance, as highlighted below. However, while Canada has primarily focused on education

and human talent, the U.S. has prioritized scientific breakthroughs and commercial innovation. And while both countries have emphasized the importance of public trust in AI technologies, the U.S. government has mostly focused on articulating guiding principles, whereas the government of Canada has also established a policy directive that includes requirements for the government's procurement, use, and monitoring of AI-enabled tools.

The Canadian government, for instance, developed the AI Source List, which provides government agencies with pre-approved suppliers and helps expedite procurement from firms with a track record of providing quality AI technologies. Furthermore, the government of Canada has developed an Algorithmic Impact Assessment tool to help policymakers determine how to select and responsibly use AI technologies within government, by identifying ethical biases and helping to mitigate them. Lastly, the government developed a Directive on Automated Decision-Making, which took effect April 2020 and provides requirements for the government's use of decision-making algorithms and systems. The requirements include conducting an Algorithmic Impact Assessment prior to production, providing sufficient transparency about the use and impact of the system, and providing quality assurance testing and monitoring of outcomes.

Canada has also encouraged investment in AI R&D, for example with the Innovation Superclusters Initiative, which created the SCALE.AI Supercluster around Montréal and invested hundreds of millions into financing for AI startups, training for professionals, and facilitating the adoption of AI for supply chains. However, Canada has just two technology "unicorns" (companies valued at over $1 billion USD,) while the U.S. has 198. As such, Canada has a significantly lower share of the total market value of large technology firms. Canada also trails behind the U.S. in the deployment of 5G commercial networks.

The U.S., in turn, leads the world in the total amount of private investment in AI startups. Federal investment in AI R&D has also continued to increase, with the administration proposing $1.5 billion USD in funding for the non-defense AI budget for fiscal years 2020-2021. The size of the technology sector as well as the country's innovation capacity are unparalleled. However, if the U.S. does not also pay attention to other criteria in the coming years, certain aspects of the current government approach may backfire. For example, despite making STEM education a priority, the U.S. already scores lower than Canada in the percentage of STEM graduates, and restrictions on foreign STEM graduates and researchers may have a chilling effect on the AI industry. Another trend to watch is whether distrust of government use of AI will continue to stand in the way of U.S. government procurement of AI tools and services. The current administration has focused on "reducing regulatory barriers" to AI development, but amidst increasing calls for federal regulation of AI applications such as facial recognition technology, this stance may need to evolve in order to avoid problematic and dangerous uses of AI, and to fully capitalize on the technology's potential for the long-term.

Regional and International Collaboration

Government-led AI collaboration across North America is still relatively rare, but is likely to increase over time. The U.S.-Canada Innovation Partnership, composed of multi-stakeholder experts from both countries, was launched by the U.S. Consul General in October 2019 to "promote a deeper bilateral relationship through collaboration on innovation, technology, research, science, and related issues." The second symposium organized by the partnership, which took place January 2020, was specifically dedicated to exploring collaboration on artificial intelligence.

Canada and the United States also collaborate on issues related to AI through various international forums including the G7, G20, OECD, and United Nations. For example, both countries have endorsed the OECD AI Principles and support the ongoing efforts of the OECD AI Policy Observatory. Additionally, the government of Canada launched the Global Partnership on Artificial Intelligence (GPAI) together with the government of France and more than a dozen international allies to facilitate cooperation on AI research and implementation activities. The U.S., though skeptical at first, ended up joining GPAI and supported its launch in June 2020. GPAI may serve as a particularly important platform for North American AI research collaboration since Montréal will host two of the four GPAI Working groups.

Conclusion

Much of North America's comparative success in AI readiness is not explicitly related to AI technologies, or even to particular administrative policies, but to broader structural realities within the region including higher income, decades of investment in STEM education, and support for technological innovation. However, North America (and particularly the United States) score exceptionally well because of the more recent focus on AI initiatives specifically. This focus does not show signs of dissipating, but rather can be expected to increase over the new few years. In particular, the current push for standardized guidelines for AI technologies will make it easier for governments to adopt new AI applications and to have greater confidence that they will be reliable, safe, fair, and accountable.

Recent trends in the region include not only increased AI R&D spending, but also greater attention to bilateral and international cooperation on AI research and strategy, and to policy frameworks that promote responsible AI development and use and facilitate public trust. Such initiatives are at relatively early stages, but are poised to help the region realize its goals for AI implementation. If the region fails to deliver upon these efforts, public backlash and distrust of government use of AI could pose a major roadblock to government AI readiness in the coming years.

United States of America

Index Score	Rank	Regional Rank
85.48/100	**1**/172	**1**/2 (North America)

Responsible Use Score	Responsible Use Rank
50.01/100	**24**/34

GDP (US$ billion)	Population
16,903	326,688,000

Vision: **100**

Governance & Ethics: **92.66**

Digital Capacity: **88.83**

Adaptability: **75.24**

Size: **81.65**

Innovation Capacity: **79.90**

Human Capital: **71.11**

Infrastructure: **90.41**

Data Availability: **89.55**

Data Representativeness: **89.16**

100
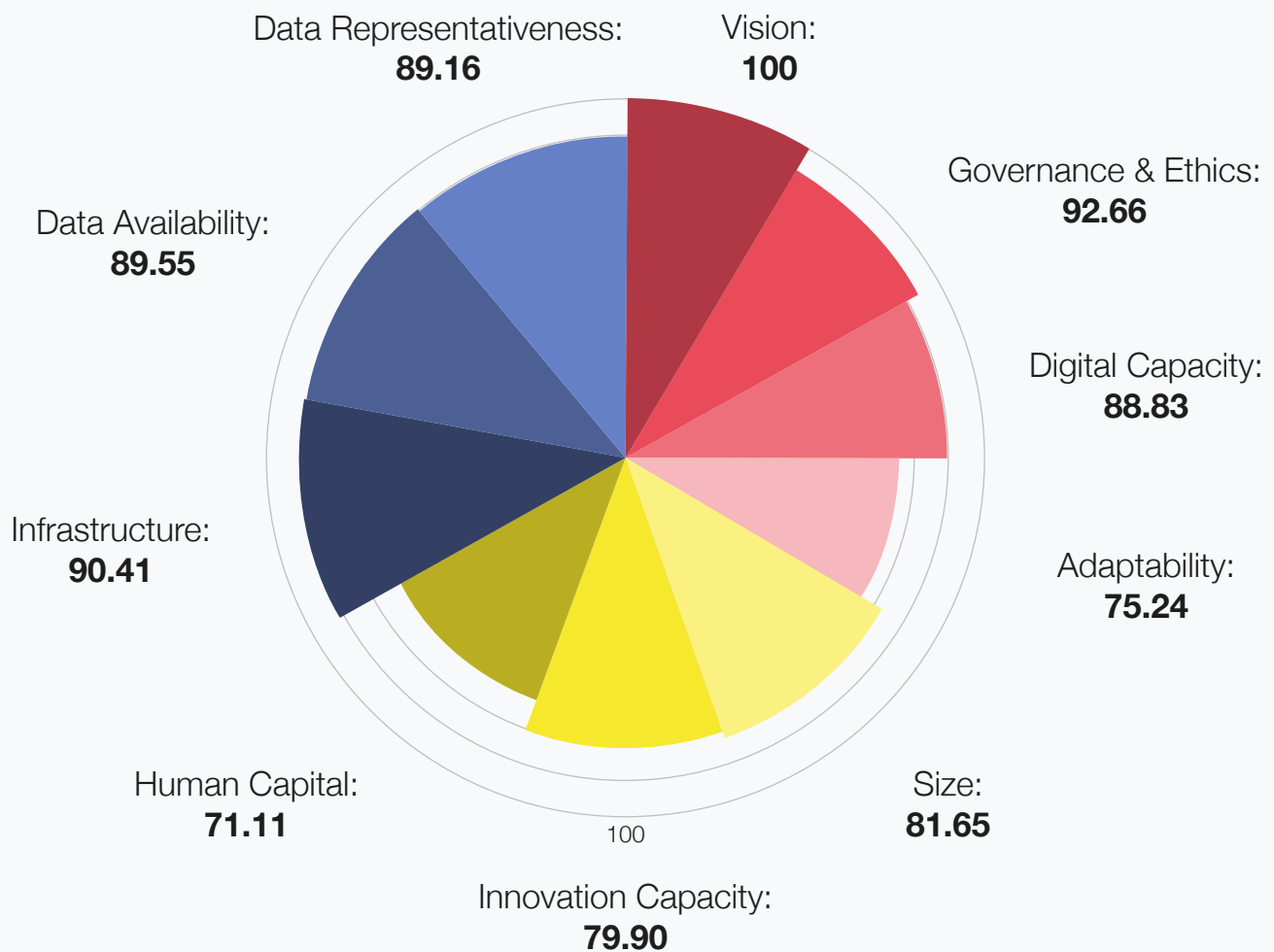
Government

Score	Rank	Region Rank
89.18/100	**2**/172	**1**/2
		(North America)

WORLD AVERAGE: **41.34**
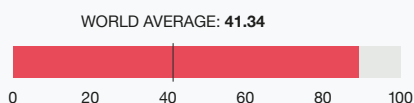
The United States of America tops this year's Government AI Readiness Index. Its score for the Government Pillar is the second highest in the world after Singapore, and reflects a strong set of policies and initiatives aimed at fostering the development and deployment of AI. The American AI Initiative, launched in 2019, sets out a strategy for maintaining the USA's global leadership in AI. The strategy aims to foster innovation in the private sector as well as encourage the adoption of AI in government.

In September 2019, the White House hosted the Summit on AI in Government. This brought together 175 leaders and experts from government, industry and academia to discuss the use of AI in the federal government. Within government, the AI Center of Excellence advises federal agencies on how best to deploy AI in their departments, and the AI Community of Practice, which brings together federal employees with an interest in AI policy in order to 'accelerate the thoughtful adoption of AI across the federal government.'

Technology Sector

Score	Rank	Region Rank
77.55/100	**1**/172	**1**/2
		(North America)

WORLD AVERAGE: **32.76**
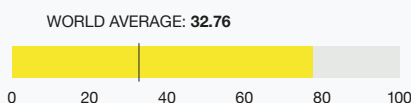
The USA has the world's highest score in the Technology Sector Pillar, and the highest score for the size dimension. With its large and world-renowned technology sector, it is unsurprising that the USA scores well in this area.

The US Government has made investment in R&D to support innovation in the technology sector a key plank of their national AI strategy. In 2019, the Government published the first-ever reporting of non-defense AI R&D spending, and in the FY21 Budget, announced in February 2020, it committed to doubling this R&D spending over the next 2 years.

The USA's lowest score in any dimension (71.11) is for the Human Capital dimension, suggesting that this is one area that could be targeted to maintain and strengthen global leadership in government AI readiness. In terms of the percentage of STEM graduates, with a score of 33.10 the US lags behind other world leaders such as the UK (48.62) and Germany (65.67). In addition, the US scores 72.17 for the digital skills indicator, lower than Finland (80.53), Singapore (76.40) and Israel (74.98) among others.

However, the USA certainly has a strong foundation on which to build to improve its human capital score, with 3 of the top 5 universities in Engineering and Technology in the QS World University Rankings based in the US (the Massachusetts Institute for Technology, Stanford University and the University of California, Berkeley). The Government also has a STEM education strategy, published in 2018, which aims to give all Americans access to life-long high-quality STEM education and training.

Data and Infrastructure

Score	Rank	Region Rank
89.70/100	**7**/172	**1**/2
		(North America)

WORLD AVERAGE: **58.64**
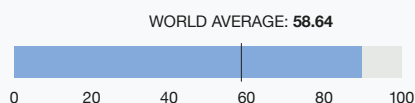
The USA scores well across the Data and Infrastructure Pillar. It has the third-highest number of cities where 5G is available of any country in the world (after South Korea and China), illustrating its investment in advanced technology infrastructure. However, the World Economic Forum has reported on the issue of the USA's 'digital divide', with lower-income Americans having lower levels of technology adoption. Until the technological infrastructure of the USA is more evenly distributed, it will be harder to capture representative data and develop public services from which all American citizens will be able to benefit.

In terms of data availability, the Government has released a Federal Data Strategy, which emphasises the importance of government agencies capturing and using data, as well as making it accessible in a high-quality form to train AI models.

Canada

Index Score	Rank	Regional Rank
73.16/100	**14**/172	**2**/2 (North America)

| Responsible Use Score	Responsible Use Rank
65.01/100	**11**/34

GDP (US$ billion)	Population
1,353.93	37,058,000

Data Representativeness: **94.80**

Vision: **100**

Governance & Ethics: **86.80**

Data Availability: **87.43**

Digital Capacity: **64.12**

Infrastructure: **60.07**

Adaptability: **69.31**

Human Capital: **68.51**

Size: **46.98**

Innovation Capacity: **60.46**

100
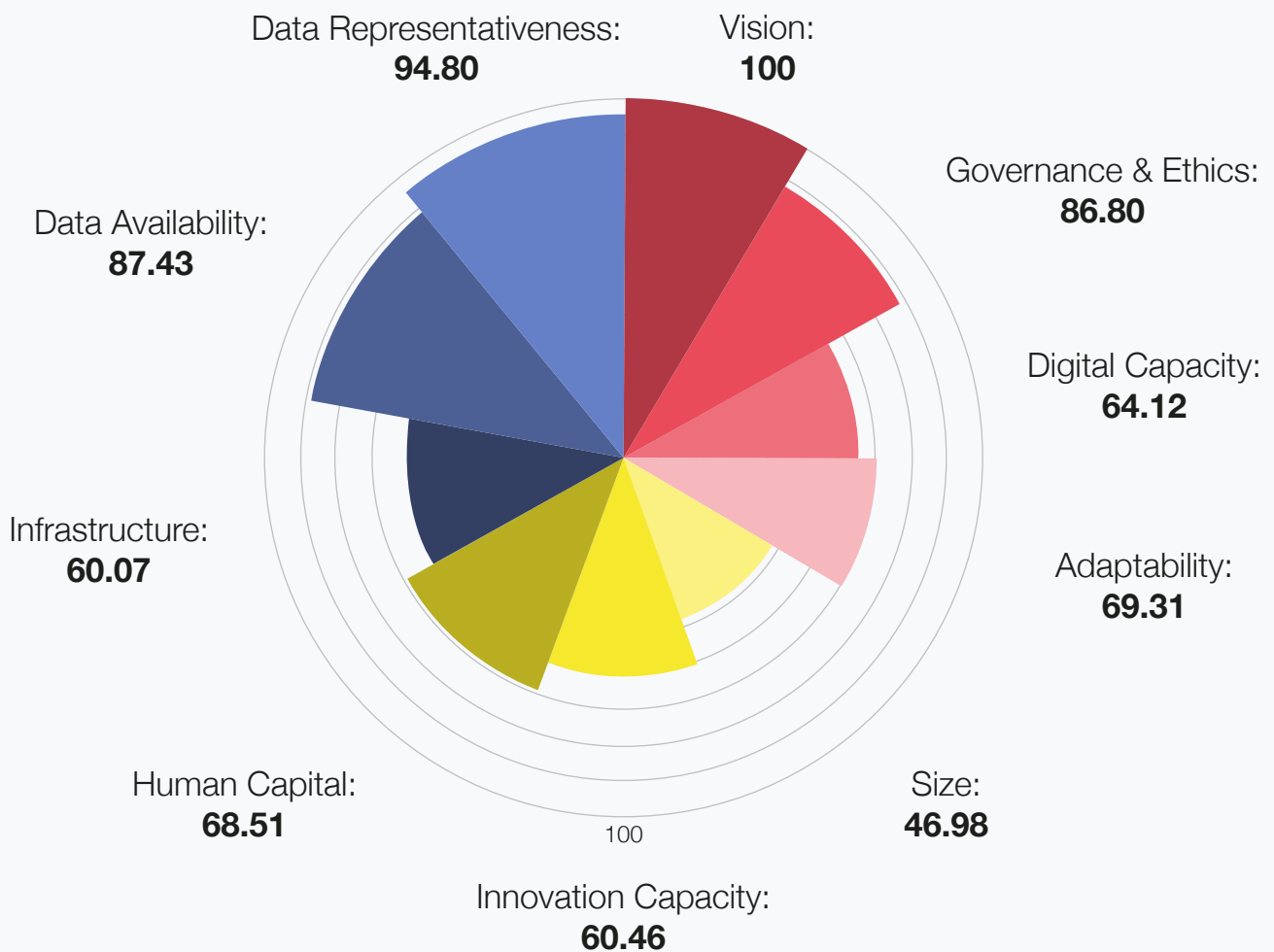
Government

Score	Rank	Region Rank
80.06/100	**11**/172	**2**/2
		(North America)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
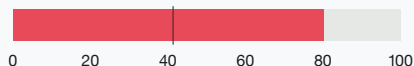
Canada was one of the first governments in the world to publish an AI strategy in 2017. The Pan-Canadian AI Strategy is particularly notable in setting out Canada's ambition to become a global thought leader on the ethical, policy and legal implications of AI. One of the pillars of the strategy is the AI & Society Program, that brings together experts from industry, academia, government, and other fields to discuss some of the risks and challenges posed by AI. One of the initiatives in this programme were the AI Futures Policy Labs, that were designed to train civil servants in the policy implications of AI.

Canada has also produced a national framework for the responsible use of AI. In government, the Directive on Automated Decision-Making sets out requirements for the use of algorithms. For example, the relevant department must conduct an impact assessment for the technology in question, and must ensure transparency and data quality. The Government is developing a list of approved AI suppliers to streamline government procurement of new technologies.

The Canadian Digital Service, launched in 2017, has a mandate to assist with the modernisation of government. It has an ambitious digital government plan to digitise all public-facing services by 2025. Canada also has a Digital Operations Strategic Plan: 2018-2022, that makes a commitment to using AI in public services in a responsible manner. The Strategic Plan also mentions the issue of a lack of digital skills within government. One of the policy solutions has been the creation of a Digital Academy for Public Servants. The Strategic Plan also commits to strengthening technology recruitment within government.

Technology Sector

Score	Rank	Region Rank
58.65/100	**15**/172	**2**/2
		(North America)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
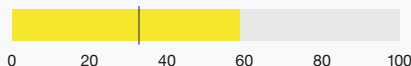
Canada's technology sector is smaller than its southern neighbour, the USA, but does have some notable players such as AI unicorn Coveo, but of course also Shopify, which became Canada's most valuable company on the Toronto Stock Exchange (TSX), in 2020. There are a number of Government initiatives in place to try and encourage technological innovation, overseen by Innovation Canada. These include the Strategic Innovation Fund, and the Innovation Superclusters Initiative. The latter includes two superclusters related to AI: the AI-Powered Supply Chains Supercluster and the Digital Technology Supercluster.

Canada has four universities in the top 50 globally for Engineering and Technology: the University of Toronto, the University of British Columbia, the University of Waterloo and McGill. There are prominent research centres around the Vector Institute for AI in Toronto, the Montreal Institute for Learning Algorithms and the Alberta Machine Intelligence Institute in Edmonton. Canadian universities have also taken a lead on issues of ethics and governance, with the University of Montreal issuing the Montréal Declaration on Responsible AI. However, ElementAI has identified a lack of connection between these geographically-spread research clusters as a barrier to further growth.

Attracting top-level AI talent is also a challenge for Canadian technological research and innovation, with Canada facing stiff competition from Silicon Valley when it comes to recruitment. The Government has created a Global Skills Strategy fast-tracks visas for those with valuable tech skills as a way to try and combat this problem.

Data and Infrastructure

Score	Rank	Region Rank
80.77/100	**25**/172	**2**/2
		(North America)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
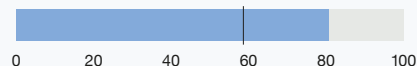
Canada is widely recognised as a world leader in open data, coming joint first in the 2018 Leaders' Edition of the Open Data Barometer. Its open data portal, open.canada.ca has more than 80,000 datasets from over 70 federal agencies and departments. In October 2018, Canada began its term as lead government chair of the Open Government Partnership.

In terms of digital infrastructure, the Canadian Government plans to drive adoption of the cloud, which will facilitate greater automation within government. The Government also has a Broadband Fund, to help foster digital inclusion. The Digital Operations Strategic Plan is optimistic that Canada's digital divide appears to be closing, noting that lower-income groups only lag higher-income ones in Internet use by a few percentage points. This represents an optimal environment for creating AI-driven public services from which the general population will be able to benefit.

LATIN AMERICA AND THE CARIBBEAN

Latin America and the Caribbean

Country	Value
Uruguay	55.57
Chile	53.09
Colombia	51.26
Argentina	50.75
Mexico	49.36
Brazil	47.46
World	44.25
Costa Rica	42.55
Trinidad and Tobago	41.24
Barbados	40.80
Saint Kitts and Nevis	40.39
Panama	39.59
Antigua and Barbuda	39.12
Jamaica	38.36
Dominican Republic	37.47
Peru	36.57
Saint Vincent and the Grenadines	35.72
Dominica	35.71
Suriname	35.46
Paraguay	35.14
Saint Lucia	35.04
Grenada	33.45
Bolivia	33.03
Ecuador	32.41
Guatemala	31.18
Belize	31.01
Honduras	30.97
Cuba	30.65
Guyana	30.55
Nicaragua	30.24
El Salvador	29.43
Venezuela	26.27
Haiti	21.11

Regional Analysis

by Fabrizio Scrollini

Last year Montevideo, Uruguay welcomed Khipu, the first Latin American conference in AI. More than 350 students and academics from all over Latin America gathered to showcase projects, techniques and questions about the future of the field in the region. More than 1000 students and academics applied to participate. The Conference provided a window into a diverse technical ecosystem emerging in the region with strong technical capabilities, as well as showcasing early discussions about gender, inclusion and governance of these technologies.

Uruguay was a good fit for organizing this conference, as the country currently leads the region in the Government AI Readiness Index. This is largely explained by its government policies to support AI, good IT infrastructure, the development of a national strategy on the matter, and human capacity built in their private and academic sector. The second place goes to Chile, which has a strong export-oriented IT sector but has been slower to enact comprehensive data policies and strategies. Colombia, Argentina and Mexico follow suit, as these countries have a group of leading digital businesses who could take advantage of the AI revolution, but several regulatory and capacity challenges stand in the way.

Uses of AI in Latin America and the Caribbean
Latin American and Caribbean countries face a complex picture in terms of adopting AI technologies. Several medium and large companies could take advantage of the use of AI techniques, as well as governments. But how AI is embedded into the business and government machinery poses several questions in terms of inclusion, impact and efficiency. AI techniques evolve in a given context and Latin American countries are among the most unequal in the world, with little capacity to regulate these developments. For instance, the inclusion of automatic decision making in welfare payments could well lead to excluding thousands of people in need. At the same time, with a long history of corruption and governance challenges, AI techniques are used to spot irregular patterns in public procurement, budgets and public works.

Our work in Empatia.la in partnership with the Interamerican Development Bank and AI4D allowed us to receive 70 proposals of smart and locally oriented uses of AI techniques, tackling problems such as transparency in public sector, the use of data to understand mobility in the COVID-19 pandemic,and the use of chatbots to provide advice to vulnerable populations. And while relatively big economies such as Brazil, Argentina, Colombia and Mexico could be seen as the natural place to pay attention, small firms in Paraguay, Bolivia, Perú and Costa Rica are also making inroads in alternative uses of AI.

Access to representative data

A critical problem is access to data. While most of Latin American countries have open data policies, which would enable them to experiment and develop new products, such policies are often poorly implemented. As part of our work in the region we are running a regional edition of the Open Data Barometer to understand how LAC countries have advanced (or not) in terms of publishing relevant information. But open data is only part of the picture. Data sharing agreements and privacy regulations are also important to set clear rules of the game for an AI field in Latin America and elsewhere. However, only a few countries in the region have clear privacy frameworks in place. Data sharing agreements are also uncommon, but are necessary if data is going to be used for analytical or predictive purposes.

Another problem in terms of data is representativeness and potential for bias. Most LAC countries have indigenous populations which are not properly included in societal processes, and in turn are not included in administrative data. The same problem would extend to gender issues where women and non binary genders run the risk of not being taken into account (or be explicitly discriminated against) depending on the context. Automating inequality could be a great risk.

The future of AI in Latin America and the Caribbean

The future for the development of AI in Latin America and the Caribbeanis still undecided. Regional banks such as the Interamerican Development Bank and the South American Bank are willing to explore the benefits and risks of AI through several initiatives such as FAIRLAC. Andrew Ng, a long established leader of this field set up a startup incubator in Medellin connected with Ruta N, a regional innovation hub. Initiatives like Empatia are exploring how exactly AI could contribute to solve public problems. Governments in the region might need to review the evidence and set up conditions for the use of these technologies as well as to make sure that such development will be inclusive and generate local and regional benefit.

We still need to understand much more about business models and specific impact of these technologies. Governments might need to step up if they do not want to miss the next generation of technological advances. Nevertheless missing the boat cannot be the only criteria. As a Khipu attendant from a corruption-ridden country eloquently asked the Conference opening panel: 'What is the point of all this if it is not going to help our people to achieve a better future?'

We cannot predict nor automate an answer for that.

Uruguay

Index Score	Rank	Regional Rank
55.57/100	**42**/172	**1**/32 (Latin America and the Caribbean)

Responsible Use Score	Responsible Use Rank
65.21/100	**10**/34

GDP (US$ billion)	Population
48.533	3,449,000

Data Representativeness: **71.06**

Vision: **100**

Governance & Ethics: **54.10**

Data Availability: **77.96**

Digital Capacity: **54.62**

Infrastructure: **78.14**

Adaptability: **46.64**

Human Capital: **31.23**

Size: **15.92**

Innovation Capacity: **34.26**

100
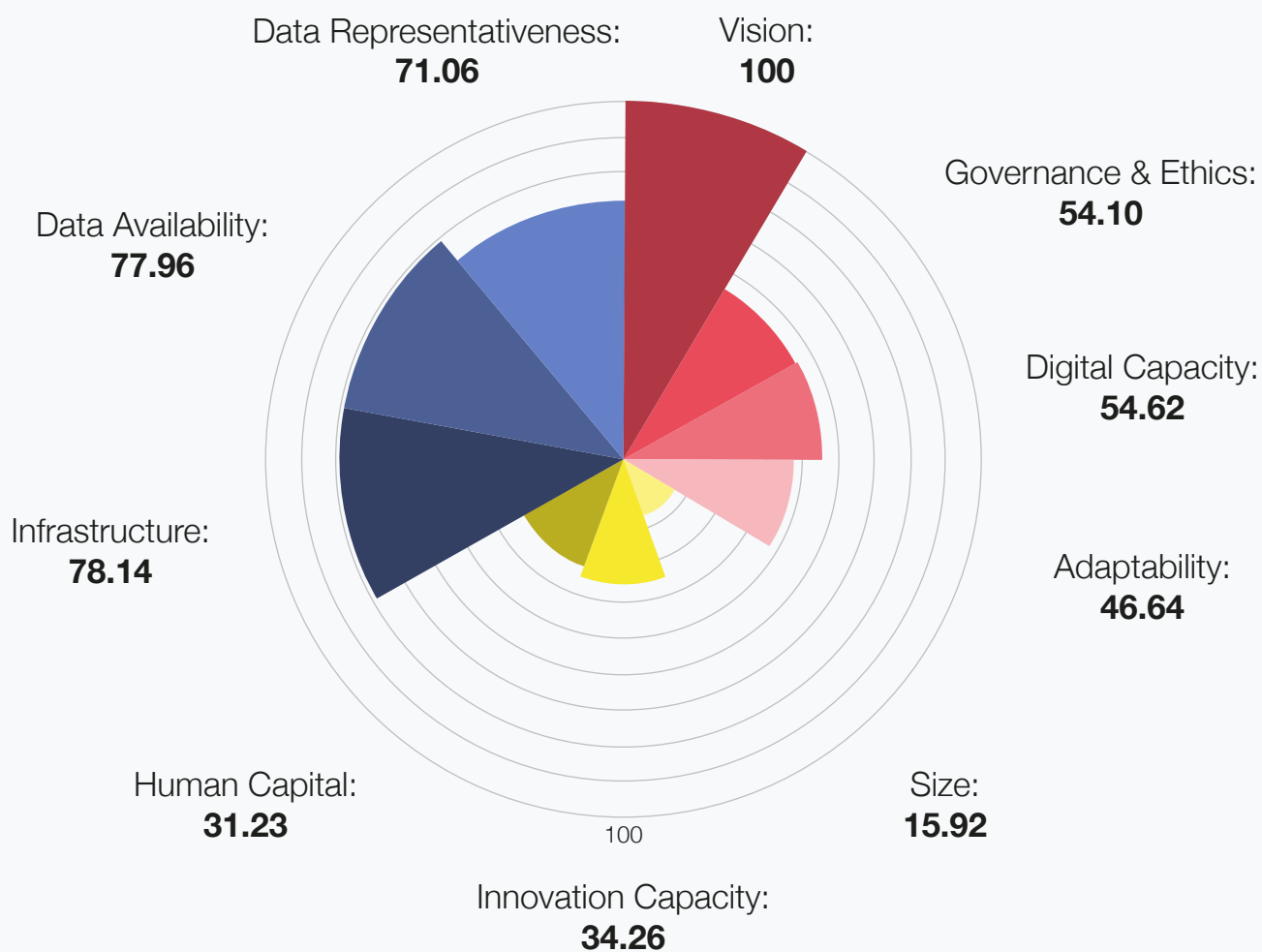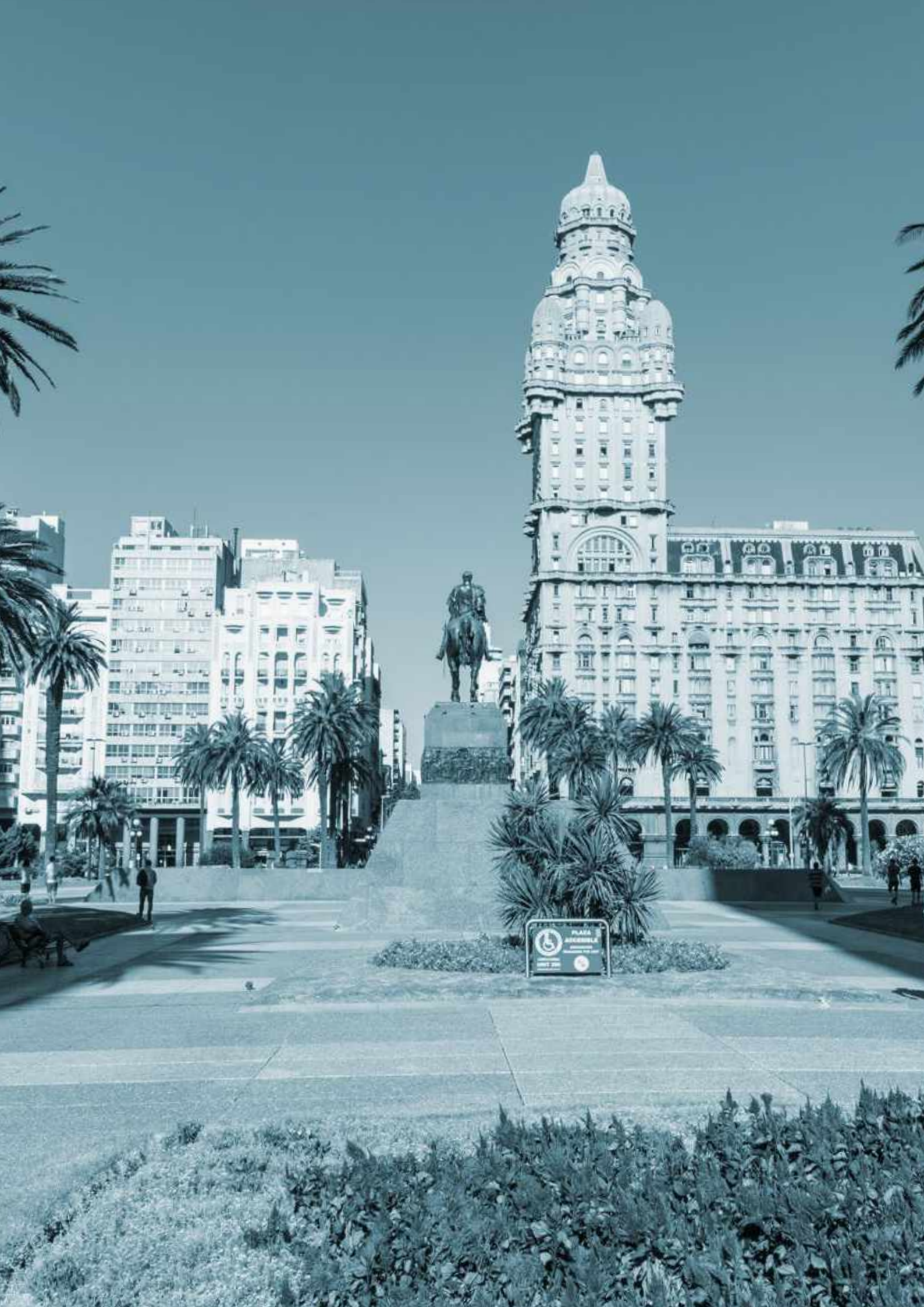
Government

Score	Rank	Region Rank
64.34/100	**30**/172	**1**/32
		(Latin America and the Caribbean)

WORLD AVERAGE: **41.34**

0 20 40 60 80 100
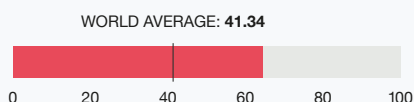
The Government published its National AI Strategy in 2019. The strategy mentions the value AI could bring to the digital transformation of government, and also sets out principles governing the responsible use of AI (e.g. algorithmic transparency).

Uruguay is the top-ranked Latin American country in the 2020 UN eGovernment Survey, and this existing strength in digital government helps bolster the country's AI readiness. In 2020, it published a Digital Government Strategy, which outlines plans to use emerging technologies such as data analytics in the public sector. However, Uruguay scores low (28.24 out of 100) in the indicator for government procurement of advanced technology, suggesting that more could be done to make sure the Government has access to these emerging technologies in future.

Technology Sector

Score	Rank	Region Rank
27.13/100	**96**/172	**10**/32
		(Latin America and the Caribbean)

WORLD AVERAGE: **32.76**

0 20 40 60 80 100
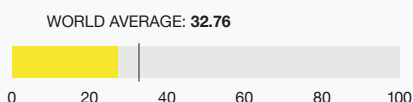
Uruguay ranks lower than a number of its Latin American peers in this pillar. This is in spite of the fact that Uruguay is the largest exporter of software per capita in Latin America. In terms of the size of its technology sector, however, Uruguay lags behind other countries. For example, Brazil and Colombia have seven and one technology unicorns respectively, and Argentina has one technology company in the Forbes Global 2000. Uruguay also scores low (10.63 out of 100) for R&D spending, and none of its universities feature in the QS Engineering and Technology rankings.

However, the Government is taking steps to support tech innovation in Uruguay, and given the countries existing expertise in software, we should see Uruguay's score improving in this pillar in the years to come. For example, the Agencia Nacional de Investigación e Innovación provides funding for research and business innovation.

Data and Infrastructure

Score	Rank	Region Rank
75.72/100	**35**/172	**1**/32
		(Latin America and the Caribbean)

WORLD AVERAGE: **58.64**

0 20 40 60 80 100
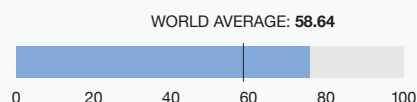
Uruguay is widely considered a regional leader in open government. It is a member of the Open Government Partnership, and its 4th Open Government Action Plan ran from 2018-2020, including commitments around open data and access to information. Open government is also one of the six areas of action in the Digital Government Strategy,

Uruguay was the first Latin American country to deploy 5G. It is ranked 25th in the UN eGovernment Survey, the highest-ranking Latin American country. As is the case across Latin America, Uruguay could improve its score in Data Representativeness, especially in terms of the socioeconomic gap in Internet usage. This gap was noted in Uruguay's most recent Digital Strategy, which includes a focus on social inclusion and bridging the digital divide.

Brazil

| Index Score	Rank	Regional Rank
47.46/100	**63**/172	**6**/32 (Latin America and the Caribbean)

Responsible Use Score	Responsible Use Rank	
42.36/100	**30**/34	

GDP (US$ billion)	Population	
1,570.54	209,469,000	

Data Representativeness: **64.63**

Vision: **50**

Governance & Ethics: **47.80**

Data Availability: **77.45**

Digital Capacity: **47.18**

Infrastructure: **45.27**

Adaptability: **35.10**

Human Capital: **45.48**

100

Size: **19.07**

Innovation Capacity: **43.12**
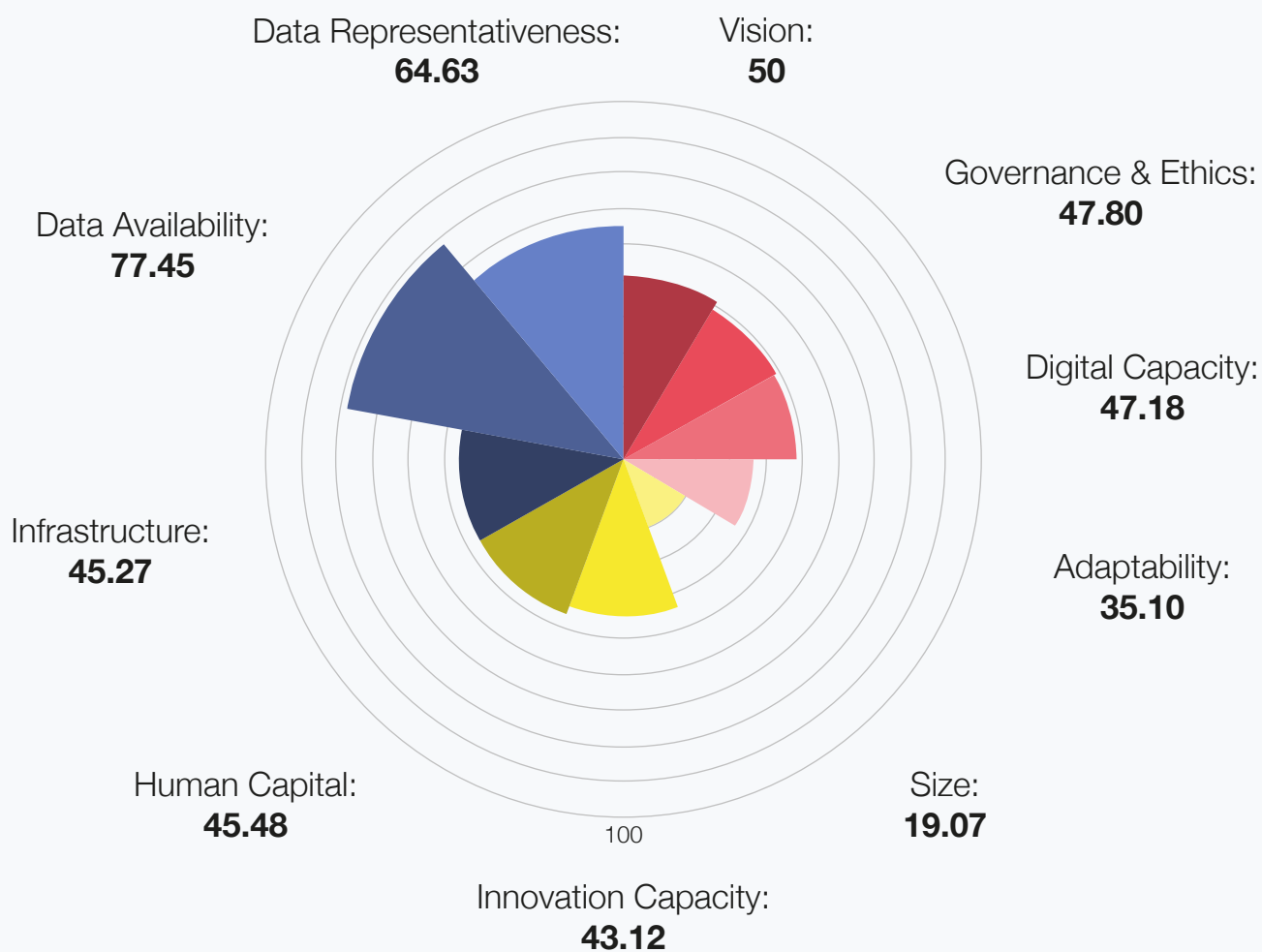
Government

Score	Rank	Region Rank
45.02/100	**60**/172	**6**/32
		(Latin America and the Caribbean)

WORLD AVERAGE: **41.34**

0 20 40 60 80 100
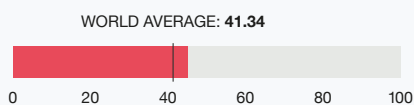
Although ranking only 6th in Latin America in this pillar, the Brazilian Government has taken an active interest in AI. In 2019, the Regional Forum on AI in Latin America and the Caribbean was hosted in São Paulo. The Brazilian Government does not yet have an AI strategy, but has held consultations on developing one. However, they do have a Digital Transformation Strategy. The Bolsanaro administration has further demonstrated its commitment to emerging technologies with a National plan for IoT.

In implementing AI in government, Brazil would also be starting from a strong base: the country ranks 21st in the world and 1st in Latin America for its online services in the 2020 UN eGovernment Survey. However, one area of concern may be around data ethics and privacy. The Government plans to create a single citizen database, which will be shared across government departments. While this data may prove incredibly useful when deploying AI within government, it must be governed in the appropriate way. Brazil was due to update its data protection legislation in 2020, but this was recently postponed until 2021.

Technology Sector

Score	Rank	Region Rank
35.92/100	**53**/172	**3**/32
		(Latin America and the Caribbean)

WORLD AVERAGE: **32.76**

0 20 40 60 80 100
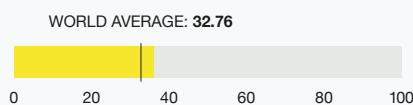
With 74 technology parks spread across the country, Brazil has a vibrant and growing technology sector. The country boasts 7 technology unicorns, with a particular strength in FinTech and e-commerce. Brazilian startups are increasingly using the e-commerce market as a way to develop and sell AI tools, so we may see AI unicorns emerging in future.

Brazil has room for improvement in terms of the amount of money it allocates to R&D spending. However, the Government is clearly invested in supporting AI research, with plans to create eight new research facilities focused on AI. The University of São Paulo, ranked 86th in the world in the QS Higher Education Rankings for Engineering and Technology, will host the largest of these research hubs.

Data and Infrastructure

Score	Rank	Region Rank
61.45/100	**68**/172	**8**/32
		(Latin America and the Caribbean)

WORLD AVERAGE: **58.64**

0 20 40 60 80 100
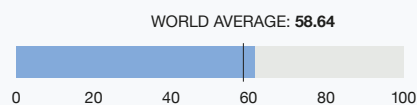
Brazil has the 5th largest number of mobile phone and internet users in the world, giving it potential access to a wealth of data. As mentioned above, the Government has plans to create a single citizen database to facilitate the flow of data between government departments. Improving access to government data is part of Brazil's Digital Transformation Strategy. Brazil is also a member of the Open Government Partnership. One of their focus areas for their fourth action plan is on open environmental data.

Although Brazil does not currently have 5G commercially available, its launch is imminent. This would be a major step forward for the country's advanced technology infrastructure. Like many countries in Latin America and the Caribbean, Brazil has a considerable urban-rural gap in terms of Internet usage and connectivity. The Government launched a broadband plan in 2017 to try and address this issue.

Colombia

Index Score	Rank	Regional Rank
51.26/100	**51**/172	**3**/32 (Latin America and the Caribbean)

| Responsible Use Score	Responsible Use Rank
44.76/100	**28**/34

GDP (US$ billion)	Population
276.627	49,649,000

Data Representativeness: **59.50**

Vision: **100**

Governance & Ethics: **49.37**

Data Availability: **72.48**

Digital Capacity: **54.41**

Infrastructure: **44.87**

Adaptability: **43.30**

Human Capital: **47.53**

Size: **12.16**

Innovation Capacity: **39.52**

100
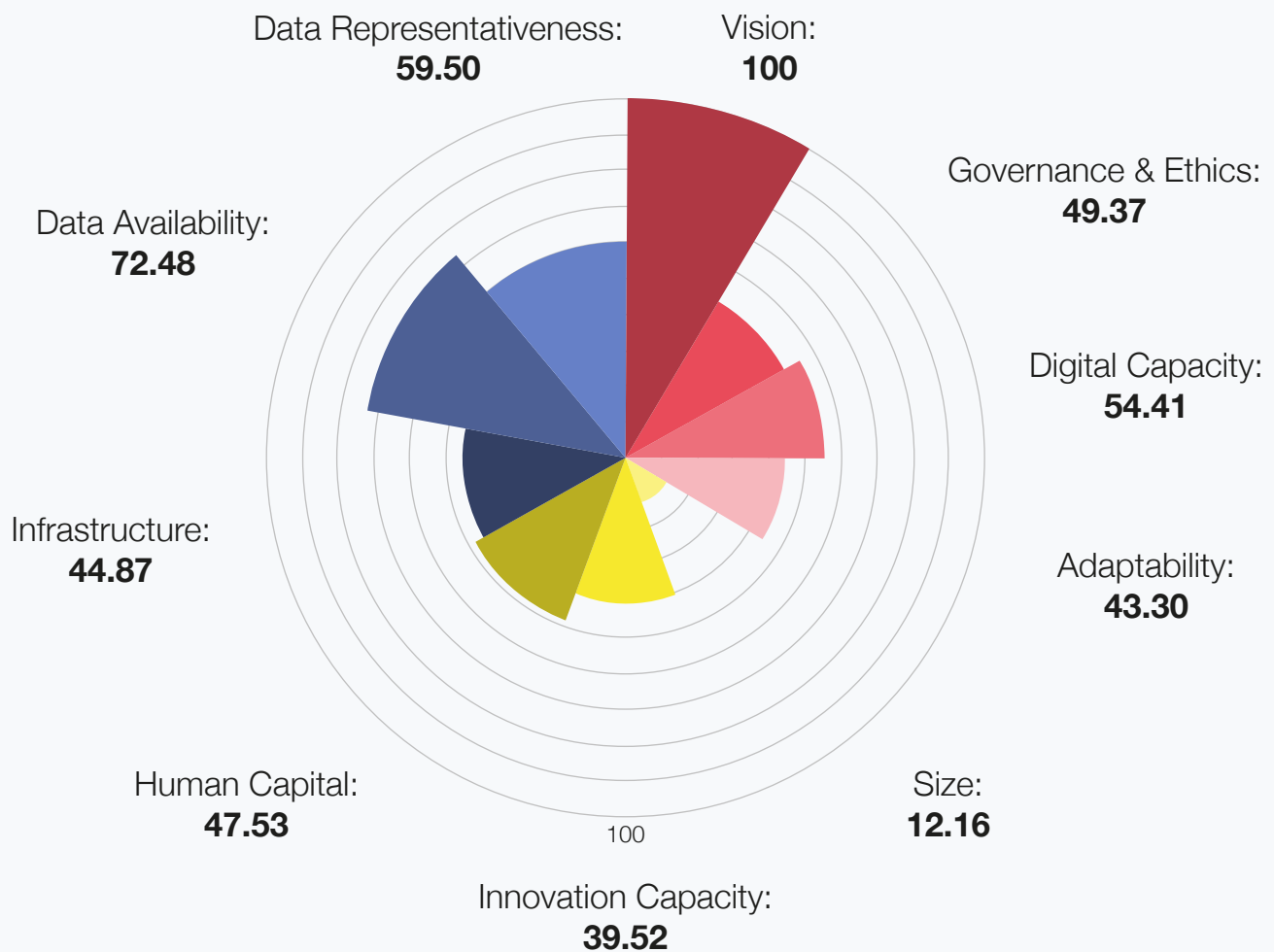
Government

Score	Rank	Region Rank
61.76/100	**36**/172	**2**/32
		(Latin America and the Caribbean)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
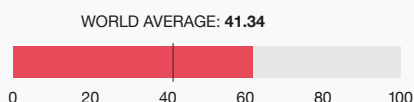
Colombia's Government has shown an increasing interest in AI in recent years. With high levels of economic growth in the early 2010s slowing over the course of the decade, the Government sees AI as a potential solution to recharge growth. Colombia has published an AI Strategy as part of their National Digital Transformation Policy. In partnership with the WEF, Colombia also opened the first Centre for the Fourth Industrial Revolution in Latin America.

Within the Ministry of Information and Communication Technologies, the Digital Transformation Directorate and Digital Government Directorate oversee policies related to the digitalisation of the economy and the state. Colombia supports innovation in the public sector through innovation labs such as ViveLab Bogotá. However, Colombia is currently only 7th in Latin America in terms of its online services, suggesting more may need to be done to build digital capacity within government.

Technology Sector

Score	Rank	Region Rank
33.07/100	**65**/172	**4**/32
		(Latin America and the Caribbean)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
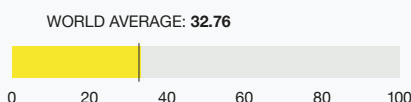
One of the aims of Colombia's AI strategy is creating a bigger private sector AI market. The Colombian Government has introduced tax incentives for entrepreneurship within the 'orange economy' that includes digital innovations. The AI Strategy also puts forward the idea of regulatory sandboxes, where entrepreneurs can experiment in a safe manner. Finally, Apps.co is an initiative to support digital entrepreneurship.

Some of these policies are paying off in terms of innovation, with Colombia being home to one technology unicorn. Colombia is also home to Ruta N, one of the biggest tech accelerators in Latin America. Looking ahead, the opening of a Centre of Excellence for AI in Medellín in 2018 suggests that there might be further growth to come for Colombia's AI sector.

Data and Infrastructure

Score	Rank	Region Rank
58.95/100	**80**/172	**12**/32
		(Latin America and the Caribbean)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
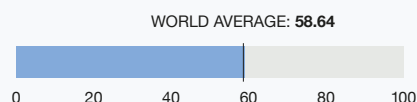
Colombia's AI strategy also mentions data infrastructure as an essential enabler of AI. Specifically, the strategy commits to improving the interoperability of data and increasing the number of public datasets. Colombia is also a member of the Open Government Partnership, with their third action plan running up to 2019.

In terms of their technology infrastructure, 5G networks are currently being tested in the country. One of the major challenges will be Colombia's urban-rural divide in internet access. The Government's Vive Digital Plan aims to broaden access to the internet and address this divide.

WESTERN
EUROPE

Western Europe

Bar chart showing Government AI Readiness Index 2020 scores for Western European countries:
United Kingdom 81.12, Finland 79.24, Germany 78.97, Sweden 78.77, Denmark 75.62, Netherlands 75.30, Norway 74.43, France 73.77, Luxembourg 72.62, Switzerland 69.22, Ireland 68.24, Austria 68.23, Spain 68.04, Italy 65.39, Portugal 63.92, Belgium 63.14, Malta 62.43, Iceland 57.63, Cyprus 54.08, Greece 47.93, World 44.25

Regional Analysis

by Céline Castets-Renard

Like in 2019, Western Europe dominates the top 20 places of the 2020 Government AI Readiness Index. Due to European and national A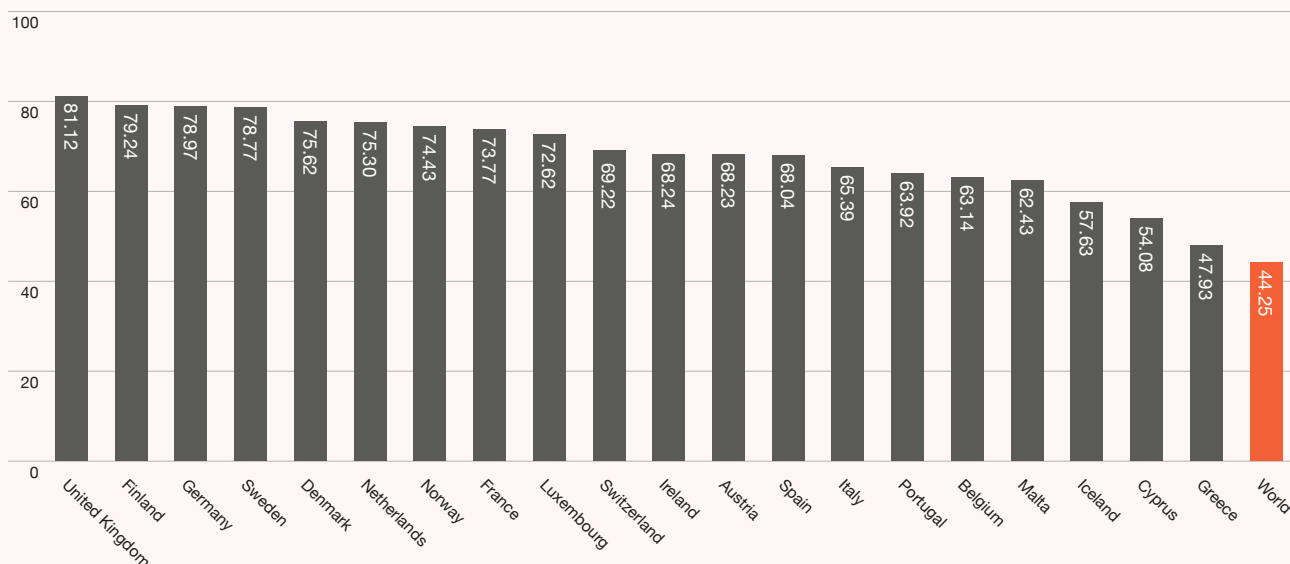I strategies, as well as efficient governance and strong economies of Western European nations, half of the top 20 governments in our rankings are Western European, with the top ranking government among this group being the UK (second globally), Finland (third), Germany (fourth) and Sweden (fifth).

Regional leaders

The UK is the top-scoring country in Western Europe. Its AI Sector Deal was released in April 2018. Since then, in terms of formal education and training towards increasing AI-related skills and competences of future generations in the UK, the government is creating 16 New Centres for Doctoral Training at universities across the country, delivering 1,000 new PhDs over the next five years and Industry-funding for new AI Masters places.

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 strategy foresees to work on a legal and ethical framework aligned with European guidelines and taking into account recommendations of the national Data Ethics Commission, such as ethical requirements to ensure transparency, verifiability and predictability of AI systems (e.g. ethical guidelines for self-driving cars).

France, although a major player in Western Europe, still sits just outside the top 10 countries globally, ranked 11th place. The country launched its national artificial intelligence strategy in March 2018. With a budget of 1.5 billion euros (a US$1.7 billion) over five years. Since then, a national coordinator for artificial intelligence was nominated in March 2020, the four Interdisciplinary Institutes of Artificial Intelligence (3IA) were launched in 2019 to lead AI training and education programs at all levels of education, with a particular focus on higher education programs. An IA&decence strategy was announced in April 2019. Moreover, France is involved in several cooperation initiatives with other European countries, including the UK and Germany.

Collaboration in Europe and Beyond

A collaborative approach has served the governments of Western Europe well so far, as demonstrated by their predominantly high scores in the Index. There have been a number of multilateral initiatives on AI R&D and related policy, both at the EU level and bilaterally. In 2019, the GAIA-X, a federated data infrastructure designed to promote interoperability at the European level, was also launched by France and Germany, as well as the co-creation in June 2020 of the global partnership on artificial intelligence. This Partnership is an international initiative created by France and Canada along with Australia, the European Union, Germany, India, Italy, Japan, Mexico, New Zealand, the Republic of Korea, Singapore, Slovenia, the United Kingdom and the United States of America. It is also multiparty and seeks to guide responsible development and use of AI in a spirit of respect for human rights, inclusion, diversity,

innovation and economic growth. In order to achieve this goal, member countries will set themselves to building bridges between theory and practice and lend their support to cutting-edge research activities and practical implementation activities connected with AI priorities.

European Union

Delivering on its strategy on AI adopted in April 2018, in December 2018 the Commission presented a Coordinated Plan-prepared together with the Member States-to foster the development and use of AI in Europe. This plan proposes some 70 joint actions for closer and more efficient cooperation between Member States, and the Commission in key areas. The plan is scheduled to run until 2027, with regular monitoring and review. The Commission strongly supports a human-centric approach in its communication of 8 April 2019 and takes into account some requirements of the High-Level Expert Group on AI who provides ethical guidelines. Moreover, on 19 February 2020, the European Commission published a new regulation in its White Paper aiming to foster a "European ecosystem of excellence and trust in AI" for an EU-wide approach. President Ursula Von der Leyen's current European Commission has unveiled its 2020 work program for "A Europe fit for the digital age: Empowering people with a new generation of technologies." A European Strategy for data and a Report on the implications of AI for safety and liability legislation accompany the White Paper. Europe can combine its technological and industrial strengths with a high-quality digital infrastructure and a regulatory framework based on its fundamental values to become a global leader in innovation in the data economy and its applications as set out in the European data strategy.

Europe is well placed to benefit from the potential of AI, not only as a user but also as a creator and a p roducer of this technology. It has excellent research centers, innovative start-ups, a world-leading position in robotics and competitive manufacturing and services sectors, from automotive to healthcare, energy, financial services and agriculture. Europe has developed a strong computing infrastructure (e.g. high-performance computers), essential to the functioning of AI. Europe also holds large volumes of public and industrial data, the potential of which is currently under-used. It has well-recognized industrial strengths in safe and secure digital systems with low-power consumption that are essential for the further development of AI. One reason for Europe's strong position in terms of research is the EU funding program that has proven instrumental in pooling action, avoiding duplicates, and leveraging public and private investments in the Member States. Over the past three years, EU funding for research and innovation for AI has risen to €1.5 billion, i.e. a 70% increase compared to the previous period.

However, investment in research and innovation in Europe is still a fraction of the public and private investment in other regions of the world. Some €3.2 billion were invested in AI in Europe in 2016, compared to around €12.1 billion in North America and €6.5 billion in Asia. In response, Europe needs to increase its investment levels significantly. The Coordinated plan on AI developed with Member States is proving to be a good starting point in building closer cooperation on AI in Europe and in creating synergies to maximize investment in the AI value chain.

United Kingdom

Index Score	Rank	Regional Rank
81.12/100	**2**/172	**1**/20 (Western Europe)

Responsible Use Score	Responsible Use Rank
54.57/100	**22**/34

GDP (US$ billion)	Population
2,398.78	66,460,000

Data Representativeness: **93.38**

Vision: **100**

Governance & Ethics: **89.48**

Data Availability: **98.70**

Digital Capacity: **75.95**

Infrastructure: **91.36**

Adaptability: **67.59**

Human Capital: **73.23**

Size: **57.24**

Innovation Capacity: **66.46**

100
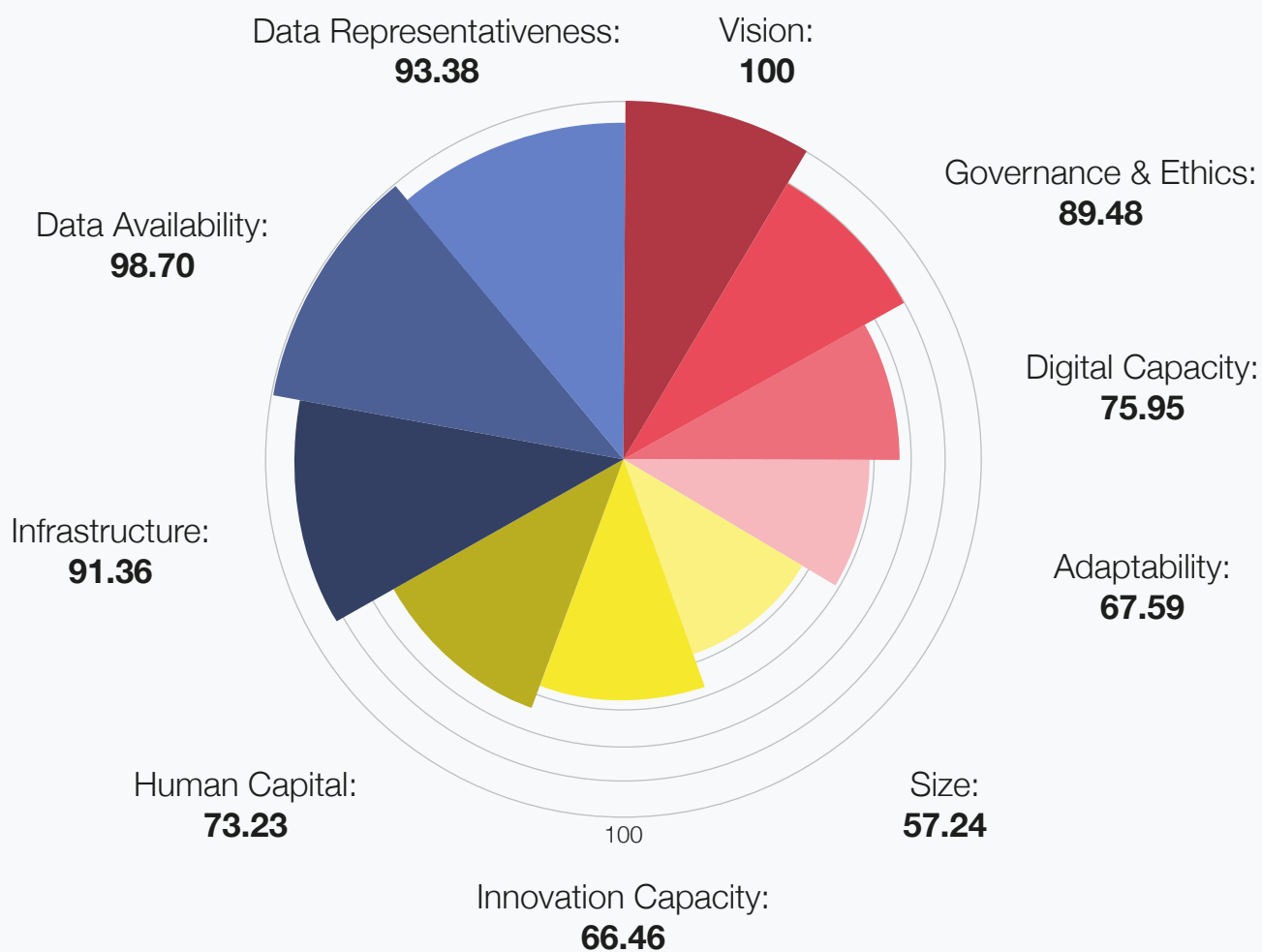
Government

Score	Rank	Region Rank
83.25/100	**5**/172	**3**/20
		(Western Europe)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
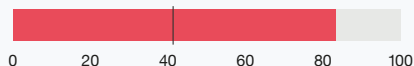
The UK published its strategy for Artificial Intelligence, the AI Sector Deal, in 2018. In the same year, the Government launched the Office for AI, which is responsible for implementing the strategy. The UK Government's Department for Digital, Culture, Media and Sports recently launched the AI Council, an advisory expert group made up of the country's leading individuals and organisations in the field that help the Government and the Office for AI set priorities in the AI and data space.

The Office for AI and the Government Digital Service have written guidelines for the use of AI in the public sector, and the Office for AI has also written guidelines for government procurement of AI. However, in the Networked Readiness Index the UK only scores 57.31 out of 100 for government procurement of advanced technology policy, suggesting that implementation may not yet have caught up with these guidelines.

In terms of the governance of AI, the UK scores well (93.1 out of 100) for cyber security, and the National Cyber Security Centre oversees issues of cyber security across the country. The UK has also developed principles around the responsible use of AI. The 2018 report of the House of Select Committee covers a number of ethical and governance issues, and makes recommendations of how to use AI responsibly. The Department of Health and Social Care has also produced a code of conduct for data-driven health and care technology.

Technology Sector

Score	Rank	Region Rank
65.64/100	**4**/172	**2**/20
		(Western Europe)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
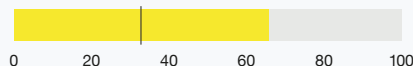
The UK has the third-highest number of technology unicorns after the USA and China, giving it the highest number per capita. Its technology companies in the Forbes Global 2000 have the sixth-highest total market value, behind the USA, China, India, Germany and Ireland. It is home to world-famous pioneering AI companies such as DeepMind, acquired by Google in 2018.

UK universities have produced world-leading AI research centres such as the Leverhulme Centre for the Future of Intelligence in Cambridge and the Future of Humanity Institute in Oxford. In June 2020, the Government also launched the world's first AI conversion courses, master's degrees to allow students from other disciplines to retrain in AI and data science.

However, the House of Lords Select Committee report notes that the UK has a long-standing issue with turning research excellence into a commercial edge. The indicators and dimensions in the technology sector pillar is therefore likely to need the greatest attention from the UK Government in future if the Government wishes to challenge the USA for the top spot in the Index.

Data and Infrastructure

Score	Rank	Region Rank
93.48/100	**1**/172	**1**/20
		(Western Europe)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
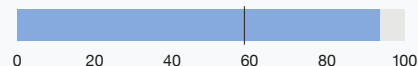
The UK is the world-leader in the Data and Infrastructure pillar, with scores over 90 for all three dimensions in this pillar. In terms of infrastructure, the UK launched its first 5G network in 2019. It currently ranks fourth in the world behind the Republic of Korea, China and the USA in terms of the number of cities in which 5G is available (31).

The UK was in joint first place with Canada in the Open Data Barometer Leaders' Edition in 2017 in terms of availability of open government data. The UK has a National Data Strategy, launched in 2019, that aims to make the UK a 'world-leading data economy'.

The Government published a Digital Inclusion Strategy in 2014 to help close the digital divide in the UK. The number of Internet non-users in the UK has almost halved since 2011, but as of 2018 61% of Internet non-users are women. Although the UK scores highly on both indicators for Data Representativeness, there is still work to be done in continuing to close remaining gaps in Internet usage and ensuring all datasets are representative to develop and deploy AI systems that are fair and unbiased.

Germany

Index Score	Rank	Regional Rank
78.97/100	**4**/172	**3**/20 (Western Europe)

| Responsible Use Score	Responsible Use Rank
59.72/100	**16**/34

GDP (US$ billion)	Population
2,845	82,906,000

Data Representativeness: **96.27**

Vision: **100**

Governance & Ethics: **63.04**

Digital Capacity: **78.62**

Adaptability: **71.22**

Size: **56.02**

Innovation Capacity: **74.63**

Human Capital: **73.61**

Infrastructure: **86.80**

Data Availability: **88.77**

100
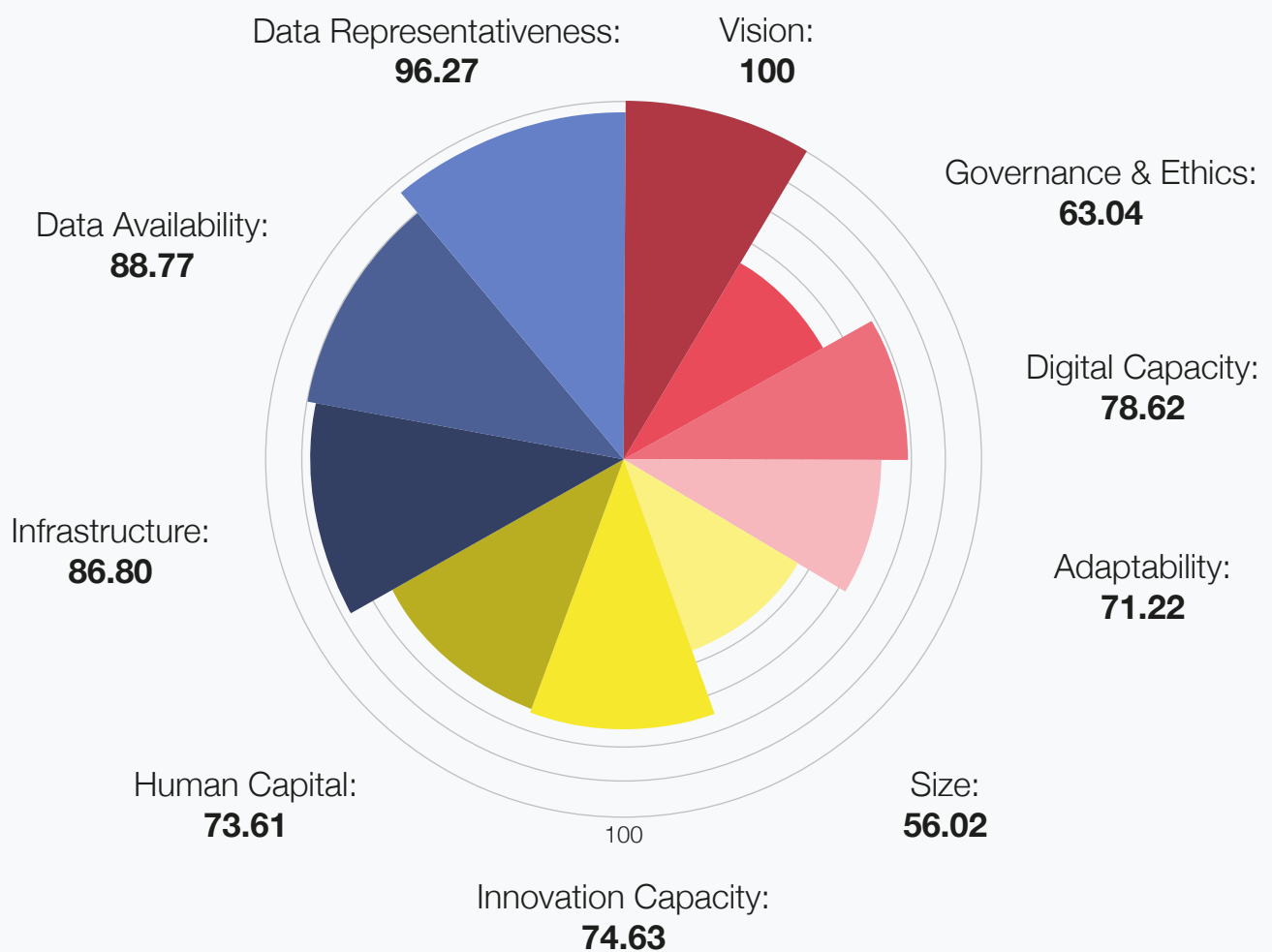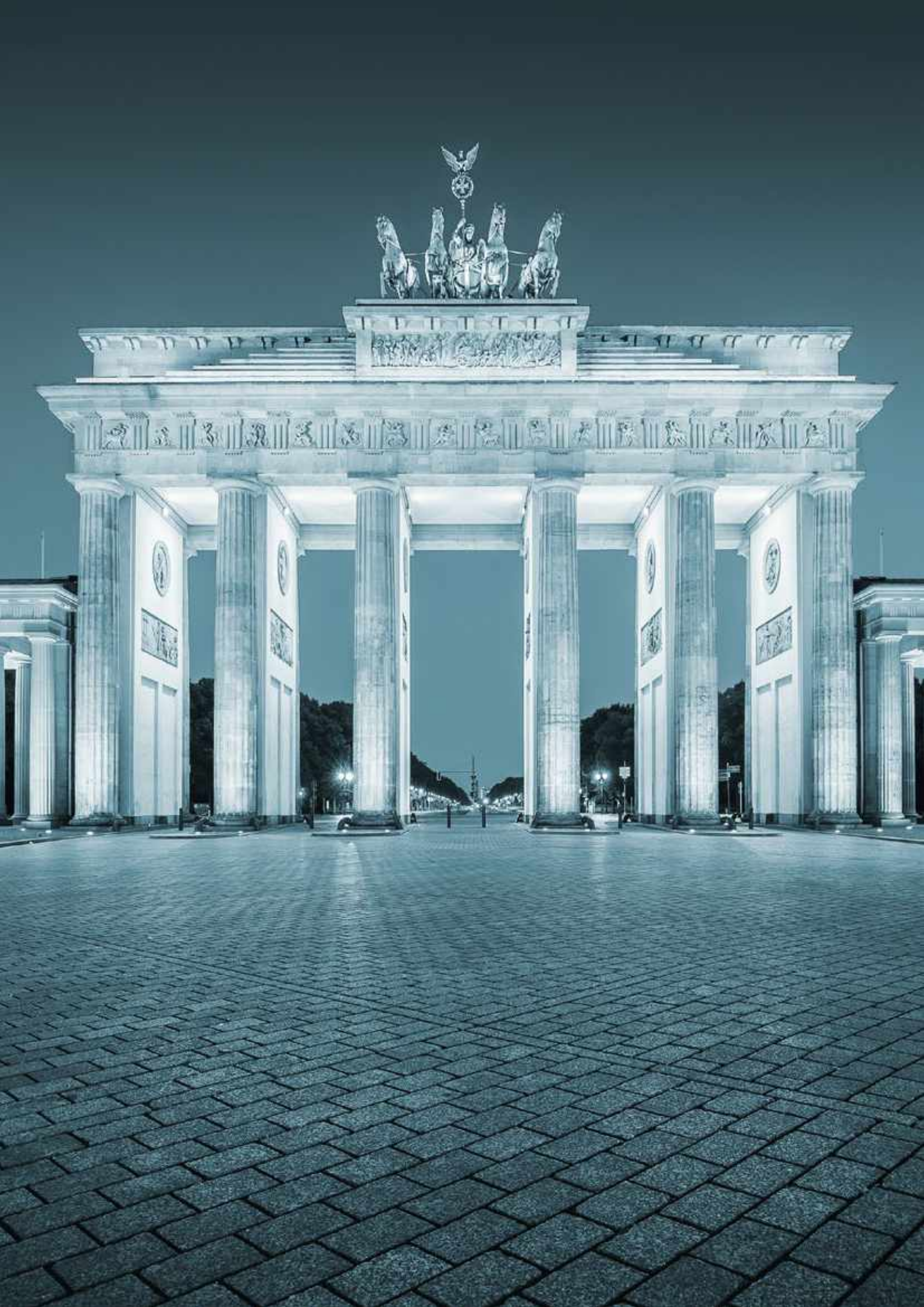
Government

Score	Rank	Region Rank
78.22/100	**17**/172	**9**/20
		(Western Europe)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
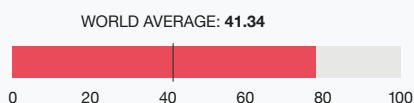
AI is becoming an increasingly important part of the German Government's agenda. Germany published a national AI Strategy in 2018, which will invest €3 billion in building AI capacity up to 2025. However, according to the Konrad Adenauer Stiftung, the strategy is unlikely to do enough to allow Germany to catch up with its competitors such as the USA and the UK. In particular, Germany does not have an Office for AI or equivalent Ministry leading on the implementation of AI in government, in contrast to other leading countries in the Index.

Overall, the feeling in Germany is that the country has the potential to become a global AI leader, and its high ranking in the Index shows that AI readiness is there. However, the problem seems to be in implementation, and in particular in the mindset of the Government. Germany has yet to see the development of AI on par with the USA, the UK or China. There is an ongoing internal debate as to whether Germany is sleeping (*'verschlafen'*) during the AI revolution.

One barrier to future government action on AI could be a lack of public trust in digital technologies, as seen, for example, in the aversion of most Germans to paying digitally as opposed to using cash. These suspicions could lead to a backlash if the Government were to use AI in their public services.

Technology Sector

Score	Rank	Region Rank
68.09/100	**2**/172	**1**/20
		(Western Europe)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
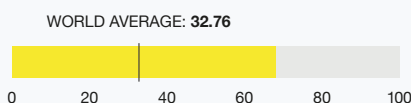
Germany has nine tech unicorns, mostly focusing on FinTech and e-Commerce. They are also home to the technology giant SAP, which specialises in enterprise application software. Although they do not yet have any major AI firms, there is an emerging AI startup ecosystem in Berlin. However, one of the barriers Germany faces to further innovation is that its private sector regulations are often seen by industry leaders and too slow and bureaucratic to stimulate growth.

The German Government has taken steps to try and improve collaboration with the private sector and the state, which may well advance the development of AI in the country. For example, 'Cyber Valley' was established in the state of Baden Wuerttemberg, and is Europe's largest research consortium. It brings together stakeholders from academia, the state Government, and industry to further AI research and innovation.

Data and Infrastructure

Score	Rank	Region Rank
90.61/100	**6**/172	**5**/20
		(Western Europe)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
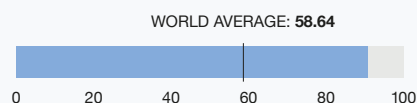
As in most Western European countries, Germany has high levels of Internet and mobile phone penetration, and a reasonably small digital divide. However, there are connectivity issues in some rural areas, and some areas of the country are only covered by slow networks and broadband speeds. Germany will have 5G in 20 cities by the end of 2020, and there are concerns that slower networks may be shut off as 5G advances through the country. Spiegel Online reported that, according to a BNetzA study, 53% of German SIM cards operate on these slower networks, which are set to be shut off by 2021.

In terms of open data, Germany scores a little lower than many other Western nations. It ranks 10th in the 2018 Open Data Barometer Leaders' Edition, behind both the UK and France. However, progress has been made through the *'Onlinezugangsgesetz'* (online access law), which stipulates that by 2022 all public services need to be online. This transition to a paperless government could be a key generator of government data in future.

Portugal

Index Score	Rank	Regional Rank
63.92/100	**27**/172	**15**/20 (Western Europe)

| Responsible Use Score	Responsible Use Rank
72.45/100	**6**/34

GDP (US$ billion)	Population
196.917	10,284,000

Data Representativeness: **78.69**

Vision: **100**

Governance & Ethics: **55.39**

Data Availability: **74.25**

Digital Capacity: **69.48**

Infrastructure: **59.91**

Adaptability: **61.25**

Human Capital: **61.42**

Size: **35.04**

Innovation Capacity: **51.37**

100
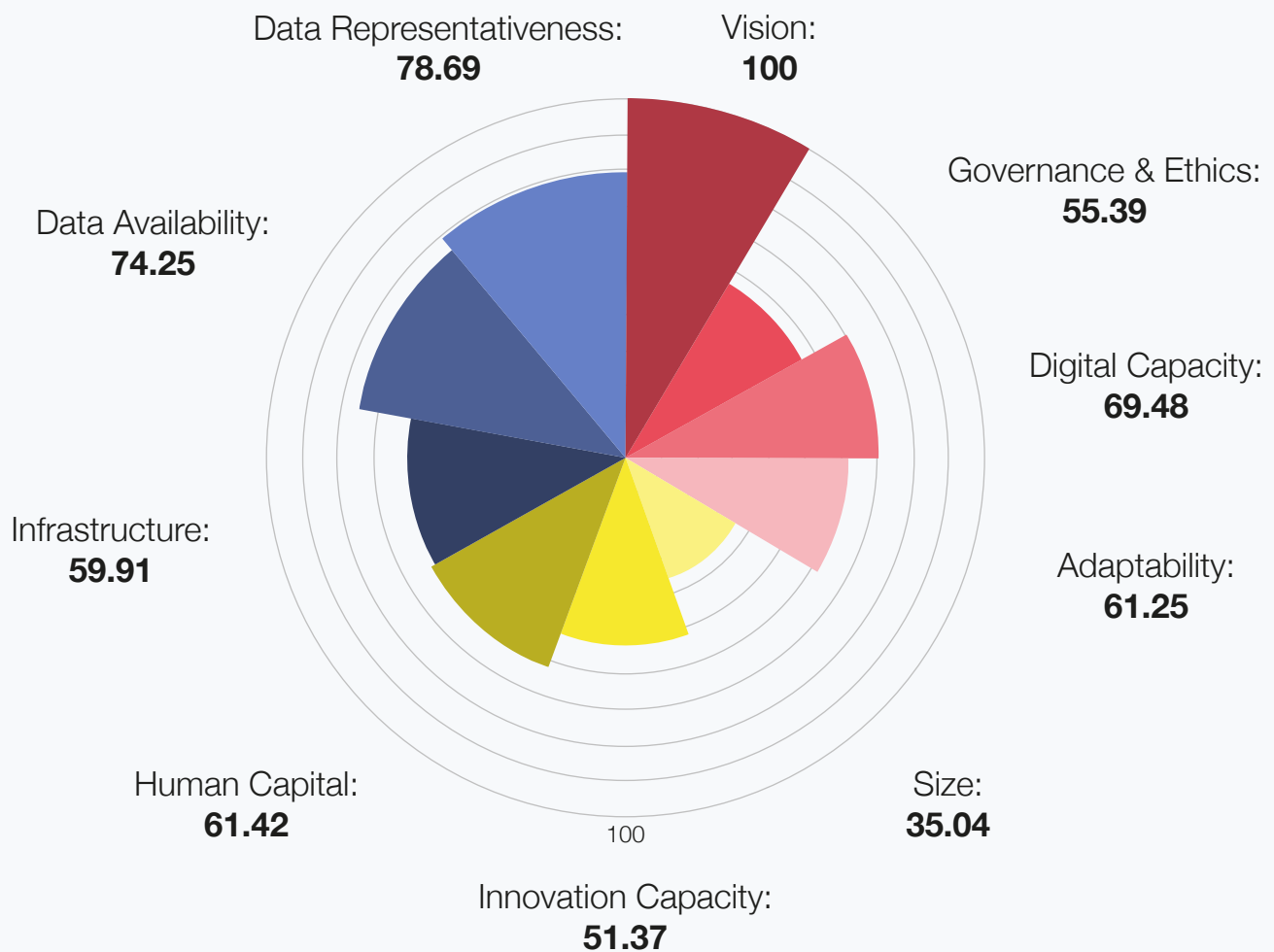
Government

Score	Rank	Region Rank
71.53/100	**21**/172	**11**/20
		(Western Europe)

WORLD AVERAGE: **41.34**
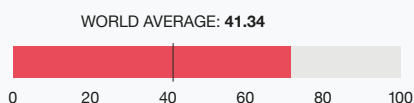
The Government of Portugal has made collaboration between the Government and the private sector to introduce technological innovation into public services a major focus. Portugal published an AI strategy in 2019, and the modernisation of public administration is one of the targets of this strategy. The Government aims to create a Collaborative Laboratory for AI in the Public Administration.

Meanwhile, Portugal also has the SIMPLEX program to reform public services, and LabX, a laboratory for public service innovation. The Government also has a €30,000 GovTech fund to reward startups with a product that fits into the UN's Sustainable Development Goals. The FCT also ran an R&D project that brought together public sector and academia to advance AI research with public data.

As an example of a recent use case of AI in government, AICEP, the state agency for the promotion of exports and investment, is using an AI platform to try and boost exports. All of this activity around government, AI and innovation in Portugal makes it likely the country may rise in the rankings in future to become a key player in Europe.

Technology Sector

Score	Rank	Region Rank
49.28/100	**25**/172	**15**/20
		(Western Europe)

WORLD AVERAGE: **32.76**

At the end of 2018, Porto was ranked as Europe's 3rd fastest-growing tech hub. Portugal's growing tech ecosystem has produced one unicorn, OutSystems, a low-code platform for building software. The Government programme Startup Portugal supports entrepreneurs and startups, and the Government also offers incubation vouchers for startups.

In its AI strategy, the Government of Portugal notes that the country's intake for STEM students at universities and polytechnic institutes is higher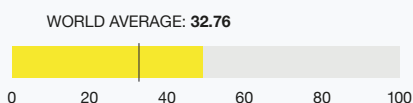 than the EU average. The Government has also invested in initiatives to improve digital skills amongst young people, such as the Ciência Viva Clubs initiative to teach young students the fundamentals of machine learning. However, the AI strategy highlights a shortage of top-level talent, such as those with PhDs in AI, as a barrier to growth, and so there will need to be policy interventions at this level as well to improve Portugal's AI readiness in future.

Data and Infrastructure

Score	Rank	Region Rank
70.95/100	**45**/172	**19**/20
		(Western Europe)

WORLD AVERAGE: **58.64**
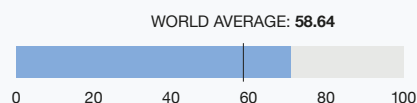
Portugal's AI strategy makes a number of commitments relevant to the Data and Infrastructure pillar. The strategy has a strong focus on digital inclusion, and there are plans to develop 'Creative Communities for Digital Inclusion' around the country to help vulnerable and digitally excluded communities develop digital skills. With a score of 67.05 out of 100 for the socioeconomic gap in Internet usage, Portugal has a deeper digital divide than other southern European states such as Spain (86.83 out of 100) and Italy (89.41), and so such a policy is vital to ensure better digital inclusion.

The strategy also sets targets for making public data easier to use. The aim is to develop a national data infrastructure managed by the national statistics office. With a score of 42 out of 100 in open data, Portugal lags behind some of its European peers, and this policy could help to close that gap.

In terms of its telecommunications infrastructure, Portugal has plans to develop a 5G network. However, the consultation process was delayed by the COVID-19 pandemic.

EASTERN EUROPE

Eastern Europe

Estonia	69.92
Lithuania	65.02
Poland	62.42
Czech Republic	61.52
Russian Federation	60.85
Slovakia	58.16
Latvia	57.58
Slovenia	55.99
Hungary	55.82
Serbia	55.43
Bulgaria	51.42
Romania	50.78
Ukraine	48.90
Croatia	48.61
Belarus	46.10
World	44.25
Montenegro	43.66
North Macedonia	43.00
Republic of Moldova	41.74
Albania	39.99
Bosnia and Herzegovina	36.25
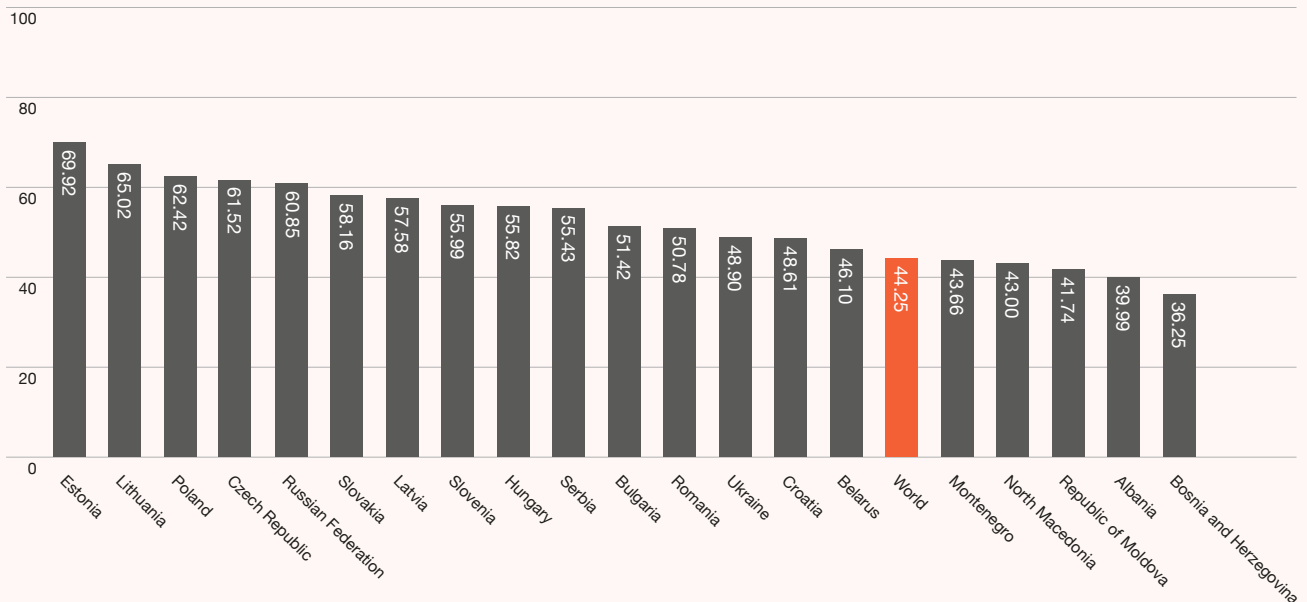
Regional Analysis

by Radu Puchiu

The 2020 Government AI Readiness Index for Eastern Europe covers 20 countries across the region. The overall average score of the region is 52.56, which is higher than the global average. The top five ranked governments in the region - Estonia, Lithuania, Poland, Czech Republic, and Russian Federation - have all expressed clear interest in advancing the AI agenda, backed by national AI strategies. All of them rank highly in the Data and Infrastructure pillar and lower in the Technology Sector pillar.

European Union
Eight of the top ten ranked countries in the region are EU member states, with the exception of Russia (fifth in the region) and Serbia (tenth in the region).

The EU Member States in the region seem to benefit more from a unitary approach of the European Commission strategy on AI, presented in 2018, and from funding projected to reach more than US$22.5 billion per year over the following decade. On 19 February 2020, the European Commission published the White Paper on Artificial Intelligence: a European approach to excellence and trust. The document was open to public consultation until 14 June 2020 and focuses on measures to foster collaboration between EU Member Countries and increase investments into AI development as well as policy options for the future common EU regulatory framework.

Also, the European Commission recently carried out a European enterprise survey on the use of technologies based on artificial intelligence which shows the potential of the Eastern European Countries companies based on their plans to adopt AI technologies.

National AI Strategies
Estonia continues to be ranked first in the region (and 17th globally) confirming the commitment in the field of AI. Estonia adopted its national AI strategy in July 2019 and a steering group led by the Ministry of Economic Affairs and Communications was set up to coordinate and monitor the implementation of this strategy. The Estonian Government also approved an investment of 10M Euros in the implementation of the strategy.

In Russia, the largest country of the group, President Vladimir Putin approved the National Strategy for the Development of Artificial Intelligence for the period until 2030. The document sets an ambitious agenda to ensure accelerated development of AI, and to coordinate the research in this area. The document also emphasises that 'the implementation of the strategy is a prerequisite for Russia's entry into the group of world leaders in the development and implementation of AI technologies and, as a result, the country's technological independence and competitiveness.'

Romania ranks 12th in Eastern Europe in the AI Readiness Index 2020 and 52nd globally, scoring high on Data Infrastructure and Data Availability. Although promised to

be adopted by the end of 2019, Romania's national AI strategy has not yet been given official approval. The newly established Authority for Digital Romania is forecasting the approval by the end of this year. The effort is also helped by the business community that submitted to the Government in July 2019 a strategy proposal for development and adoption of AI technology at the country level.

Artificial Intelligence Research

Investment in research centres seems to be a common approach from the EU Member countries in Central and Eastern Europe. In Romania, Technical University of Cluj-Napoca (UTCN) is in line to receive a grant of 16.7M euro in European funding to establish the Institute for Research in Artificial Intelligence (ICIA) and build a 10,500 square metre AI excellence centre, the largest of its kind in Eastern Europe.

Meanwhile, the Hungarian Government announced in October 2019 that it will set up a research centre and data agency as part of its artificial intelligence action plan. This was following the Czech Republic announcement in May 2019 on the creation of a European Centre of AI Excellence as a short-term goal of its strategy.

There is also an important increase in the AI expertise in the region. Ukraine has the largest number of AI and machine learning providers in the region. In just 3 years, the number of companies with AI expertise has gone up 4 times. As of the beginning of 2020, Ukraine has almost 150 vendors with

sufficient AI expertise, followed by Poland with more than 110 vendors and Belarus with 45 companies.

Non-EU States

The Western Balkans region ranks lower in the AI Readiness Index especially on the Governance pillar. Nevertheless, in spite of the region's slow pace in AI, Montenegro was named as a leader in the region's technology development, with a strong focus on innovation strategy.

It is also notable that Serbia features among the top 10 countries in the region. The country set an ambitious agenda through the adoption of its Strategy for the Development of Artificial Intelligence for the period 2020 – 2025 and the plan to establish an Institute for Artificial Intelligence for 2021.

Looking ahead

The Index data shows that the counties in the area score higher on data infrastructure than on the government or technology sector pillars. Making data open and available to the public, and fostering a strong innovation ecosystem are still the areas which need the most improvement in the region. The fact that fifteen countries out of the twenty ranked in the region have approved or are in the process to approve national strategies on AI is an important step in streamlining the efforts and investments in this area. Along with the efforts on implementing these strategies, regional collaboration and the network approach to innovation will all contribute to a better score in government AI readiness.

Estonia

Index Score	Rank	Regional Rank
69.92/100	**17**/172	**1**/20 (Eastern Europe)

Responsible Use Score	Responsible Use Rank
79.85/100	**1**/34

GDP (US$ billion)	Population
21.302	1,322,000

Data Representativeness: **91.18**

Vision: **100**

Governance & Ethics: **64.94**

Digital Capacity: **78.08**

Adaptability: **61.39**

Size: **32.15**

Innovation Capacity: **55.96**

Human Capital: **57.12**

Infrastructure: **86.57**

Data Availability: **78.01**

100
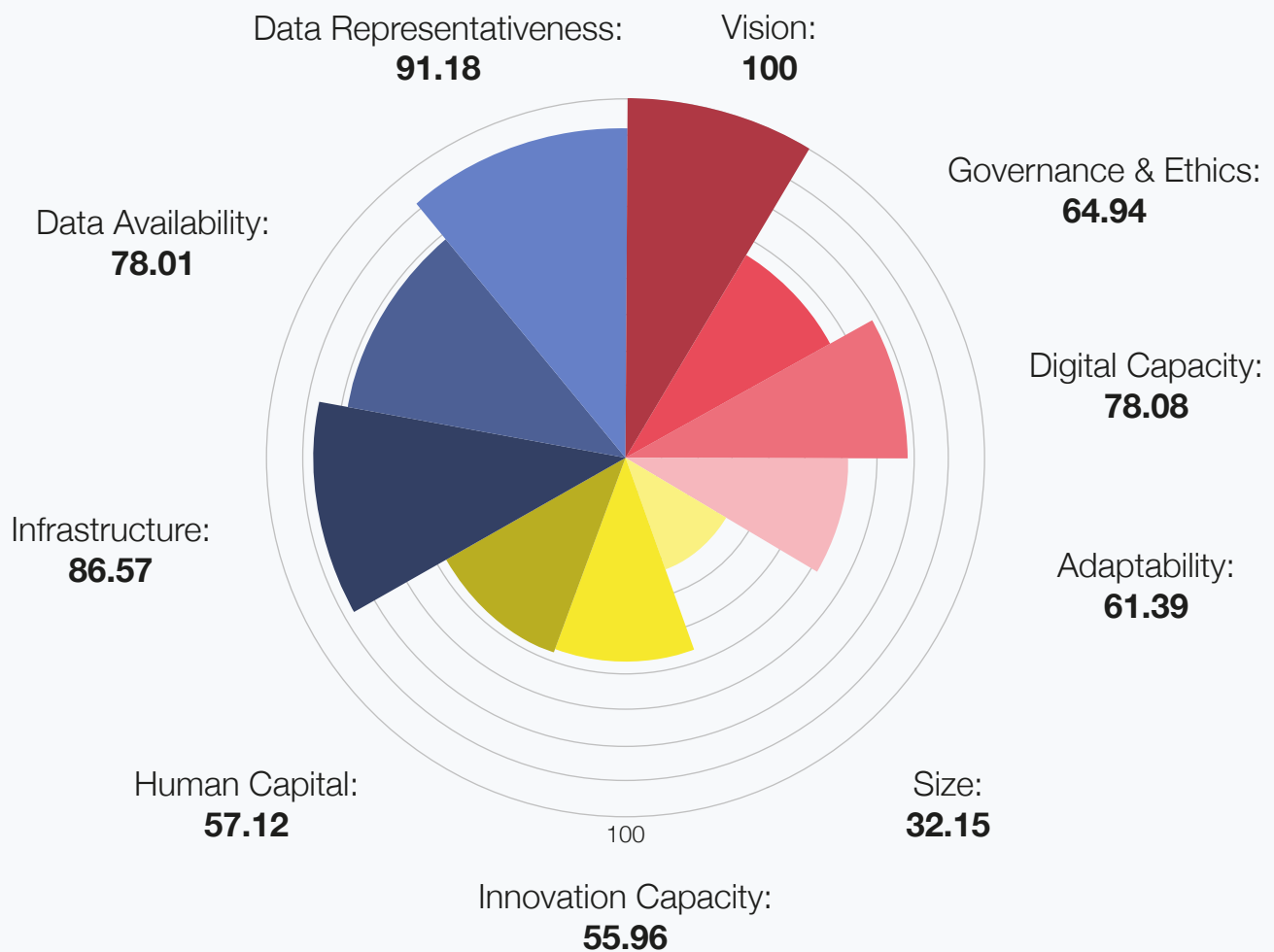
Government

Score	Rank	Region Rank
76.10/100	**18**/172	**1**/20
		(Eastern Europe)

WORLD AVERAGE: **41.34**
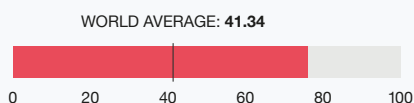
Estonia's long history of innovation in the area of e-Government offers a strong foundation for its AI readiness. For example, it pioneered the use of secure digital IDs to help citizens access different public services. Its notably high scores in the indicators for ICT use and government efficiency (89.01 out of 100) and online services (90.28 out of 100) reflect this global leadership in e-Government.

The Government of Estonia was a signatory to the Declaration on AI in the Nordic-Baltic Region in 2018, adopted an AI strategy in 2019. AI also features in the country's Digital Agenda 2020, which includes a commitment to piloting the use of AI in public services. In February 2020, the Government published a plan to develop AI voice assistants that would help citizens navigate public services.

Technology Sector

Score	Rank	Region Rank
48.41/100	**27**/172	**2**/20
		(Eastern Europe)

WORLD AVERAGE: **32.76**

The Technology Sector is Estonia's lowest-scoring and lowest-ranked Pillar, with its lowest score in the size dimension. It does have one technology unicorn - Bolt, a ride-sharing platform. The Government has also taken steps to promote innovation and entrepreneurship in the count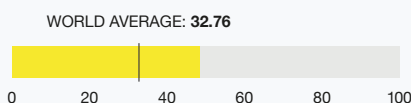ry, for example through the Startup Estonia initiative. There is also an annual e-governance hackathon co-hosted by the Ministry of Economic Affairs and Communications, where participants compete to come up with digital solutions to public problems. Accelerate Estonia, another government-backed startup initiative, organised a COVID-19 hackathon to boost innovation in the pandemic response.

In terms of human capital, Estonia has long shown an interest in equipping its citizens with digital skills thanks to its history of e-Government initiatives. The Information Technology Foundation for Education (HITSA) was formed in 2013 out of older initiatives such as the Tiger Leap Foundation (founded in 1997) and the Information Technology Foundation (founded in 2000). It works with the Government and academia to teach young people digital skills and promote the use of technology in education.

Data and Infrastructure

Score	Rank	Region Rank
85.25/100	**12**/172	**1**/20
		(Eastern Europe)

WORLD AVERAGE: **58.64**
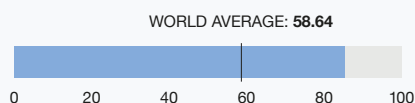
Improving telecommunications infrastructure and connectivity was a major aim of Estonia's Digital Agenda 2020. Some important progress has been made in recent years. For example, the Estonian Wideband Infrastructure Network project is working to bring ultra-fast broadband to rural households in Estonia. The project was a finalist in the 2019 European Broadband Awards. Estonia also has 5G - the country's first network opened in 2018, and there are plans to achieve 5G connectivity in all major cities by 2023.

The Government has also been working to improve the availability of open government data. An open data portal was launched in 2018, though the website notes that it is still a work in progress.

Russia

Index Score	Rank	Regional Rank
60.85/100	**33**/172	**5**/20 (Eastern Europe)

Responsible Use Score	Responsible Use Rank
39.12/100	**33**/34

GDP (US$ billion)	Population
1,108	144,478,000

Data Representativeness: **90.34**

Vision: **100**

Governance & Ethics: **57.93**

Data Availability: **76.91**

Digital Capacity: **59.72**

Infrastructure: **47.24**

Adaptability: **48.10**

Human Capital: **67.84**

Size: **16.85**

Innovation Capacity: **49.14**

100
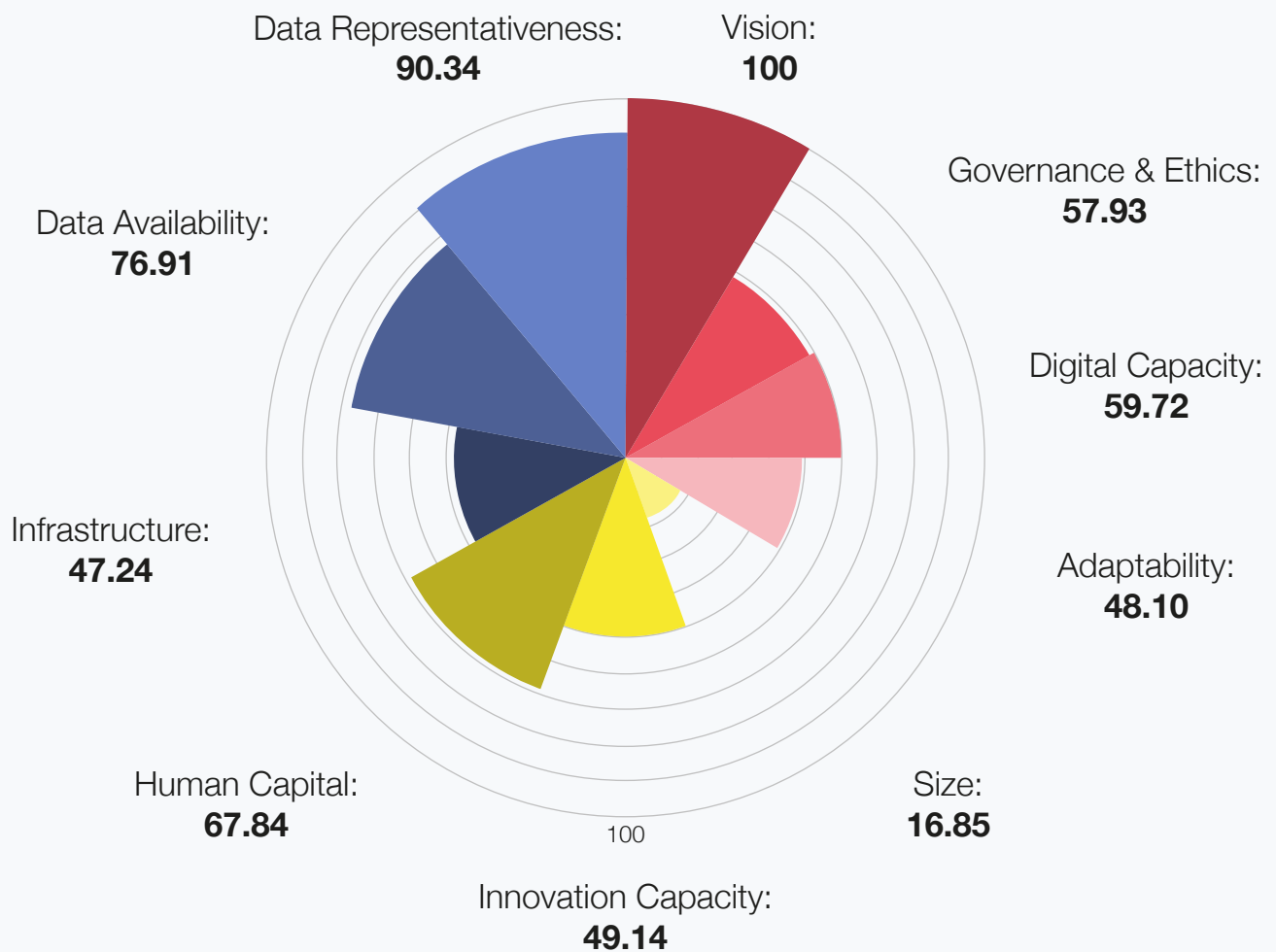
Government

Score	Rank	Region Rank
66.44/100	**27**/172	**3**/20
		(Eastern Europe)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
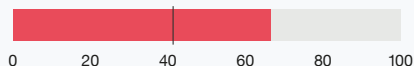
The Russian Government sees AI strength as a major strategic advantage, with Vladimir Putin stating that whichever country leads in AI will 'become ruler of the world'. Putin has also used the COVID-19 pandemic to reiterate his commitment to use of AI. Russia published its AI strategy in 2019, in a sign that the Government is serious about trying to improve Russia's capabilities.

A large part of the Russian state's interest in AI is military, but there are signs that military research and development could lead to advances in civilian technologies as well. For example, the company 'Kryptonite' aims to turn military advances into civilian products. In June 2020, Russia also passed an 'AI Law' which experiments with giving Moscow-based firms access to anonymised personal data, in order to drive private-sector AI growth.

Although Russia has introduced draft legislation to regulate AI, there are reasons to be concerned that AI may be used irresponsibly and unethically within the country. The precedent set by the Yarovaya Law, which requires telecommunications companies to store users' online communications suggests that the Government is not squeamish about mass surveillance. In addition, there has been growing cooperation between Russia and China, fuelled by mutual distrust of the US. Both countries have weak records on human rights and other important enablers of responsible use for AI.

Technology Sector

Score	Rank	Region Rank
44.61/100	**32**/172	**3**/20
		(Eastern Europe)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
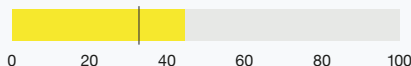
Russia's approach to AI is arguably more centrally-planned even than China's, with the state rather than the private sector being the main driver of AI. The military in particular expends large amounts on R&D. Even the biggest commercial adopter of AI in Russia, Sberbank, is a government-supported bank. Sberbank also helped to draft Russia's national AI roadmap.

Russia's private technology sector has room for improvement . The Skolkovo Innovation Cluster (Russian 'Silicon Valley') supports startups in commercialising their products. It was launched in 2010 but quickly found the Russian market was too small and immature, so many developers had to take their products elsewhere. However, the state is increasing its support for the private sector, through initiatives such as the National Technology Initiative and investment in AI companies by the Russian Direct Investment Fund.

In comparison to its private sector, one of Russia's strengths is its education in STEM. Lomonosov Moscow State University is ranked 59th in the world for Engineering and Technology, and the Moscow Institute of Physics and Technologies hosts a Center for AI opened by VKontakte, one of Russia's largest social media companies. In recognition of Russia's AI talent, Samsung opened an AI research centre in Moscow in 2018. However, the 'brain drain' is a persistent problem, with top Russian scientists routinely emigrating to the West.

Data and Infrastructure

Score	Rank	Region Rank
71.50/100	**44**/172	**9**/20
		(Eastern Europe)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
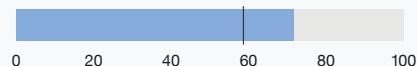
Russia has reasonably good Internet and mobile phone penetration, but there is a regional digital divide that may make collecting representative data a challenge. However, as in China, the state's mass surveillance operations may offer an alternative path to training data for AI, albeit one that is at odds with the responsible use of AI. In addition, the Russian state exercises worrying levels of state control over digital infrastructure. For example, the Government instituted Internet blackouts in August 2019 during protests in Moscow.

Russia's AI strategy calls for the creation of online repositories to collect, store and process data, with private companies encouraged to publish data on these platforms. The Government also has an open data portal, and Russia scores much higher than China on the Open Data Barometer, suggesting that open data reforms may have had more purchase in the country.

Romania

Index Score	Rank	Regional Rank
50.78/100	**52**/172	**12**/20 (Eastern Europe)

Responsible Use Score	Responsible Use Rank
59.00/100	**17**/34

GDP (US$ billion)	Population
234.262	98,424,000
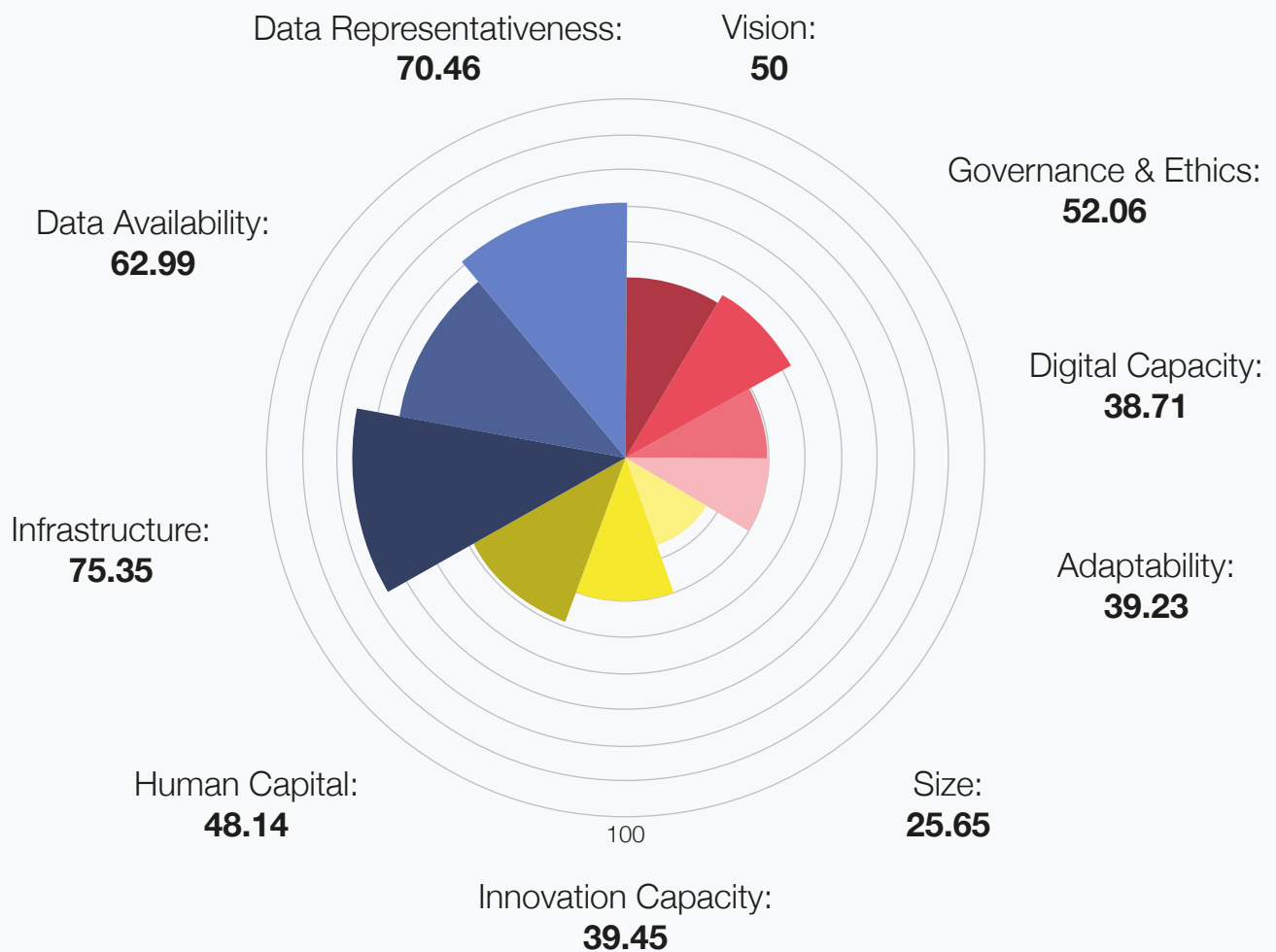
Data Representativeness: **70.46**

Vision: **50**

Governance & Ethics: **52.06**

Data Availability: **62.99**

Digital Capacity: **38.71**

Infrastructure: **75.35**

Adaptability: **39.23**

Human Capital: **48.14**

Size: **25.65**

Innovation Capacity: **39.45**

100

Government

Score	Rank	Region Rank
45.00/100	**61**/172	**14**/20
		(Eastern Europe)

WORLD AVERAGE: **41.34**

0　20　40　60　80　100
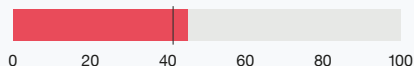
The Romanian Government has shown an increasing interest in AI. The Government is currently developing a national AI strategy, and plans to use the strategy to adhere to the OECD Recommendations on AI. This would make them the first non-OECD European country to do so. The strategy will also align with the EU vision for responsible use of AI. Romania's digital strategy more broadly is laid out in the National Strategy for the Digital Agenda for Romania 2020. Romania also has an advisory council for digital policy, 'Digital Romania' which first met in 2019.

In terms of digital government, Romania lags behind the EU28 average in terms of percentage of individuals interacting with the Government online. The country ranks 62nd in the UN eGovernment Survey's Online Services Index. However, Romania has set its sights on improving its digital government in future: the Authority for the Digitalisation of Romania is responsible for government reforms, including the use of AI and new technologies in public services.

Technology Sector

Score	Rank	Region Rank
37.75/100	**46**/172	**10**/20
		(Eastern Europe)

WORLD AVERAGE: **32.76**

0　20　40　60　80　100

Romania currently has a nascent technology sector that often struggles with access to venture capital. However Romanian tech companies are growing in prominence - for example, in 2019, Fitbit acquired Romanian startup Vector Watch. Investment in AI startups in Romania is estimated to r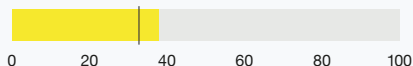each 50million EUR per year by 2025. Romania's tech ecosystem will also benefit from EU funding to support innovation. The European Regional Development Fund gave EUR 2million to Romania to support SMEs and improve cooperation between businesses and research institutions.

Like many other post-Soviet countries, one of Romania's strengths is its education system, particularly in STEM. Romanian universities currently working in AI include the University of Politehnica of Bucharest has a Center for Advanced Research on New Materials, Products and Innovative Processes (CAMPUS). CAMPUS contains a robotics and AI lab that developed a humanoid robot to help young autistic children, as well as a drone that can detect failures in power lines. CAMPUS also hosts Innovations Labs, an accelerator for startups. To strengthen Romania's academic research into AI, the draft AI strategy proposes creating industry-funded chairs in ML for Romanian universities.

Data and Infrastructure

Score	Rank	Region Rank
69.60/100	**46**/172	**10**/20
		(Eastern Europe)

WORLD AVERAGE: **58.64**

0　20　40　60　80　100
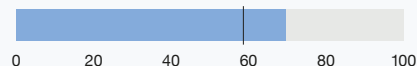
Along with a handful of other countries, Romania has launched 5G, in a sign that the Government is committed to the kind of advanced tech infrastructure that will be an important enabler for AI. Romania was Orange's first choice to launch their first commercial 5G network, and the company cited Romania's strong tech sector and history of advanced innovation as factors in deciding to launch there. Romania has lower Internet and mobile phone penetration than some of its Eastern European neighbours, but the Government is working to improve connectivity across the country. The National Plan for Next Generation Network Infrastructure aims to increase broadband coverage and speeds, and the Ro-NET project offers structural funds to develop broadband infrastructure in areas that are still uncovered.

Romania has an open data portal, and is a member of the Open Government Partnership. Its 2018-2020 Action Plan makes commitments to increase the number of datasets available, as well as to extend access to information standards to the level of local public authorities, which should increase the availability of open government data.

MIDDLE EAST AND NORTH AFRICA

Middle East and North Africa

Bar chart showing AI readiness scores:
United Arab Emirates 72.40, Israel 68.82, Qatar 56.78, Saudi Arabia 56.23, Bahrain 54.75, Oman 52.10, Kuwait 50.61, Egypt 49.19, Tunisia 44.39, World 44.25, Iran 42.89, Jordan 41.76, Morocco 36.42, Lebanon 35.91, Iraq 33.88, Algeria 33.47, Djibouti 31.01, Syrian Arab Republic 19.33, Yemen 19.07
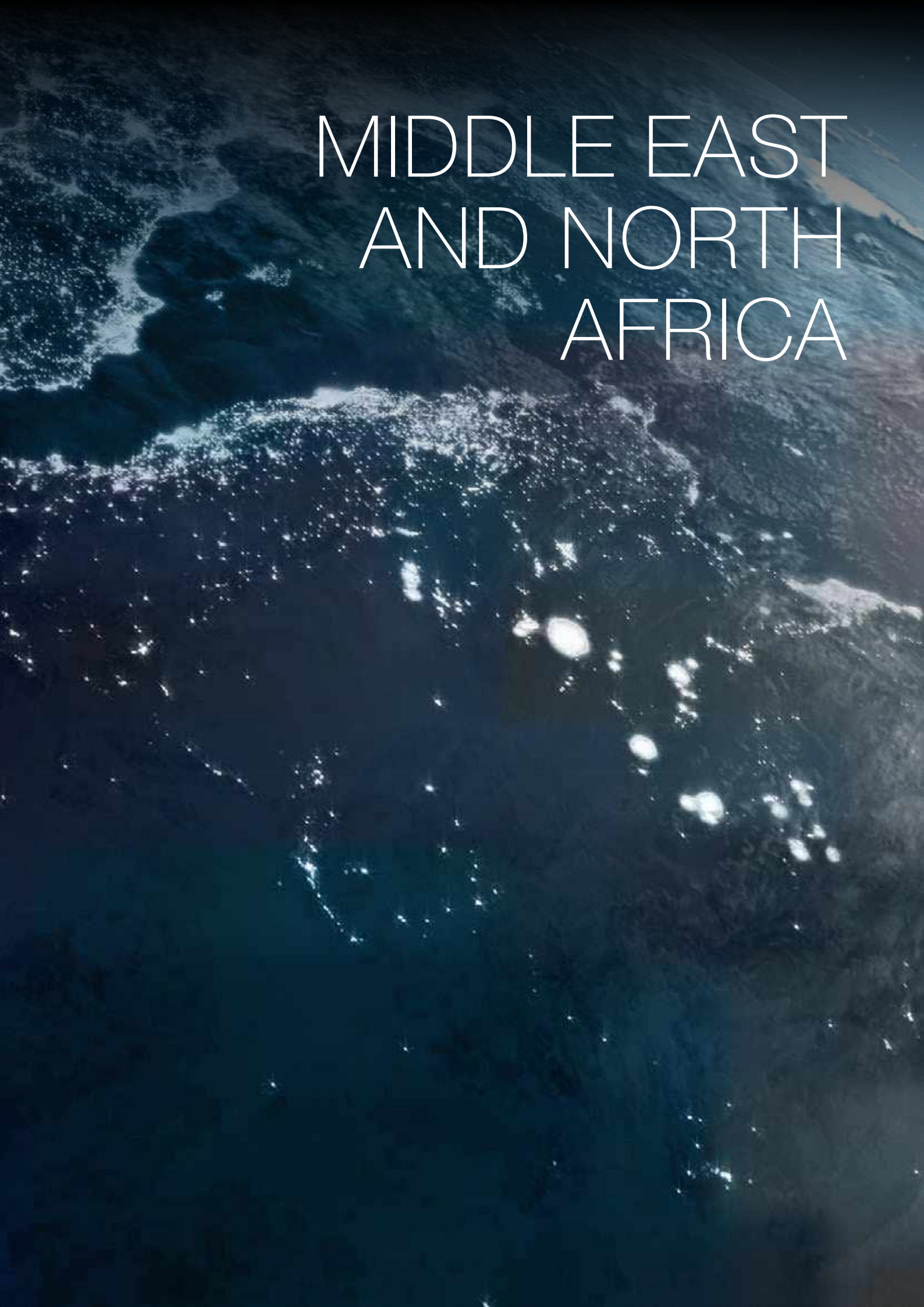
Regional Analysis

by Fadi Salem

The MENA region provides a representative snapshot of the world in terms of government readiness for AI. Compared to other regions, the scores of the 18 countries covered in the MENA countries group diverge widely. There is a 53 points difference between best performing and worst performing countries in the region, the widest gap among all other reg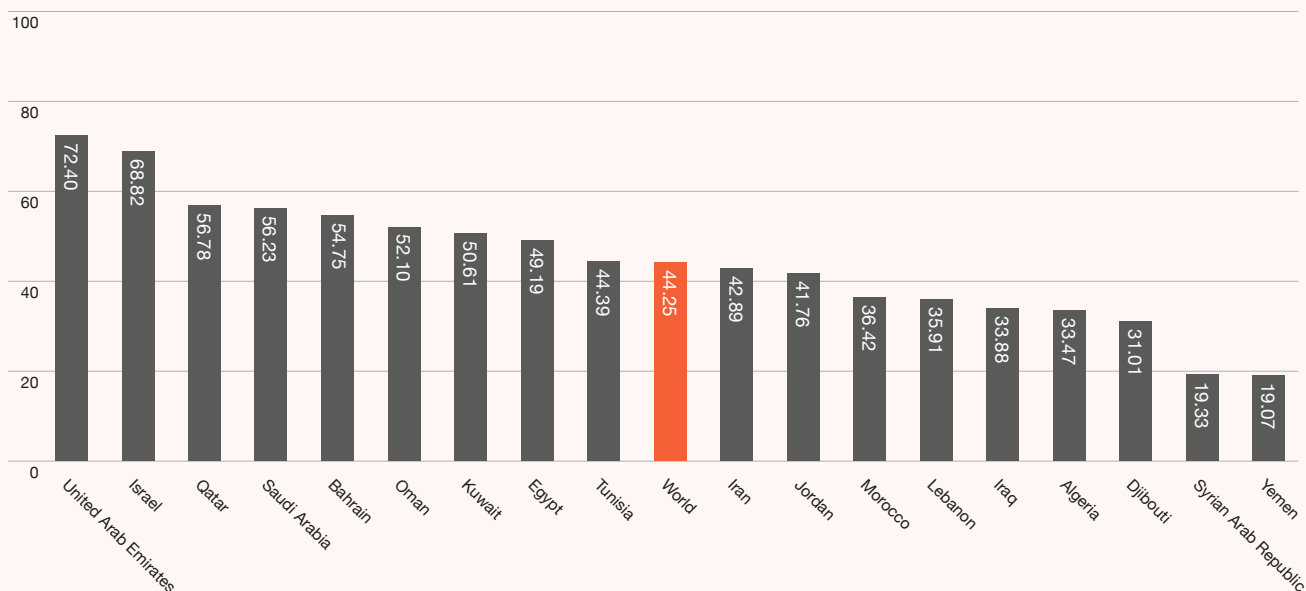ions in the world. For example, the best scoring country (UAE) is among the top 20 worldwide (ranked 16 globally with a score of 72.40), while the lowest scoring country in the region (Yemen) is one of the lowest scoring worldwide (ranked 172 with a score of 19.07). Due to these widely distributed regional scores in terms of AI government readiness, the average score for the MENA region (44.39) is equivalent to that of the 178 countries covered in the index (44.25). This trend also stands when comparing the regional averages on each sub-indicator with its equivalent global average.

Barriers to a Regional Approach

The policy implications of the widely diverse state of AI readiness in the region can be substantial. For example, only two countries in the region (UAE and Egypt) have already introduced national AI strategy, while in other countries AI may not be on the radar screen of decision makers at all. While this imbalance reflects the diverse state of development for countries in the region, it also suggests that there are limited spillovers in relation to the digital economy ecosystem (including its AI components) across the region. Furthermore, and in contrast with regions that are more coherent like Europe, this wide diversity effectively renders any potential coordinated approach towards AI governance less feasible in terms of policy, data and knowledge infrastructures.

This resembles a critical barrier towards advancing AI applications in government, not just for the region as a group, but also for individual states. This is especially true given two realities: 1) that most countries of the MENA region have porous and transient societal demographics, linguistic similarities and cultural norms, which in turn translate into a potentially shared pool of big societal data, in large part; and 2) Such representative societal data is vital for representative machine learning approaches on numerous policy and developmental fronts. These realities limit the feasibility and functionality of many AI applications by governments in the region due to their disconnected, small and poor datasets. This affects potential AI-driven approaches ranging from localized service delivery, national policy response to regional decision-making and policy-formulation.

The UAE continues to top the region in terms of AI readiness, and is the only country in the region scoring above 70 points. This advanced level of readiness is largely driven by a series of proactive Government steps over the past several years, towards implementing a future-looking vision of government based on digitization and adoption of advanced technologies. Since the launch of
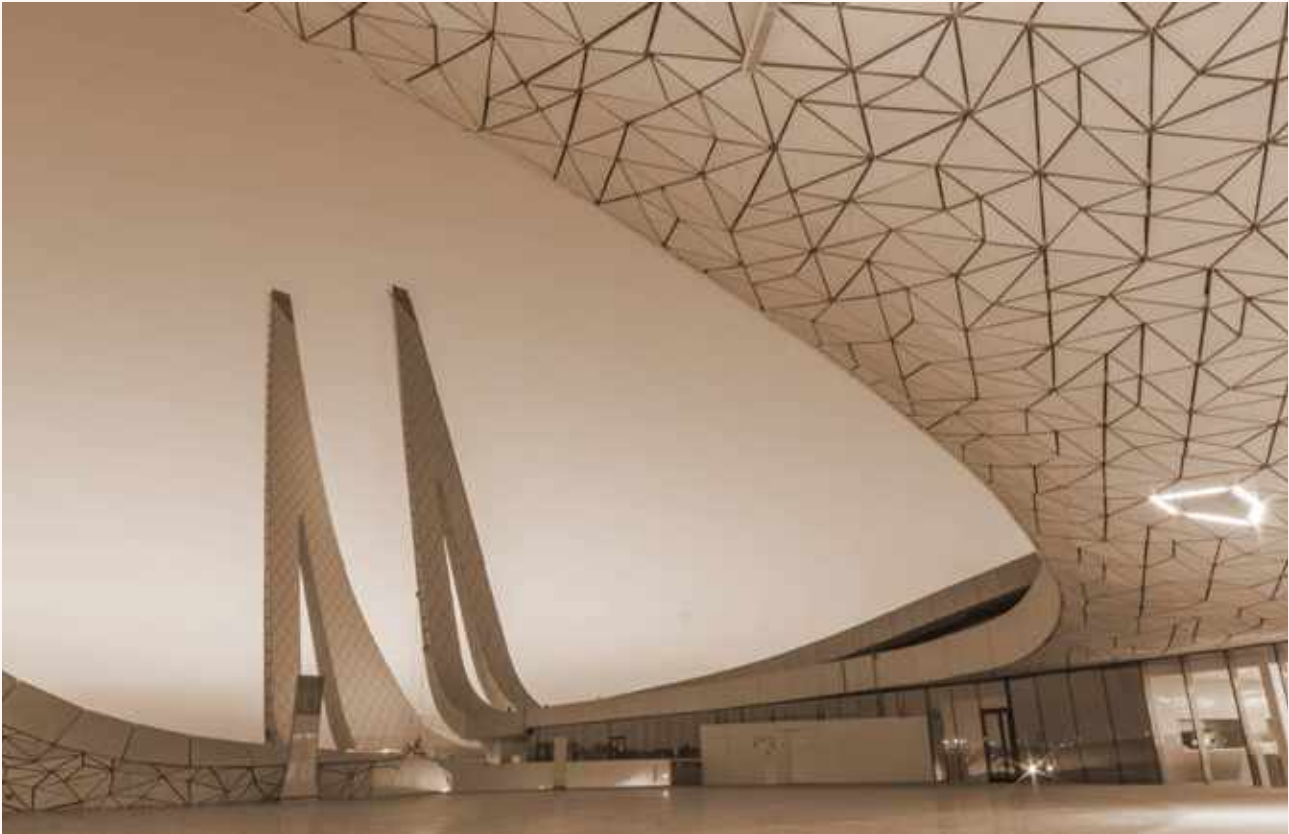
the <u>UAE Strategy for Artificial Intelligence</u> and the <u>National Program for AI</u> in 2017, the UAE Government continued to lay down the foundations for realizing this vision, in terms of organizational structures, regulatory frameworks, data governance infrastructure and educational policy initiatives.

One clear government direction, partially in response to the transformations triggered by the COVID-19 pandemic, is the association of its vision for AI in government, with digital economy policy directions. For example, the latest ministerial reshuffle in July 2020, saw the expansion of the portfolio of the Minister of State for Artificial Intelligence (created in 2017) to include, alongside the AI portfolio, "Digital Economy" and "Remote Work" mandates. Similarly, the new cabinet includes Ministers with "Advanced Technology", "Advanced Sciences", "Entrepreneurship and Small and Medium Enterprises" in their titles. Under the same cabinet, the Government also established <u>new senior government roles</u> in the form of national heads of "Digital Government", "Cybersecurity" and "Government Innovation". Similarly, there have also been several local government AI-driven initiatives, including smart city applications, launch of AI awards, incubators, training programs and <u>official AI ethics guidelines and assessment toolkit in Dubai</u>. These initiatives triggered wide societal interest in AI applications, data science and digital transformation. One example of a response to this interest is the country's newly established <u>AI-focused postgraduate university</u> (MBZUAI), which received thousands of applications for its first batch planned in 2021.

Digitally Divided and Data Poor
In stark contrast to the case of the UAE, the region also hosts some of the world's worst performers in terms of AI readiness. For example, Syria and Yemen, two of the region's war-torn countries for years, expectedly, rank in the bottom of the global rankings, scoring among the lowest in almost all of the measured dimensions.[1] The digital divide and data divide in the region is driven by political instability, lack of sustainable development, sporadic digitization efforts and missing or broken regulatory and organizational infrastructure.

Furthermore, some of the findings of the report suggest that many countries in the MENA region are facing numerous barriers in building their AI readiness (like other less developed countries). Data poor nations in the region (those not invested in structuring and governing the data produced by government, businesses and society) are going to face an uphill battle in terms of harvesting the benefits of AI, even if AI's technological implementations become a reality in these countries at a later stage. For example, the findings of the report show that half the countries in the region, especially the most populous ones (e.g. Egypt, Morocco and Algeria) score low on the "Data Availability" and "Data Representativeness" indicators.

The wide regional contrast in terms of government readiness for AI has one silver lining though. There is potential for regional spillover in terms of the building blocks of AI readiness. The fact that the region has some of the most AI-ready governments in the world may

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1 There was not enough data to include Libya—another war-torn MENA country—in the ranking.

provide a potential for spillover in terms of AI innovations, shared best practices as well as human capital. For example, investment in locally-specific AI applications (e.g. NLP applications, machine learning-based expert systems and highly-specific chatbots, among others) is taking place across borders in the region even in war-ravaged countries, where pockets of talent is matched with investments from advanced digital economies in the region, to supply applications and services in AI-ready countries in the region. The outcomes of these investments, whether in terms of data commons, technological applications, informational repositories or knowledgebase, may be readily applicable across other countries in the region, once the infrastructure is put in place.

Concerns about AI in the MENA region
Concerns about AI applications (whether applied by governments or private sector) are a global reality. In the MENA region, they are widely shared by around 60 percent of internet users. These concerns range from those associated with economic implications of AI applications (i.e. loss of jobs), safety concerns (i.e. autonomous vehicles and drones), security concerns (i.e. military and policing applications), ethical concerns related to representation, fairness and neutrality (i.e. healthcare and bots or opinion

manipulation applications) and privacy concerns (i.e. surveillance systems and decision-making applications), with privacy concerns topping the list according to 71% or internet users in the region.

Overall, these concerns are largely justified, if we look closer at the scores of the countries of the region on some of the related sub-indicators. For example, none of the countries in the region has introduced a national-level ethics framework (although such frameworks exist on few local government levels - Dubai is a key example).

Looking Ahead
There is still much to be done to improve AI readiness in the MENA region. However, given the interconnectedness of their societies and economies, countries of the MENA region need to collectively garner the 'tide' of societal data so all of its AI 'boats' may rise. There are numerous efforts to garner coordinated regional responses to digital development in MENA. Building a shared and open data commons, as a foundational step for AI development, can be embedded in some of these regional digitization efforts. One of prerequisites for such a regional approach includes laying down the regulatory foundations and privacy safety nets for compatible data governance frameworks.

United Arab Emirates

Index Score	Rank	Regional Rank
74.39/100	**16**/172	**1**/18 (Middle East and North Africa)

Responsible Use Score	Responsible Use Rank
46.66/100	**26**/34

GDP (US$ billion)	Population
214.03	9,632,000

Data Representativeness: **81.45**

Vision: **100**

Governance & Ethics: **63.31**

Digital Capacity: **88.25**

Adaptability: **78.58**

Data Availability: **78.01**

Infrastructure: **88.86**

Human Capital: **60.95**

Size: **30.99**

Innovation Capacity: **63.70**

100
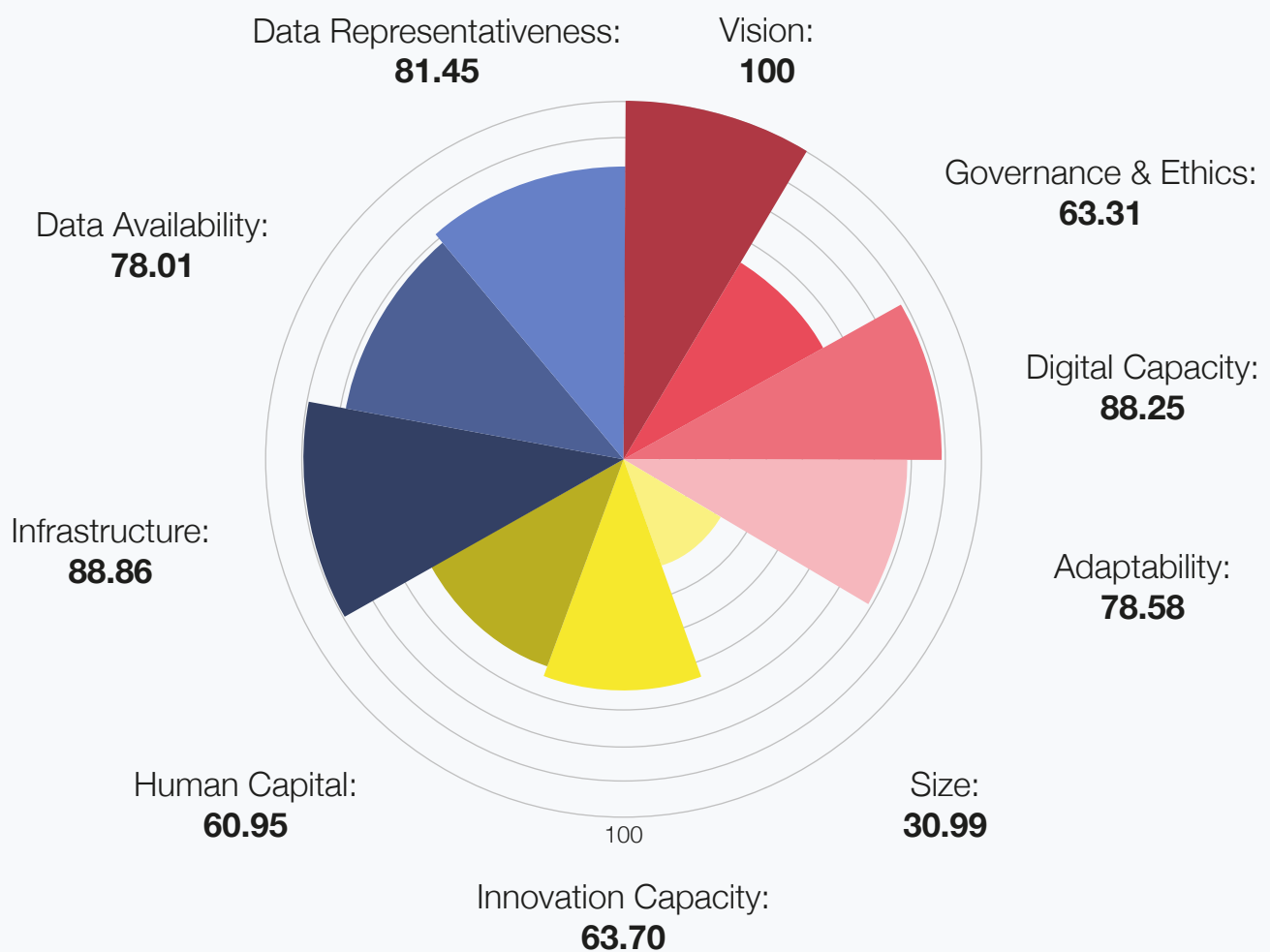
Government

Score	Rank	Region Rank
82.53/100	**7**/172	**1**/18
		(Middle East and North Africa)

WORLD AVERAGE: **41.34**

0 20 40 60 80 100
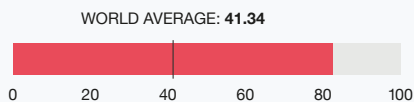
The United Arab Emirates (UAE) ranks in the top 10 globally in this pillar, showing how important AI is to the Government's agenda. The Government of the UAE made innovation and the embrace of new technologies a priority in its National AI Strategy of 2017, which established a dedicated Ministry for Artificial Intelligence to oversee the strategy's implementation.

The UAE also has a good foundation in digital government and public innovation, which may help the Government implement AI in public service delivery. The UAE scores third-highest in the world after Singapore and the USA for the Digital Capacity dimension, and it is the highest ranked MENA country in the Un eGovernment Survey's Online Services Index. The Mohammed Bin Rashid Centre for Government Innovation encourages innovation within government through its regular innovation labs for different ministries.

Technology Sector

Score	Rank	Region Rank
51.88/100	**21**/172	**2**/18
		(Middle East and North Africa)

WORLD AVERAGE: **32.76**

0 20 40 60 80 100
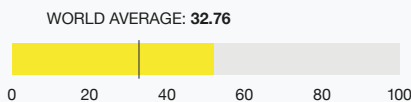
Of all three pillars, the UAE has the lowest score in the Technology Sector. This mainly reflects a still-growing technology sector: no country in the Middle East and North Africa region yet has any technology unicorns, or any technology companies in the Forbes Global 2000.

However, with a number of government policies in place to support the growth of the technology sector, the UAE's score in this pillar may well rise in future. In 2007, the country set up the Arab World's first ICT Fund, which continues to fund technology companies in the UAE. The Dubai Future Accelerators Program brings together public and private sector organisations to stimulate technological innovation. The city of Dubai also has a dedicated AI Lab that offers support to startups.

Meanwhile, the Mohammed Bin Zayed University of AI (established in 2019), aims to be a leading graduate research centre in AI.

Data and Infrastructure

Score	Rank	Region Rank
82.77/100	**18**/172	**1**/18
		(Middle East and North Africa)

WORLD AVERAGE: **58.64**

0 20 40 60 80 100
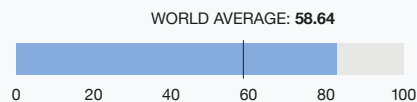
The arrival of 5G in the UAE has been a major boost to its technological infrastructure, with coverage of up to 80% in major cities. This will likely have a stimulating effect on the country's AI and IoT sectors. The UAE also has a high proportion of Internet users and a high number of mobile-cellular subscriptions, boosting its connectivity and data availability.

The UAE's lowest score in this pillar is for Open Government Data. However, there are positive signs that the Government is committed to improving the availability of open data: the UAE now has an open data portal, Bayanat. The Government's Smart Data Framework includes open data as one of its key principles.

Israel

Index Score	Rank	Regional Rank
68.60/100	**20**/172	**2**/18 (Middle East and North Africa)

| Responsible Use Score	Responsible Use Rank
52.03/100	**23**/34

GDP (US$ billion)	Population
288.201	8,883,000

Data Representativeness: **87.53**

Vision: **50**

Governance & Ethics: **60.89**

Data Availability: **79.26**

Digital Capacity: **72.12**

Infrastructure: **64.73**

Adaptability: **64.38**

Human Capital: **68.46**

Size: **46.79**

100

Innovation Capacity: **87.10**
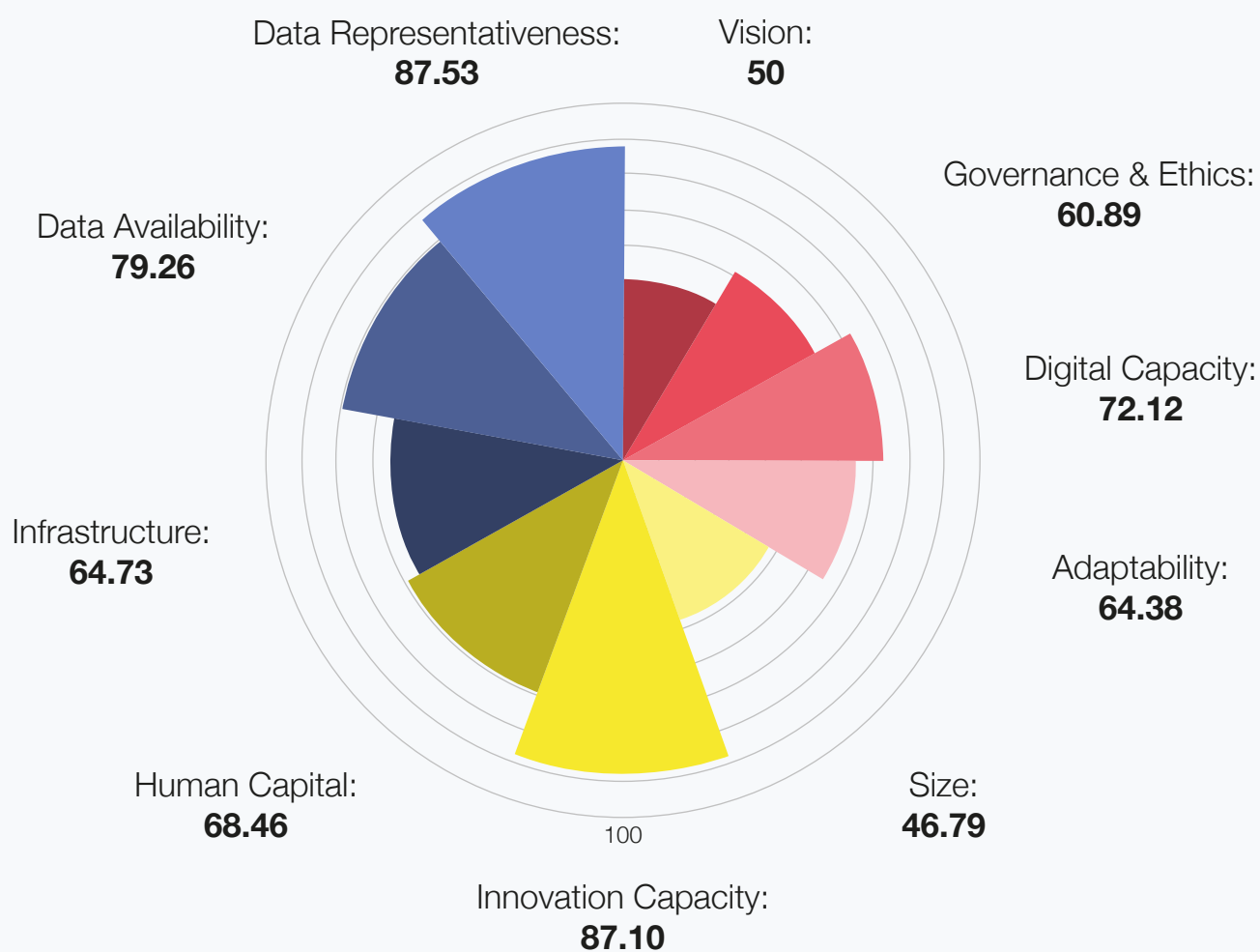
Government

Score	Rank	Region Rank
61.85/100	**35**/172	**3**/18
		(Middle East and North Africa)

WORLD AVERAGE: **41.34**

Israel does not currently have a national AI strategy, but the Government has recognised AI as an important challenge, and wants to position Israel as a world leader in AI capabilities. The Prime Minister's Office has established a committee to investigate how Israel can replicate its success in cybersecurity in the field of AI. There are plans to invest US$1-2billion in supporting the AI sector, with the aim of making Israel one of the 5 top countries in AI worldwide. Some fear that these efforts will be too little too late, as Israel is already lagging too far behind other major AI players such as the US and China. However, Israel was successfully able to use AI to identify high-risk COVID-19 patients, suggesting there is still potential for significant impact from AI within the country.

Israel's AI committee has recommended a focus on the digitalisation of government services, with a recognition that AI could help with this task. The committee has also recommended that a coordination agency be set up as part of a government agency to achieve this. Currently, innovation policy is overseen by the Israel Innovation Authority.

Technology Sector

Score	Rank	Region Rank
67.45/100	**3**/172	**1**/18
		(Middle East and North Africa)

WORLD AVERAGE: **32.76**
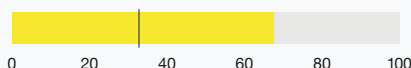
Israel has a vibrant tech and AI ecosystem that has been growing steadily over the past few years. In the first quarter of 2020, private funding of AI startups in Israel totaled US$882 million, an increase of over US$200 million on the previous year. Israel has three AI unicorns: Infi, OrCam Technologies and Lightricks. Beyond startups, leading multinational tech companies have recognised Israel as an area of strong AI talent. Apple and Facebook have both established labs in the country, Intel set up a new Center for Artificial Intelligence with the Technion Israel Institute of Technology in Haifa, and Nvidia has also opened an AI-based R&D centre in Israel.

One of Israel's important areas of strength is in computing infrastructure (e.g. the USB flash drive and the Intel 8088), and this could be the country's edge in the future in the growth of its tech ecosystem. In 2019, Nvidia acquired Israeli company Mellanox, which makes high performance networking technology, for almost US$7 billion.

Data and Infrastructure

Score	Rank	Region Rank
77.17/100	**32**/172	**4**/18
		(Middle East and North Africa)

WORLD AVERAGE: **58.64**

Israel ranks lower in this peer than many of its high-income peers in the Middle East and North Africa. Although Israel does not yet have 5G, it is aiming to launch a network in 2020. Israel's advanced technology infrastructure will also improve as a result of Amazon Web Services' announcement in 2019 that it would be expanding its operations in Israel. Amazon Web Services will be launching local infrastructure that will make the distribution of large data files easier, which could be a key enabler for the growth of AI in the country.

Israel also has some way to go in terms of data availability, particularly with regards to the availability of government data. A promising initiative in this regard is a US$264 million effort to combine digital medical records into a unified system, making patients' data available in a format conducive to AI and data analytics.

Egypt

Index Score	Rank	Regional Rank
49.19/100	**56**/172	**8**/18 (Middle East and North Africa)

Responsible Use Score	Responsible Use Rank
45.52/100	**27**/34

GDP (US$ billion)	Population
234.262	98,424,000

Data Representativeness: **48.90**

Vision: **100**

Governance & Ethics: **56.50**

Data Availability: **59.49**

Digital Capacity: **48.61**

Infrastructure: **37.39**

Adaptability: **48.50**

Human Capital: **50.53**

Size: **17.08**

Innovation Capacity: **39.14**

100
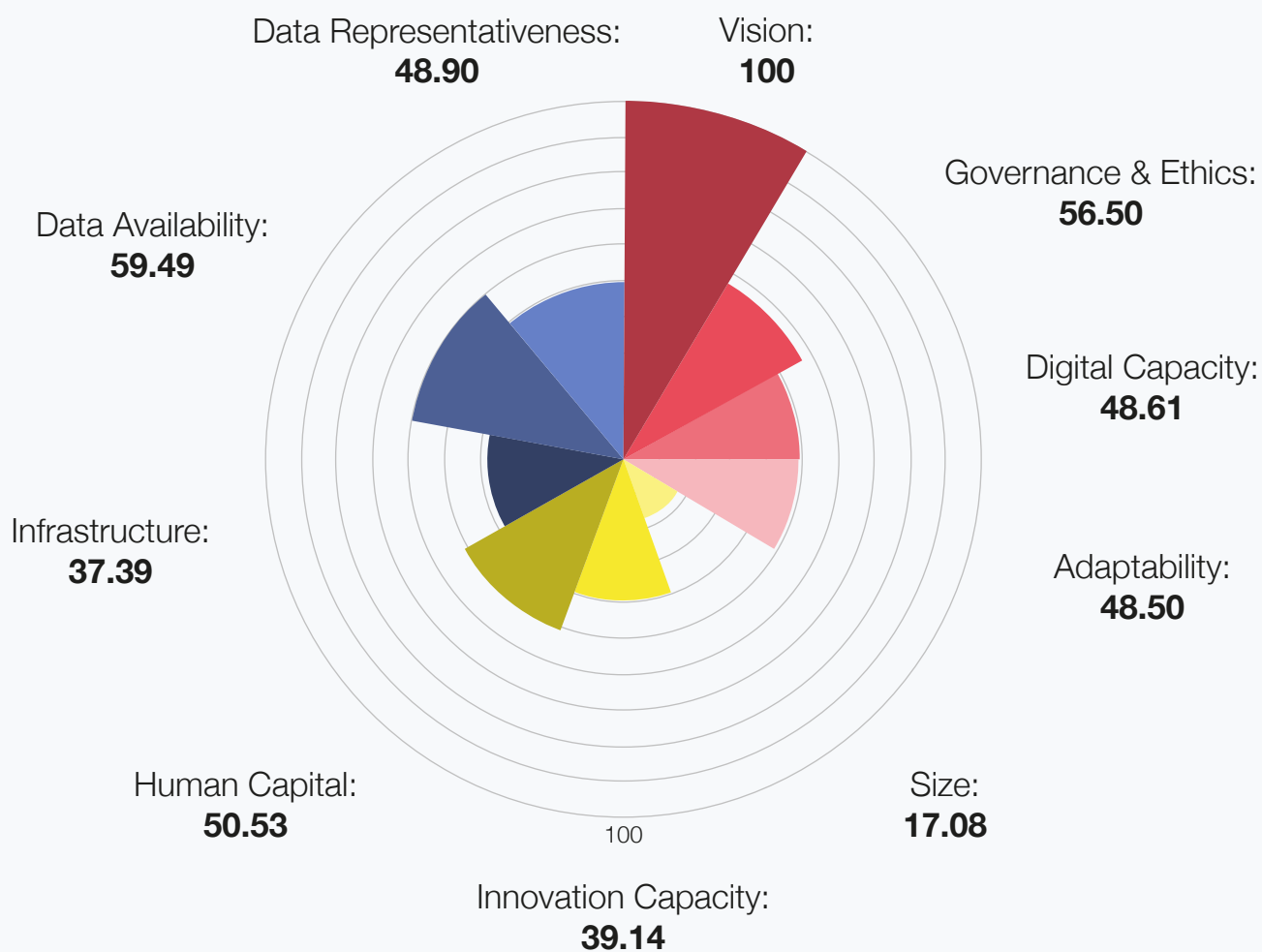
Government

Score	Rank	Region Rank
63.40/100	**31**/172	**2**/18
		(Middle East and North Africa)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
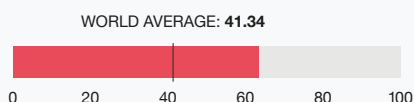
The government of Egypt launched its national AI Strategy in 2019. The strategy has two pillars: building human capacity and supporting scientific research and innovation. Egypt has also created a National AI Council which is responsible for supervising the implementation of the strategy. The Council first met in February 2020. As well as taking an interest in AI within its own borders, the Government has also pursued a collaborative approach, pushing for the creation of an African Union Working Group on AI.

In terms of existing government digital infrastructure, Egypt is starting from something of a low base, and this will be a barrier to overcome if the Government wants to use AI in public services. The country is ranked 99th in the world for its online services according to the UN eGovernment Survey. Egypt has also been somewhat late to some of the important areas of governance for AI. The country passed its first data privacy law in 2020.

Technology Sector

Score	Rank	Region Rank
35.58/100	**56**/172	**7**/18
		(Middle East and North Africa)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100

Egypt's technology sector is small but growing, and already features some AI companies such as AvidBeam, which works with computer vision, and Affectiva, which uses AI to recognise emotions. Some of Egypt's universities are also known for their STEM education or their AI research. Cairo University is in the top 200 universities in the world for Engineering and Technology, and has a well-respected Faculty of Computers and AI. Meanwhile, the American University in Cairo is also known for its AI research, and ran a 2019 workshop on AI in the middle east and Africa.

However, the Government has recognised that shortage of top AI talent is an issue, and the national strategy aims to tackle this problem. The Government plans to create a new Egyptian University of Information Technology, as well as two new AI colleges and 8 computer and information faculties.

Data and Infrastructure

Score	Rank	Region Rank
48.59/100	**117**/172	**13**/18
		(Middle East and North Africa)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
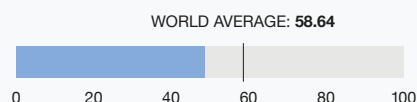
Egypt's scores in the data and infrastructure pillar are low, especially compared to some of its peers in the Middle East and North Africa. It is ranked 125th for its Telecommunications Infrastructure in the UN eGovernment Survey, whereas Tunisia is ranked 77th.

Egypt has a long-running Community Integration Initiative to try and boost ICT use and skills among rural and marginalised communities. However, significant gaps remain in terms of digital inclusion, and the Government should aim to improve its scores in the Data Representativeness dimension to ensure that AI training sets include high-quality and representative data.
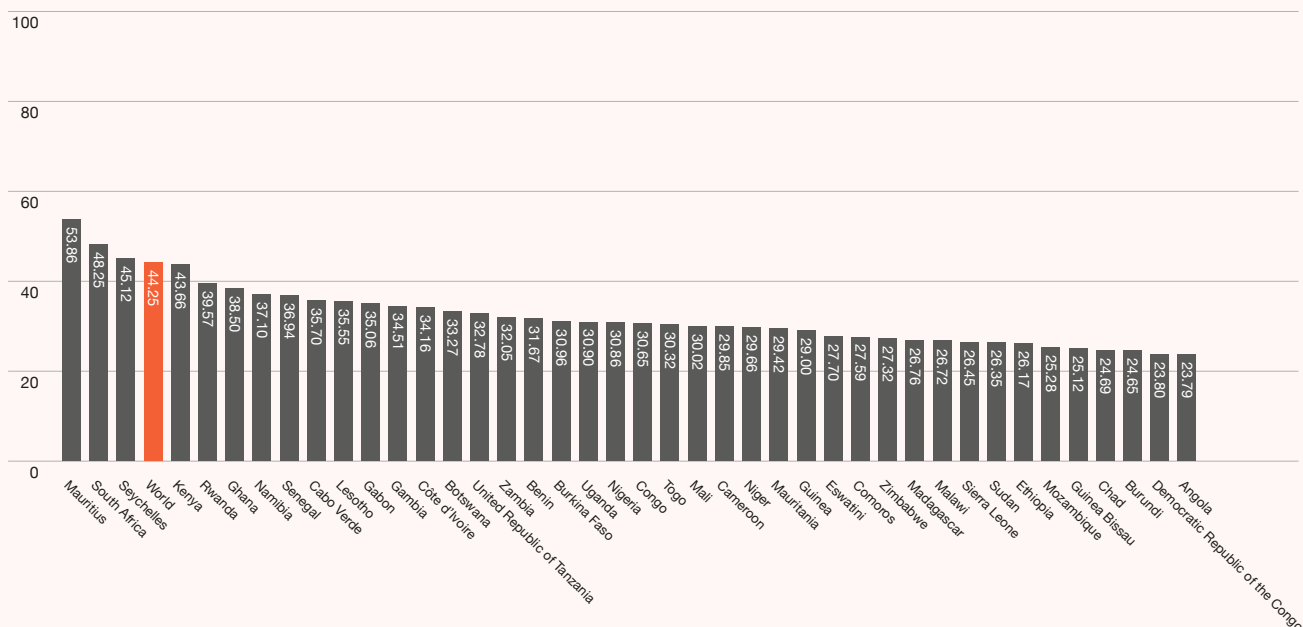
SUB-SAHARAN AFRICA

Sub-Saharan Africa

Bar chart showing AI readiness scores by country:
Mauritius 53.86, South Africa 48.25, Seychelles 45.12, World 44.25, Kenya 43.66, Rwanda 39.57, Ghana 38.50, Namibia 37.10, Senegal 36.94, Cabo Verde 35.70, Lesotho 35.55, Gabon 35.06, Gambia 34.51, Côte d'Ivoire 34.16, Botswana 33.27, United Republic of Tanzania 32.78, Zambia 32.05, Benin 31.67, Burkina Faso 30.96, Uganda 30.90, Nigeria 30.86, Congo 30.65, Togo 30.32, Mali 30.02, Cameroon 29.85, Niger 29.66, Mauritania 29.42, Guinea 29.00, Eswatini 27.70, Comoros 27.59, Zimbabwe 27.32, Madagascar 26.76, Malawi 26.72, Sierra Leone 26.45, Sudan 26.35, Ethiopia 26.17, Mozambique 25.28, Guinea Bissau 25.12, Chad 24.69, Burundi 24.65, Democratic Republic of the Congo 23.80, Angola 23.79

Regional Analysis

by Araba Sey

African countries score low on AI readiness as measured by the 2020 Government AI Readiness Index. The Index indicates that overall, African countries are relatively better prepared in the Data and Infrastructure pillar, followed by the Government pillar and then the Technology Sector pillar. Within these pillars, countries have or are building more capacity in telecommunications and other infrastructures needed to support AI, and in the availability of representative AI training data. They have less capacity in relation to the size of the technology sector, the business environment and existence of a skilled AI workforce. There is also limited preparation of appropriate regulatory and ethical frameworks; and governments themselves generally have low use of ICTs and low responsiveness to change. The highest-ranked African country (Mauritius) is in 45th position globally, with the other top five countries in the region being South Africa (59th), Seychelles (68th), Kenya (71st) and Rwanda (87th). These results should come as no surprise, as African countries have historically lagged the rest of the world in technological developments. Despite the different generations of technology that African countries have "leapfrogged", they still face the persistent challenge of catching up, as the pace of technological change outstrips their leaping abilities.

The AI Sector in Africa
The dearth of relevant data repositories covering Africa makes it difficult to get a full picture of developments on the continent or to explain national trends. However, some scoping exercises show that AI is already being employed in several countries and in a variety of sectors including banking, e-commerce, health, agriculture, energy, education, and industry. For example, there were at least 86 African companies in 17 countries that were using 4IR technologies (including AI) in the agricultural sector.

The academic and entrepreneurial communities are particularly active. A mapping of emerging AI hotspots in the Global South identified 148 players in nine sub-Saharan African countries, mostly in academia (111). In 2019 there were about 6500 technology startups in Africa, of which about 10% were focused on Fourth Industrial Revolution (4IR) technologies such as Internet of Things (IoT), Big Data and AI. The AI sector in Africa received about USD 17.5 million in government and private sector investments in 2019. In the past decade, USD 1658 million has been invested in AI in South Africa, mostly for IoT technologies. Yet the potential of AI remains largely untapped.

Policy Barriers
Apart from the well-known infrastructure limitations, inconsistent policy and regulatory failure slow progress towards AI readiness. Few countries have an official AI strategy or national policy – according to Digital Watch, in January 2019 only Tunisia, Egypt and Kenya showed signs of developing such strategies. Since then, more African countries (including several of those at the top of the Africa ranking) are beginning to put this on the national agenda – Mauritius released a strategy document at the end of 2018, which included setting up a Mauritius AI council.

Both the AI Strategy and the Mauritius 2030 Strategic Plan prioritize developing local talent, such as through making programming a required university course.

Although South Africa does not yet have a national strategy on AI, the Government has set up a Presidential Commission on the Fourth Industrial Revolution to develop a strategic plan for South Africa's 4IR vision. Likewise, Rwanda expects to have a data protection policy in place by 2020, with the expectation that it will indirectly address key AI-related governance issues.

Talent Shortages
AI readiness in Africa is also constrained by lack of an appropriately skilled local workforce. As a Forbes Insights article notes, "AI solutions don't spring fully formed—they emerge from communities of researchers and entrepreneurs, which require a lot of groundwork to build." The talent that does exist tends to face numerous obstacles, including low visibility within the global community of AI researchers and entrepreneurs due, for example, to visa-related barriers to attending international conferences.

Even in highly-ranked Rwanda, the Permanent Secretary of the Ministry of ICT, reportedly estimated that the country had only about 10 AI engineers in November 2019. There are increasing efforts to establish home-grown remedies to nurture the local AI scene in Africa. This includes companies organizing AI conferences in Africa – such as Machine Learning Africa, a South Africa-based organization that hosts the Artificial Intelligence Business Conference and AI and the Future of Healthcare Summit. The inaugural Data Science & AI Summit was slated to take place in 2020 in Rwanda; and the 2020 International Conference on Learning Representations, which was moved to Ethiopia in an effort to support African participation. Most of these convenings have been postponed or held online due to the COVID-19 pandemic, but they illustrate ongoing moves towards strengthening the AI knowledge community in Africa. Grassroots developments, such as Deep Learning Indaba, often led by young innovators, are also driving AI and data science ecosystems to support the development of locally grown AI expertise.

Looking Ahead
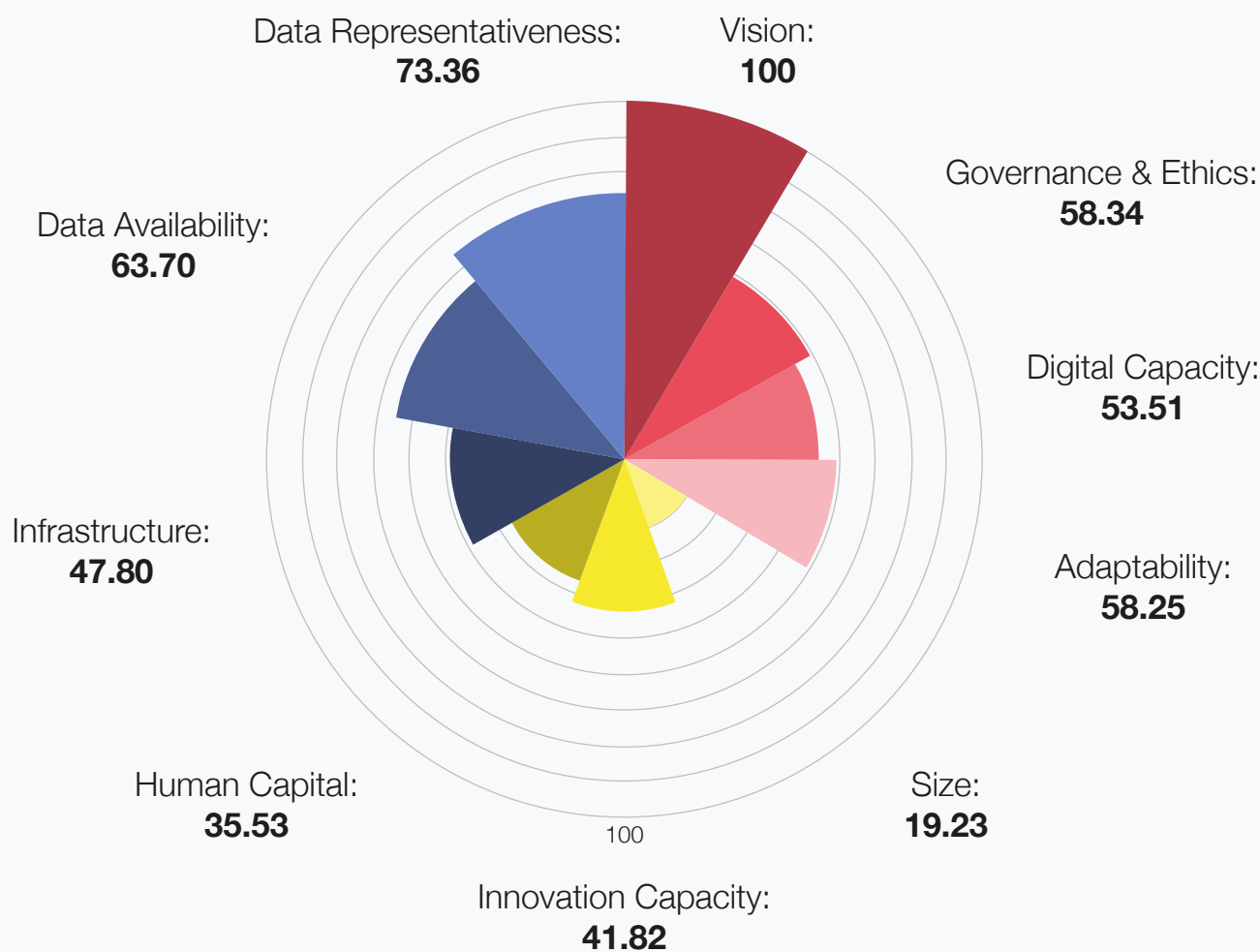There are a number of AI-related initiatives in the region to look out for:

- In February 2020, the African Union adopted the African Digital Transformation Strategy (2020-2030) to guide digital development in Africa. The strategy mentions AI a few times, although quite generically as an example of technologies to adopt or keep abreast with.
- The African Continental Free Trade Agreement could facilitate the growth of AI infrastructure and talent by promoting regional integration and free flow of people, investments, goods and services.
- In mid-2020, Canada's International Development Research Centre and Swedish International Development Agency launched the AI4D Africa program. AI4D Africa is a 4-year, CAD$20m partnership to **support** the creation of an ecosystem that supports responsible, home-grown development and deployment of AI through investments in three key areas: innovation, policy research, and skills.
- UNESCO is undertaking an Artificial Intelligence capacity building needs assessment survey to determine the current state of AI policy development and gaps in human and institutional capacity in the Africa region.
- The Moonshot for Africa program of the World Bank aims to fund a range of ambitious digital connectivity programs in Africa, from broadband connectivity to machine learning and artificial intelligence technologies.
- The global digital tax debate, where negotiations continue around the OECD's proposal for a multilateral global digital tax regime. Several African countries including South Africa, Kenya and Nigeria have unilaterally announced plans or unveiled draft legislation to require tech companies to pay tax in the countries where they generate revenue, irrespective of physical presence.

The results of these types of research, practical, economic, financial, and legal initiatives will doubtless affect the trajectory of progress towards government AI readiness across the continent in the coming year.

Mauritius

Index Score	Rank	Regional Rank
53.86/100	**45**/172	**1**/41 (Sub-Saharan Africa)

Responsible Use Score	Responsible Use Rank
64.10/100	**13**/34

GDP (US$ billion)	Population
12.927	1,265,000

Data Representativeness:
73.36

Vision:
100

Governance & Ethics:
58.34

Data Availability:
63.70

Digital Capacity:
53.51

Infrastructure:
47.80

Adaptability:
58.25

Human Capital:
35.53

Size:
19.23

Innovation Capacity:
41.82

100

Government

Score	Rank	Region Rank
67.78/100	**25**/172	**1**/41 (Sub-Saharan Africa)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
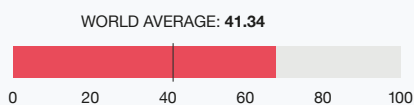
Mauritius is to date the only country in Sub-Saharan Africa to publish an AI strategy, which was released in 2018. The strategy has a particular focus on how AI can support the Ocean Economy, which comprises over 10% of Mauritius' GDP. For example, it suggests investment into a maritime Internet of Things. The strategy also established an AI council that advises the Government on supporting Mauritius' AI ecosystem.

Besides the AI strategy, Mauritius also has an ambitious Digital Mauritius 2030 strategy, which aims to bolster the country's position as a regional leader in terms of ICTs. The strategy has a particular focus on digital government, and is supplemented by the Digital Government Transformation Strategy. Mauritius' AI strategy also mentions the uses that AI could have in helping to transform public services.

In terms of governance and ethics, Mauritius is also seeking to set an example for the region. Its Digital Mauritius Strategy has a particular focus on cybersecurity, and the country ranks 15th in the world according to the Global Cybersecurity Index, the highest-ranking country in Sub-Saharan Africa. Mauritius has also updated its data protection legislation in recent years, in order to bring it in line with the example set by Europe's GDPR.

Technology Sector

Score	Rank	Region Rank
32.19/100	**72**/172	**2**/41 (Sub-Saharan Africa)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
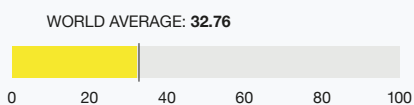
Mauritius' technology sector is small but flourishing. Port Louis can lay claim to being one of the top startup hubs in Africa, and Mauritius hosts an annual World AI Show, bringing experts and industry leaders around the world to the country to share expertise. Mauritius is also ranked 13th in the world in the World Bank's Ease of Doing Business rankings.

Since 2017, the Government has offered tax incentives for innovative companies. The Government also grants regulatory sandbox licences to encourage experimentation, and runs a National SME Incubator Scheme. To encourage collaboration between academia and the private sector in R&D, the Mauritius Research and Innovation Council runs a scheme that offers grants for SMEs to collaborate with local academic and research institutions.

In terms of developing digital skills within the workforce, the Human Resources Development Council (HRDC) runs an AI skills development support programme. This programme helps a range of different groups, from university students through to professionals, by introducing them to the fundamentals of AI. The HRDC also offers scholarships through this programme for students to pursue AI-related undergraduate and postgraduate degree courses.

Data and Infrastructure

Score	Rank	Region Rank
61.62/100	**66**/172	**22**/41 (Sub-Saharan Africa)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
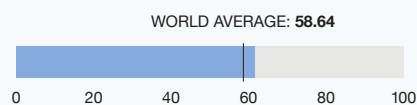
Mauritius is routinely rated one of the most mature telecoms markets in Africa, with particularly high levels of mobile phone penetration. Internet penetration is slightly lower, and there is a noticeable digital divide in terms of a socioeconomic gap in Internet usage. However, Mauritius Telecom has invested over US$75 million to bring fibre broadband to the island to improve connectivity across the board. To improve inclusivity, from 2015 to 2018 the Government provided 350 free WiFi Hotspots and 100 Public Internet Access Points.

One area for Mauritius to improve in this pillar is in terms of open data, where it scores 26 out of 100. The Government is pursuing a National Open Data Strategy, published in 2017, to improve access to government data, so Mauritius should hopefully see its score in this indicator rise in future.

South Africa

Index Score	Rank	Regional Rank
48.25/100	**58**/172	**2**/41 (Sub-Saharan Africa)

Responsible Use Score	Responsible Use Rank
42.70/100	**29**/34

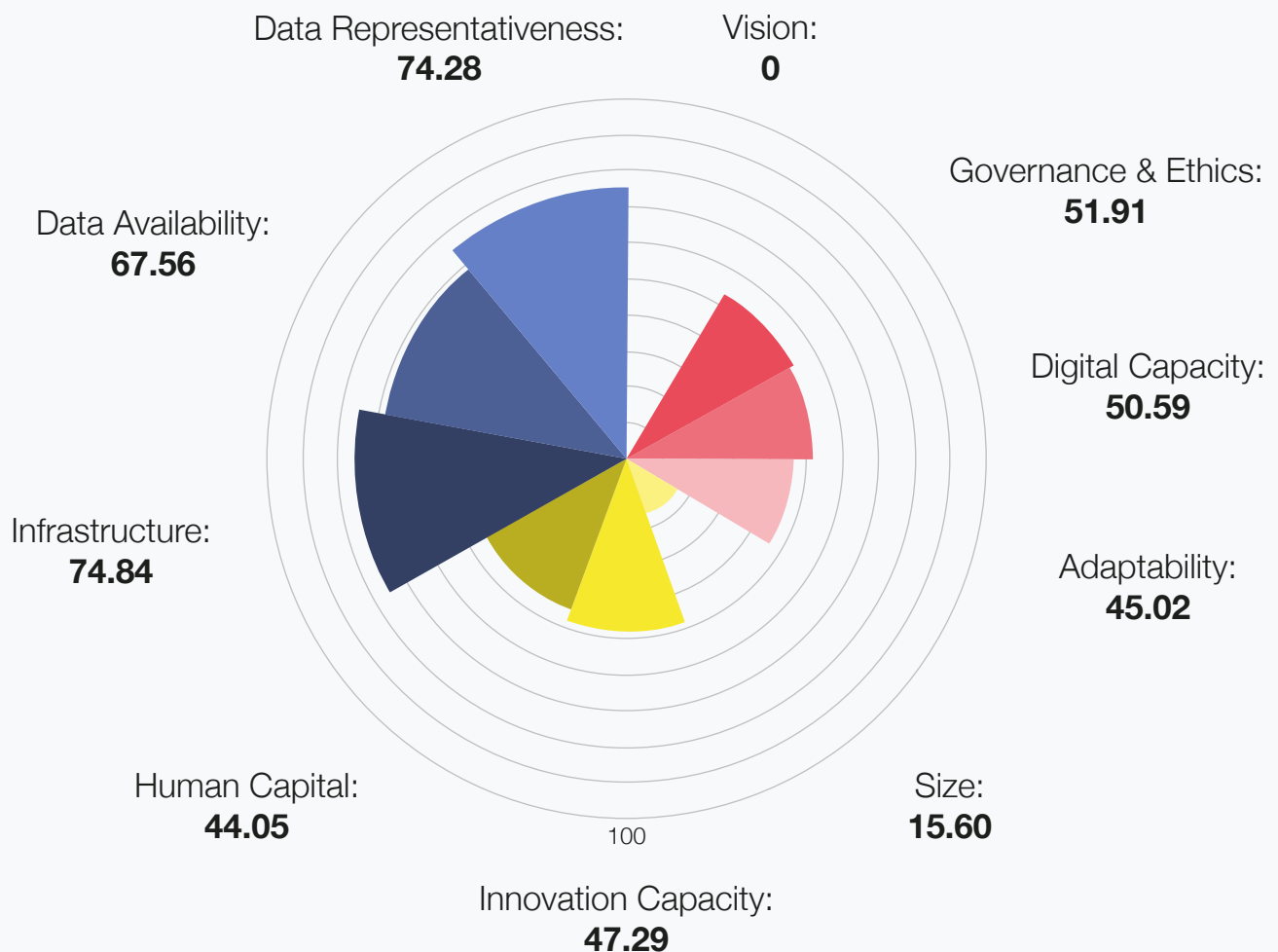| GDP (US$ billion)	Population
298.942	57,780,000

Data Representativeness:
74.28

Vision:
0

Governance & Ethics:
51.91

Data Availability:
67.56

Digital Capacity:
50.59

Infrastructure:
74.84

Adaptability:
45.02

Human Capital:
44.05

Size:
15.60

Innovation Capacity:
47.29

100

Government

Score	Rank	Region Rank
36.88/100	**75**/172	**5**/41 (Sub-Saharan Africa)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
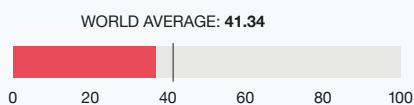
Although South Africa does not yet have a national strategy for Artificial Intelligence, there is some evidence that the Government is considering how best to govern and use AI. The advisory Presidential Commission on the Fourth Industrial Revolution, formed in 2019, includes experts in AI and other emerging technologies. South Africa's Centre for the Fourth Industrial Revolution, affiliated with the WEF's Centre for the Fourth Industrial Revolution Network for Global Technology Governance, aims to develop policies and governance frameworks that will allow South Africa to use AI in a responsible way.

Elsewhere, the South African Government has also put in place policies and initiatives to facilitate the use of technology in government, which could assist with the implementation of AI in public services. For example, the Centre for Public Service Innovation supports the use of new technologies to improve public services. The Department of Science and Innovation also held a discussion forum in October 2019 that focused on the use of technology in municipal governments.

Technology Sector

Score	Rank	Region Rank
35.65/100	**54**/172	**1**/41 (Sub-Saharan Africa)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
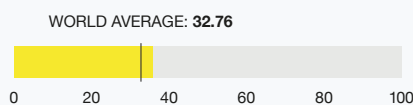
In a 2019 report, the National Advisory Council of Innovation found that South Africa needs to triple its number of science and technology researchers to catch up with other upper middle-income countries. The report also found that over the last decade, the proportion of researchers in business as opposed to in higher education has fallen, as has government funding for business R&D. This suggests that the Government needs to do more to support a dynamic and innovative private sector. Initiatives such as the Small Enterprise Development Agency's incubation programme for technology startups are a step in the right direction.

One of South Africa's strengths in this pillar is its academic research into AI. The Centre for Artificial Intelligence Research, founded in 2011, has nodes at five South African universities: the University of Cape Town, University of KwaZulu-Natal, North-West University, University of Pretoria and Stellenbosch University. The Centre has helped to develop a national network of AI researchers. And in 2020, a group of academic, private sector and civil-society groups signed an expression of interest in developing a new AI institute in South Africa.

Data and Infrastructure

Score	Rank	Region Rank
72.22/100	**42**/172	**1**/41 (Sub-Saharan Africa)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
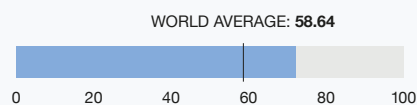
South Africa has its highest score by some margin in this pillar, suggesting a good foundation on which future AI growth could be built. South Africa launched Africa's first 5G network in May 2020, and it is the third-highest ranking Sub-Saharan African country after Mauritius and the Seychelles in the UN eGovernment Survey's Telecommunications Infrastructure Index.

South Africa's lowest score of the three dimensions in this pillar is for the Data Availability Dimension, with a particularly low score (34) for open government data. However, the country is a member of the Open Government Partnership and has been making progress towards opening up government datasets.

South Africa's digital divide could present a barrier to the collection of representative data. A 2018 ITU report found that there was inequality in access to technology infrastructure such as broadband because costs are too high for some citizens. To tackle this problem, South Africa has included making high-speed broadband more widely available and cheaper as part of the National Development Plan 2030.

Senegal

Index Score	Rank	Regional Rank
36.94/100	**97**/172	**8**/41 (Sub-Saharan Africa)

| Responsible Use Score	Responsible Use Rank
66.38/100	**9**/34

GDP (US$ billion)	Population
19.286	15,854,000

Data Representativeness: **63.50**

Vision: **0**

Governance & Ethics: **44.75**

Data Availability: **50.61**

Digital Capacity: **47.98**

Infrastructure: **38.05**

Adaptability: **47.97**

Human Capital: **24.90**

Size: **11.69**

Innovation Capacity: **38.15**

100
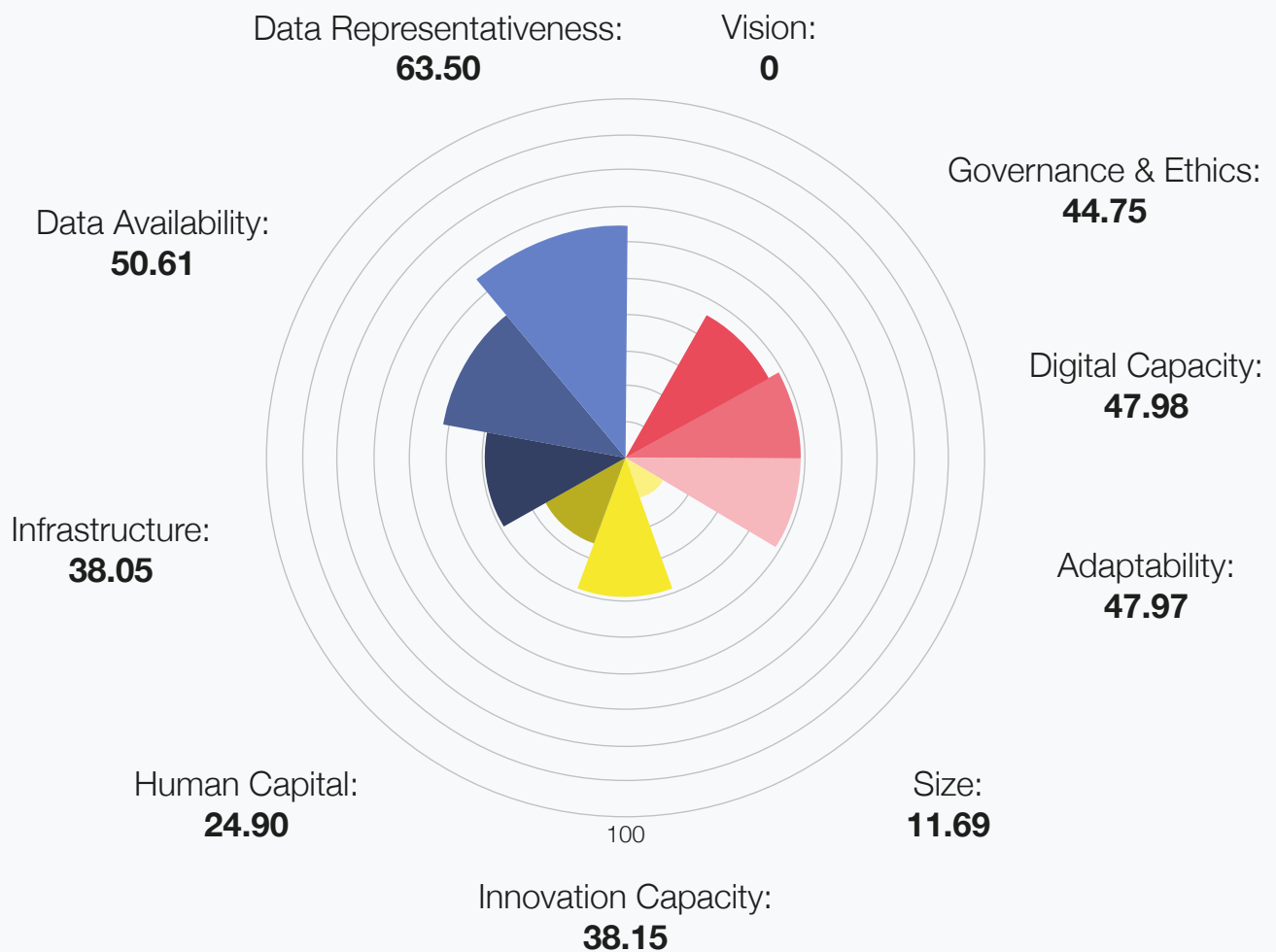
Government

Score	Rank	Region Rank
35.18/100	**84**/172	**7**/41 (Sub-Saharan Africa)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100

Senegal suffers from a lack of a coherent policy framework for innovation in general or AI specifically. However, it does have the Digital Senegal 2025 Strategy that aims to foster a dynamic and innovative technology ecosystem. There are also some existing case studies of collaboration between the Government and startups to deliver technology-driven public services. One example is TownPay, a digital tax collection platform. This is a sign that, in future, Senegal could develop greater AI readiness as it continues to partner with tech innovators.

Technology Sector

| Score	Rank	Region Rank
24.92/100	**108**/172	**8**/41 (Sub-Saharan Africa)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
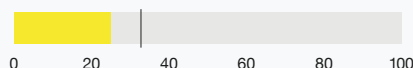
Senegal has a small but growing technology sector. In 2017, it secured a loan from the World Bank to support the ICT and energy sectors. In 2018, the construction of a major research and innovation site in Dakar was announced, and in 2019, Dakar hosted the first ever African 'Digital Women's Day', showcasing tech innovations by women. Senegal also has one of the first AI programming schools in West Africa at the Dakar Institute of Technology, which opened in 2019.

One of the main barriers to innovation in the country is that research institutions are fragmented and under the supervision of different ministries and funding sources are similarly fragmented and often lack visibility. A study showed that Senegal has 555 researchers per million inhabitants, which is lower than many OECD countries (e.g. in Germany it is 5036 per million) but comparable with Chile (533 per million) and ahead of Mexico (244). However, the balance of R&D activity is heavily tilted towards the state, with little private sector involvement.

Data and Infrastructure

Score	Rank	Region Rank
50.72/100	**111**/172	**10**/41 (Sub-Saharan Africa)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
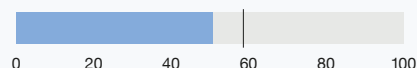
Senegal suffers from significant inequalities in Internet usage along gender and socioeconomic lines. The COVID-19 has further exposed these divides, with poorer students less likely to be learning online. However, the country has collaborated with France-IX to improve broadband infrastructure in an attempt to close this gap.
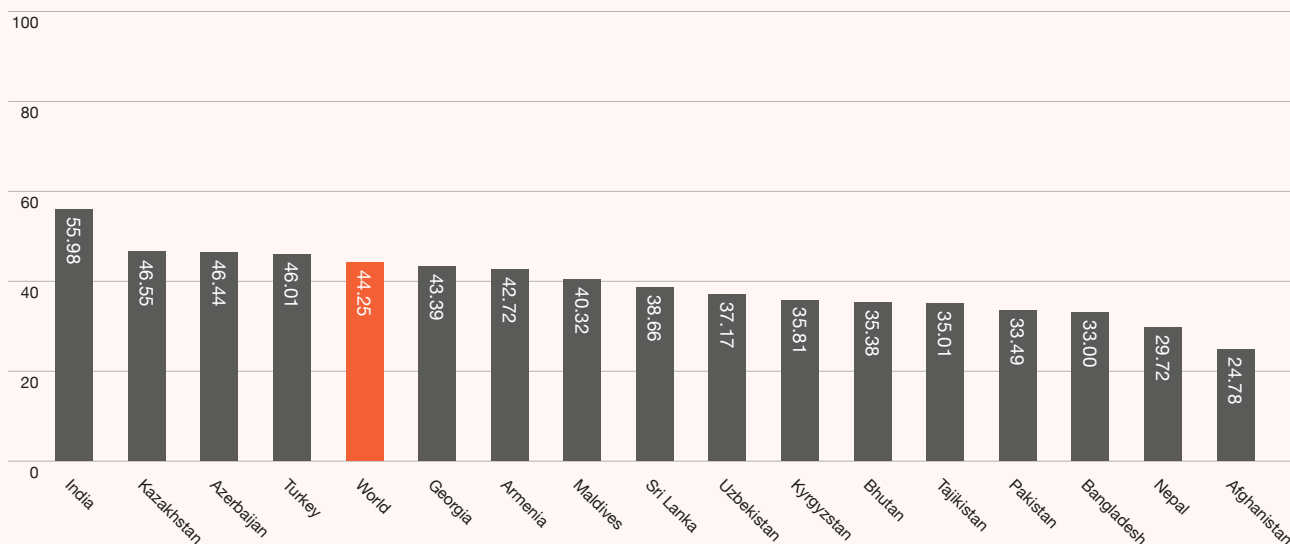
Senegal has been a member of the Open Government Partnership since 2018, and in the process of developing their first action plan. The commitments in this plan will hopefully include opening up more government data, which will help improve Senegal's score in the Data Availability dimension.

SOUTH AND CENTRAL ASIA

South and Central Asia

Regional Analysis

by Yaera Chung

This year's Government AI Readiness Index for South and Central Asia covers 16 countries from the region. As a whole, the region's average score is marked at 39.03, which is slightly lower than the global average score of 44.25. Aside from India (40th in the global rank), there are no other countries from the region in the top 50 worldwide. This shows the difficulty countries across the region are having in harnessing their capabilities on government, the technology sector, and data infrastructure.

Among the top-ranked countries in the region, it is worth noticing of shared commonalities resulted by their geolocations. Kazakhstan (2nd in the region), Azerbaijan (3rd), Georgia (5th), and Armenia (6th) are composed of the former Soviet Union countries, and the top six (except the case of India) are located along with China's Belt and Road Initiative (BRI) or known as "Silk Road Economic Belt". Since the countries in Central Asia and South Caucasus have close ties in both historically and economically to Russia and China, the result of geopolitical influence and investments are also observed in the Government AI Readiness Index scores. In contrast, the five lowest-ranked countries are Bhutan, Pakistan, Bangladesh, Nepal, and Afghanistan, which are mostly less developed countries and have been experiencing internal conflicts for a period of time.

Government Strategies

India is first ranked in the region with its brand of 'AI for All' national strategy, and the Government has set aside $480

million for investment into emerging technologies including AI. The Government identified five sectors of AI intervention in India - healthcare, agriculture, education, smart cities, and smart mobility based on the successful interventions in other countries and their potential for high social impact within India. India shows great potential due to its large number of STEM graduates and the Government's commitment, yet, there are challenges around brain drainage and weak infrastructures to support connectivity.

Overall, one of the key challenges in addressing AI readiness for the region is the lack of government strategy in implementing AI. Out of 16 countries, only India has a national strategy for implementing AI, and the rest lack such a strategy. This made a significant difference in the rating and resulted in low performance across the government pillars. Nevertheless, Azerbaijan has recently started to apply AI technology in governance by envisioning potential opportunities in the National Strategy for 2020-2025, and Turkey is working on developing a national strategy for AI. Therefore, we anticipate improved conditions for the governance of AI preparedness in the near future.

Technology Sector

The region also suffers greatly from lacking supply of AI tools and skilled laborers from the national technology sector. With the exception of India, the size of technology sectors - e.g, the value of trade in ICT goods and services and market value of ICT companies - is significantly below the world average. In terms of innovation capacity and human capital, the governments of the countries in the region are trying to address the challenges by improving the market environment and skills development. Georgia

has ranked seventh place in the World Bank's Ease of Doing Business ranking last year, whereas Azerbaijan made significant progress from 63rd place in 2016 to 25th in 2019. Nevertheless, the countries in the region still lack a systemic approach to strengthen the ecosystem for the technology sector - including lacking investment policy for private sectors, industry-specific development programs, and under-developed infrastructure.

Data and Infrastructure

In terms of data and infrastructure, the majority of the countries in the region scored higher than the global average scores in data availability and data representativeness but scored significantly low scores in the infrastructure. Across the region, the countries lacked the availability of latest technologies identified by the Network Readiness Index, and also 5G Infrastructures in the country. India has planned to start 5G network service in late-2020, but due to COVID-19 pandemic, the service is now planned to start in mid-2021 or 2022. For Central Asia, Huawei and the Chinese government is investing significantly to develop digital infrastructure and digital governance across the region - which closely aligns with China's Belt and Road Initiative.

Summary

The readiness assessment of South and Central Asia clearly shows the stark difference between the countries with the least developed countries versus middle-income countries with dedicated investments and geopolitical interests. Whereas the highest-ranked actors in Governance AI Readiness in the region mostly are found in Central Asia and South Caucasus, the lowest-ranked countries are mostly from the least developed countries in Southwest Asia. Overall, it clearly showed the need for the national AI strategy for the countries in the region, and a systemic approach to develop and foster a stronger ecosystem for the technology sector is in dire need to strengthen their readiness for AI governance.

India

Index Score	Rank	Regional Rank
55.98/100	**39**/172	**1**/16 (South and Central Asia)

Responsible Use Score	Responsible Use Rank
41.19/100	**32**/34

GDP (US$ billion)	Population
1,962.730	1,352,617,000

Data Representativeness:
50.72

Vision:
100

Governance & Ethics:
57.69

Data Availability:
59.03

Digital Capacity:
73.92

Infrastructure:
36.58

Adaptability:
55.74

Human Capital:
54.64

Size:
37.15

Innovation Capacity:
50.22

100
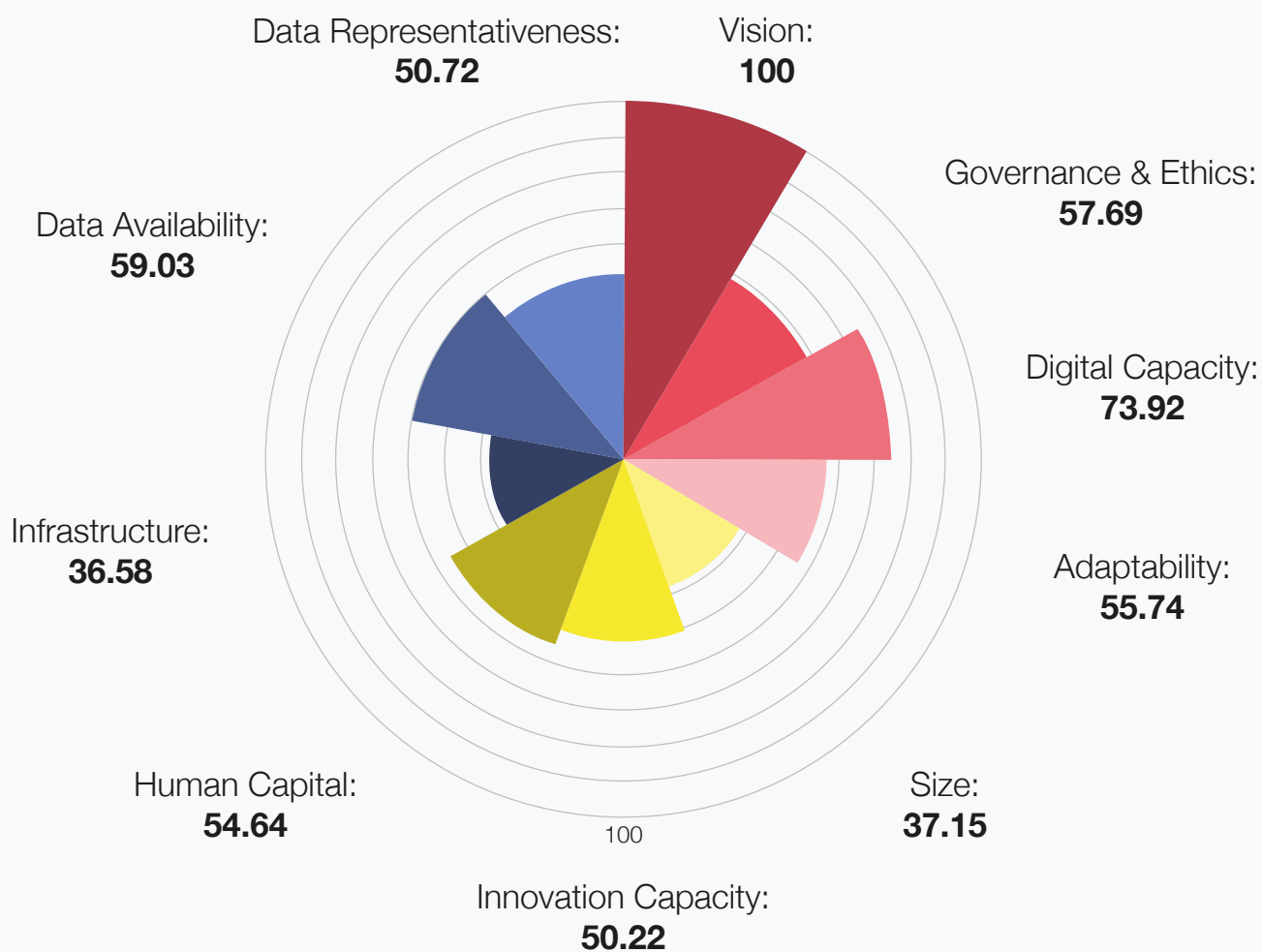
Government

Score	Rank	Region Rank
71.84/100	**19**/172	**1**/16
		(South and Central Asia)

WORLD AVERAGE: **41.34**

```
0    20    40    60    80    100
```
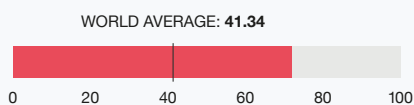
India published a National Strategy on Artificial Intelligence in 2018. Written by Government think tank NITI Aayog, the strategy sets out some focus areas for AI in India, including Healthcare, Agriculture and Smart Mobility. NITI Aayog has also helped run some pilot AI projects in these areas - they worked with IBM to pilot AI in agriculture.

India also has an advisory AI Task Force, launched in 2017. The Task Force report from 2018 highlights improving public services as one of the key 'grand challenges' for AI in India. However, India scores noticeably lower in the dimensions of Adaptability and Governance and Ethics than it does in the other two dimensions in the government pillar. This could suggest that barriers to the use of AI in government include difficulty effecting and maintaining change, as well as creating a strong governance framework for the AI. India's National Strategy does highlight 'unclear privacy, security and ethical regulations' as one of the challenges for AI adoption.

Technology Sector

Score	Rank	Region Rank
47.34/100	**29**/172	**1**/16
		(South and Central Asia)

WORLD AVERAGE: **32.76**

```
0    20    40    60    80    100
```
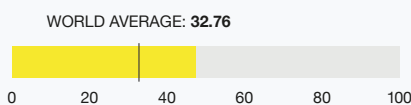
India has many of the right raw materials for a successful AI sector, such as strong existing ICT and telecommunications companies and world-renowned universities for STEM education. It has the 4th highest number of technology unicorns after the US, China and the UK, and the 3rd highest market value for technology companies in the Forbes Global 2000. However, India does not yet have a reputation for AI excellence on par with countries such as China. The National Strategy highlights poor availability of AI expertise and low intensity of AI research as issues that India must overcome if its AI ecosystem is to grow.

Government programmes to support the technology sector include the Centre of Excellence for IoT and AI, an incubator for startups. There is also the Responsible AI for Youth Programme, that seeks to address the 'AI skills gap'. Besides government efforts, Google also announced in July 2020 that it will invest US$10bn in India in the next 5-7 years.

Data and Infrastructure

Score	Rank	Region Rank
48.78/100	**116**/172	**9**/16
		(South and Central Asia)

WORLD AVERAGE: **58.64**

```
0    20    40    60    80    100
```
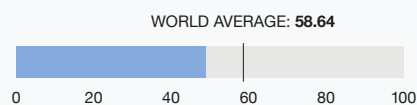
India scores significantly lower in this pillar than in the other two, and is in the bottom half of countries globally in terms of its data and infrastructure. According to the ITU Global ICT Development Index, less than a third of adults use the Internet, and India ranks 144th in the UN eGovernment Survey's Telecommunications Infrastructure Index. Improving infrastructure and access to high-quality data can therefore be seen as the main challenge India faces if it is to break into the top tier of countries in terms of AI readiness.

To improve the availability of government data, NITI Aayog will be developing a National Data Platform, due to be launched in 2021. The Government is also taking steps to address India's significant digital divide, with rural areas having much lower internet density. The Digital India programme has an ongoing initiative to provide high-speed, low-cost Internet to rural India.

Kazakhstan

Index Score	Rank	Regional Rank
46.55/100	**63**/172	**2**/16 (South and Central Asia)

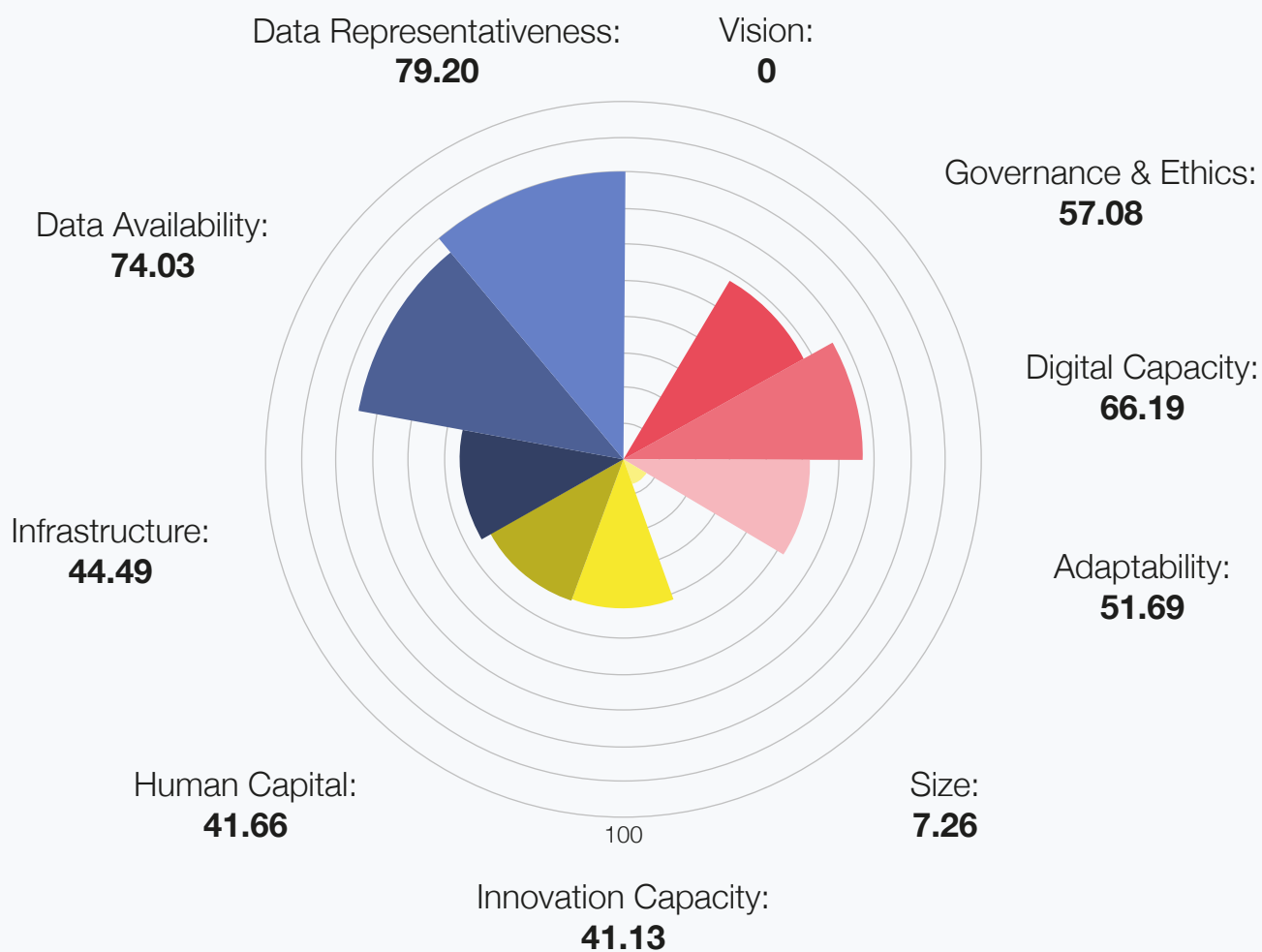| Responsible Use Score	Responsible Use Rank
46.77/100	**25**/34

GDP (US$ billion)	Population
103.963	18,272,000

Data Representativeness:
79.20

Vision:
0

Governance & Ethics:
57.08

Data Availability:
74.03

Digital Capacity:
66.19

Infrastructure:
44.49

Adaptability:
51.69

Human Capital:
41.66

Size:
7.26

Innovation Capacity:
41.13

100

Government

Score	Rank	Region Rank
43.74/100	**62**/172	**3**/16 (South and Central Asia)

WORLD AVERAGE: **41.34**

| 0 | 20 | 40 | 60 | 80 | 100 |
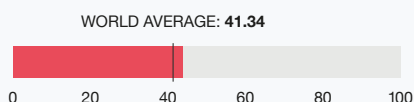
The Government of Kazakhstan has taken an active interest in AI and new technologies as part of its programme to reform the country's economy. Although there is no current AI strategy, the Government did have a roadmap for AI and other smart technologies from 2016 to 2018. There is also the Digital Kazakhstan programme, one of the planks of which is improving digital government and the provision of online services. Kazakhstan ranks 11th in the world for Online Services in the 2020 UN eGovernment Survey.

Kazakhstan's general commitment to digitalisation has also seen it pilot the use of AI in some public services. For example, in 2017, the Ministry of Healthcare worked with IBM to pilot the use of AI in oncology.

Technology Sector

Score	Rank	Region Rank
30.02/100	**80**/172	**6**/16 (South and Central Asia)

WORLD AVERAGE: **32.76**

| 0 | 20 | 40 | 60 | 80 | 100 |
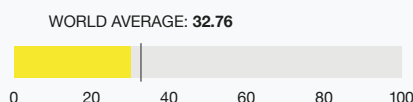
Kazakhstan scores particularly low for R&D spending (2.70 out of 100), which is a barrier to a dynamic and innovative technology sector. In an OECD review of Kazakh Innovation policies from 2017, the report also noted that the country's post-Soviet higher education system is fragmented and underfunded, making it difficult for academia to drive innovation through research.

However, there are signs that the Government is tackling some of Kazakhstan's innovation problems in a way that will be beneficial to AI and technology companies. For example, the Ministry of Education and Science, along with the World Bank, launched the Fostering Productive Innovation Project to support research into and commercialisation of new technologies. One of the startups funded through this project, ReLive, offers AI-supported stroke rehabilitation.

Kazakhstan has also tried to attract foreign talent and companies for its technology sector. StartUp Kazakhstan is an accelerator program for startups from any country wishing to do business in Kazakhstan. One multinational company that now works in Kazakhstan is IBM, which has an office for their Watson Machine Learning work in the country.

Data and Infrastructure

Score	Rank	Region Rank
65.91/100	**55**/172	**2**/16 (South and Central Asia)

WORLD AVERAGE: **58.64**

| 0 | 20 | 40 | 60 | 80 | 100 |
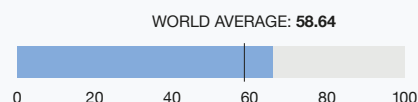
Improving infrastructure is a major target of the Digital Kazakhstan programme. Although mobile phone penetration is high, Internet use lags behind, especially in rural areas. The aim is for 97% of rural settlements to have broadband by 2022. This could help the country improve on its score of 64.15 out of 100 for the socioeconomic gap in Internet usage, and further digital inclusion.

Although 5G is not yet commercially available in Kazakhstan, it was the first country in Central Asia to launch a trial 5G network in October 2019. There are plans to have a network in the capital by 2021.

Kazakhstan's score of 26 out of 100 for open data suggests this is another area the Government should target to improve AI readiness. The Government does have an open data portal, and the website lists three examples of apps that have been developed using this open data, such as Здоровье+ that helps find information about hospitals.

Turkey

Index Score	Rank	Regional Rank
46.01/100	**66**/172	**4**/16 (South and Central Asia)

| Responsible Use Score	Responsible Use Rank
42.25/100	**31**/34

GDP (US$ billion)	Population
551.658	82,320,000

Data Representativeness:
68.18

Vision:
0

Governance & Ethics:
58.72

Data Availability:
63.19

Digital Capacity:
61.90

Infrastructure:
47.26

Adaptability:
51.48

Human Capital:
46.36

Size:
17.63

Innovation Capacity:
42.41

100
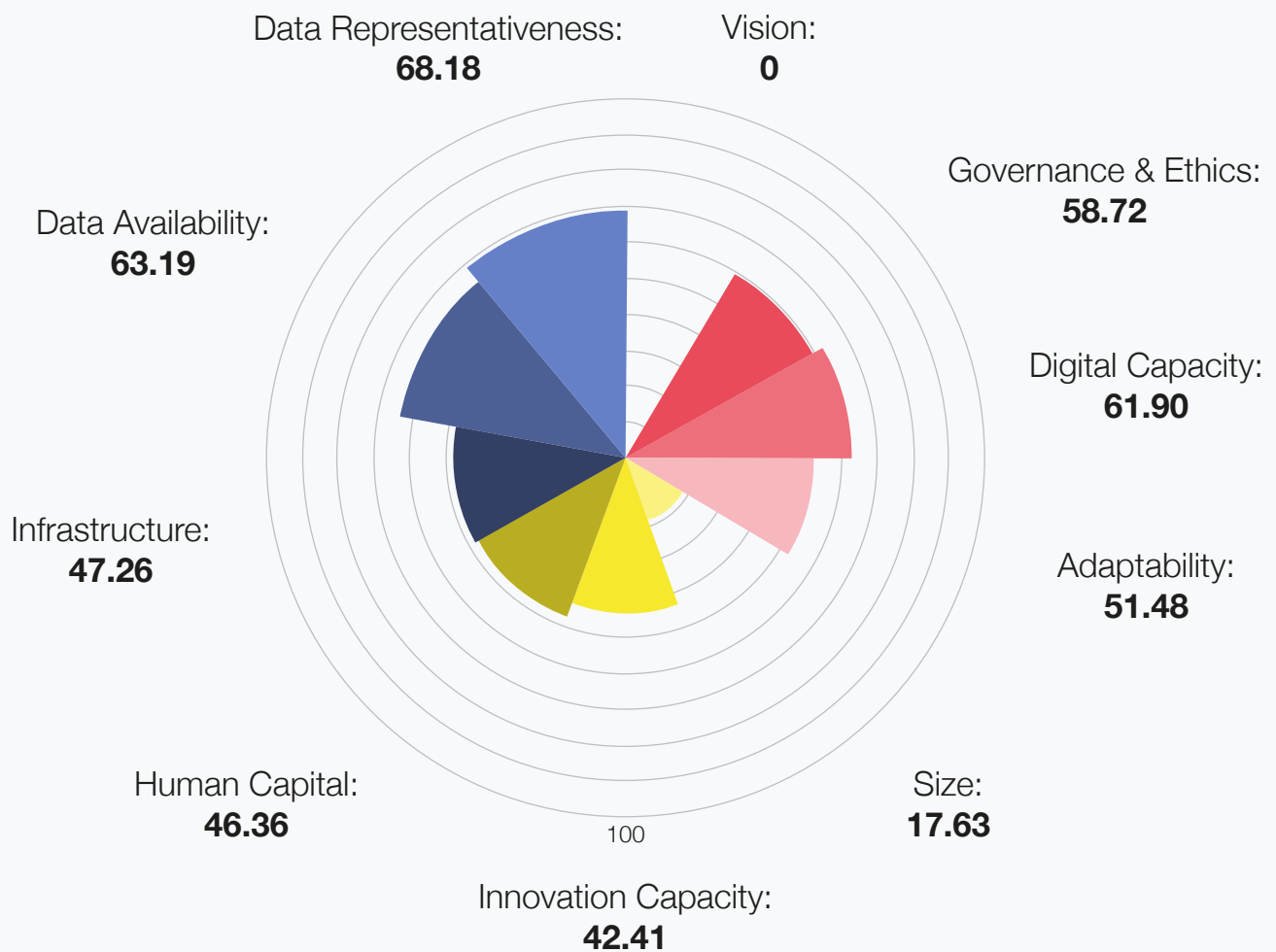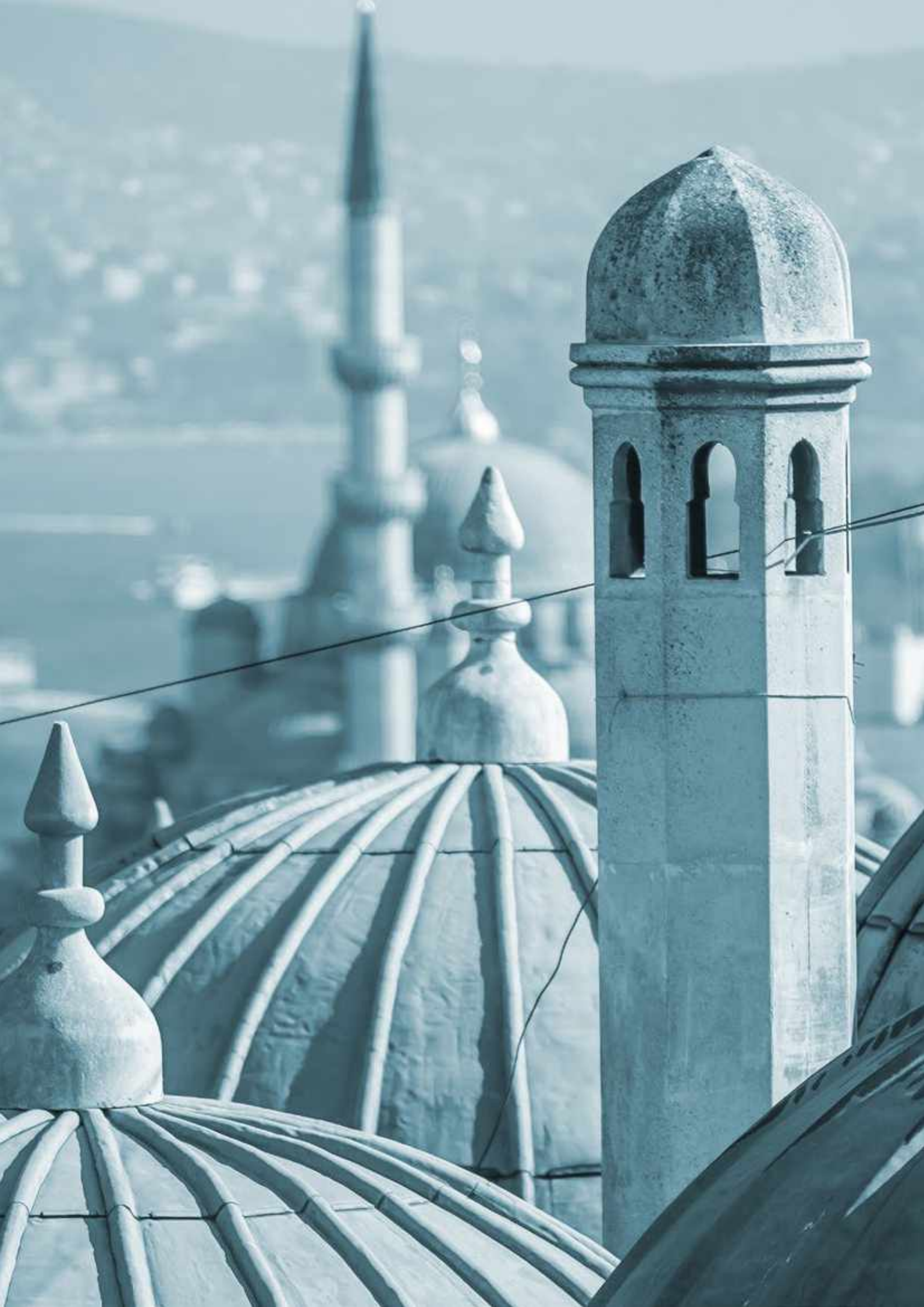
Government

Score	Rank	Region Rank
43.03/100	**63**/172	**4**/16
		(South and Central Asia)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
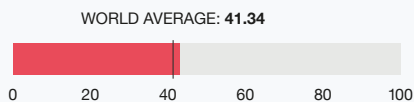
Although the Government of Turkey does not have an AI strategy, it did have a National e-Government Strategy that ran from 2016 to 2019, and a 2019-2022 National Smart Cities Strategy and Action plan. Both of these express a willingness to embrace new technologies to improve government and public services, but a more targeted policy for AI would help the Government improve its AI readiness.

Turkey established its Digital Transformation Office of the Presidency in 2018. This office coordinates the digital transformation of the state. In the 2020 eGovernment Survey, Turkey ranked 23rd in the world, and 2nd in South and Central Asia behind Kazakhstan in terms of its online services. This suggests that there is a basic digital infrastructure in government into which AI could be implemented. However, Turkey's score of 42.19 out of 100 for the Government procurement of advanced technology indicator shows that more needs to be done to move beyond the basic requirements of e-services and incorporate advanced technologies into government.

Technology Sector

Score	Rank	Region Rank
35.46/100	**58**/172	**2**/16
		(South and Central Asia)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
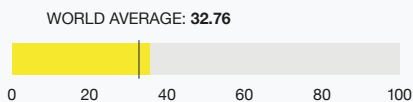
Turkey's startup ecosystem has struggled to access venture capital in recent years, partly because of the political instability since the coup in 2016. Nevertheless, there are a few promising research centres that help drive technological innovation in Turkey. The Cloud Computing and Big Data Research Laboratory project was launched in 2013, and the AI Research Centre at Istanbul Technical University, founded in December 2018. The Istanbul Technical University also has an accelerator, Cekirdek, based in its technology park on campus.

The Government of Turkey funds research and entrepreneurial endeavours through the Scientific and Technological Research Council of Turkey. However, with a score of 21.11 out of 100 for R&D spending, Turkey could invest more in R&D to improve its ranking in this pillar in future.

Data and Infrastructure

Score	Rank	Region Rank
59.54/100	**79**/172	**6**/16
		(South and Central Asia)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
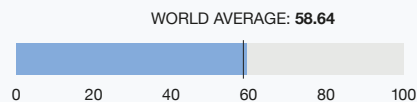
The Data and Infrastructure pillar is Turkey's lowest-ranked, suggesting that this is an area for improvement if the country wants to build AI readiness. Turkey was a member of the Open Government Partnership until 2016, when it had its membership withdrawn. However, the National Data Dictionary project, which aims to standardise data systems across government, which may have a beneficial effect on data availability.

Turkey ranks 79th in the world in terms of its telecommunications infrastructure according to the 2020 UN eGovernment Survey. However, the country has ambitious plans for its infrastructure in future. It plans to switch to 5G by 2021, and networks have already been trialled in the country.
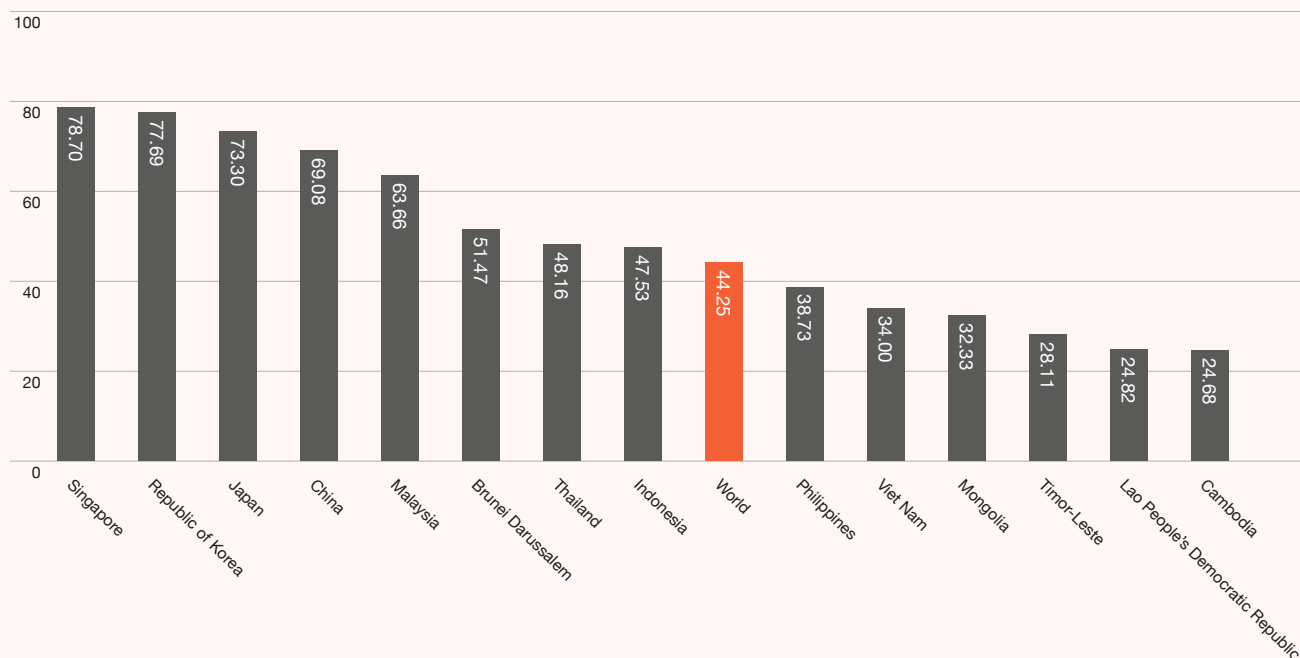
EAST ASIA

East Asia

Regional Analysis

This edition of the Government AI Readiness Index covers 15 governments across the East Asia region. Four countries are among the top twenty globally for government AI readiness: Singapore (first in the region, sixth globally), South Korea (second in the region, seventh globally), Japan (third in the region, thirteenth globally) and China (fourth in the region, nineteenth globally). As a region, East Asia is ranked as the most ready for AI after North America, Western Europe and Eastern Europe. This is indicative of the importance and promise of AI development in the region.

Regional contexts

The East Asia region is home to over 20% of the world's population. It stands to gain the most from deploying AI applications given its still early stages of development but huge potential to scale returns.

Governments in this region are serious R&D spenders. According to the latest data from UNESCO (taken from the year 2017 for Singapore and 2018 for the rest) China now leads the world in annual government R&D spending with around $59 billion, Japan $14 billion, Korea $8.2 billion, and Singapore $1.2 billion (figures adjusted to PPP).

Specifically on AI, East Asian governments have each formulated comprehensive, long-term national plans that seek strategic integration of AI into their economies and societies. Accordingly, they have created AI-specific bodies, such as China's AI Plan Promotion Office under the Ministry of Science and Technology; Japan's Strategic Council for AI Technology; South Korea's Presidential Committee on the Fourth Industrial Revolution; and Singapore's National AI Office.

The collectivist spirit in the region might also be a relevant factor in the future development and deployment of AI in the region. During the COVID-19 pandemic, East Asian countries including China, South Korea, Singapore, and Japan have all been quite effective in "flattening the curve" via methods such as digital contact tracing. Their collectivist attitudes may encourage civic-minded embrace of and a more willing compliance with government-led response.

Singapore and China as AI governance forerunners

AI governance has become one of the top policy priorities for both Singapore and China in 2019. Singapore is ranked the first globally on the Government pillar, including both Digital Capacity and Adaptability. In our analysis, China's strongest dimension is Governance and Ethics.

In April 2019, Singapore won a top award at the World Summit on the Information Society Forum, a United Nations level platform. The initiatives that contributed to the win included: Asia's first model AI governance framework that was released in January; an international and industry-led advisory council on the ethical use of AI and data; and a research programme on the governance of AI, ethics and data use established through the SMU Centre for Artificial Intelligence and Data Governance. At the 2020 World Economic Forum in Davos, the Minister for Communications

and Information presented the country's guidelines for responsibly implementing AI, managing its risks, and building consumer trust.

In Feb 2019, China's Ministry of Science and Technology initiated the establishment of the New-Generation AI Governance Professional Committee consisting of experts from academia and industry. In Jun 2019, the Committee released the "Governance Principles for a New Generation of Artificial Intelligence: Develop Responsible Artificial Intelligence"《新一代人工智能治理原则——发展负责任的人工智能》, which proposed eight principles, namely, harmony and human-friendliness, fairness and justice, inclusiveness and sharing, respect for privacy, security and controllability, shared responsibility, open collaboration, and agile governance. According to Zhao Zhiyun, the Director of New-Generation AI Development Research Center (新一代人工智能发展研究中心) of the Ministry of Science and Technology, China's priority in 2020 will be the implementation of the governance principles.

Singapore as the leader in investing in human capital
It is noteworthy that Singapore is ranked as the world leader on Human Capital. In October 2019, the National AI Strategy (NAIS) will oversee over S$500 million committed to funding activities related to AI under the Research, Innovation and Enterprise 2020 Plan. It has identified five national projects across logistics, housing, healthcare,

education and security for which it is training 25,000 professionals in AI basics.

Other countries have various limitations. According to a recent research project by Macro Polo, China is the largest source of top-tier researchers, with 29% of these researchers having received undergraduate degrees in China. But the majority of those Chinese researchers (56%) go on to study, work, and live in the United States. For South Korea, it seems that it does not have as many top-tier talents as compared to similar size populations such as the UK and Canada.

Data advantages of South Korea and Japan
Ranked as the second and third in East Asia respectively, South Korea and Japan have the strongest advantages in Data Availability and Data Representativeness. Both countries have a very high number of Internet users (% of adult population), which is used as a rough proxy for the availability of data that could be used to train AI models.

As the first country with widespread 5G deployment, South Korea has an edge in gathering data that will deepen its AI prowess in areas such as smart manufacturing, immersive gaming and autonomous vehicles. South Korea also takes a unique approach in its data governance by dividing responsibility between providers (companies), developers, and users. This is in contrast to places such as the

European Union and China where we see authorities holding companies responsible for the technologies they develop and distribute. It is yet to see how different approaches would unfold and impact national AI capabilities at scale.

For Japan, back in 2018, the Japanese Government announced that artificial intelligence would also become an official part of its "integrated innovation strategy." An element of the strategy is to unify data formats and standards throughout various industries to enhance the ability to utilize big data techniques in Japan. The Japanese Government has also been making considerable effort to facilitate data circulation while maintaining its quality. A notable example is The Basic Act on the Advancement of Utilising Public and Private Sector Data.

It should be noted that there is no data on the Socioeconomic gap in Internet usage for South Korea and Japan per The 2017 Global Findex database. Therefore, the rankings on Data Representativeness might not be accurate.

Young workforce in Southeast Asia

Many of the countries in Southeast Asia are ranked relatively low in our analysis, due to the early stages of development in digital infrastructure and AI ecosystems. Several of them have young and relatively large populations. For example, Indonesia has a population of over 250 million and a median age of 31.1, and the Philippines has a population of over 100 million and a median age of 24.1. This demographic context represents either a risk or an opportunity in the era of machine intelligence, depending on the response of the governments. If the governments are able to train and leverage the potentially large STEM workforce, a digital gap could be mitigated. Countries from across East Asia should consider region-wide partnerships to leverage their comparative advantages and advance regional priorities.

Looking ahead

East Asia is a region of great dynamism and potential for AI development and applications. Major governments seem to have the vision and leadership for innovating in governance, maintaining data advantages, and investing in R&D. To further develop the AI ecosystems, these countries also need to attract, nurture, and retain the top-tier talent from across the region and from other parts of the world. For the less ready countries with young populations, education and training of the next generation would be the key task.

Singapore

Index Score	Rank	Regional Rank
78.70/100	**6**/172	**1**/15 (East Asia)

Responsible Use Score	Responsible Use Rank
57.55/100	**19**/34

GDP (US$ billion)	Population
161.931	5,639,000

Data Representativeness: **83.65**

Vision: **100**

Governance & Ethics: **91.58**

Data Availability: **83.50**

Digital Capacity: **93.82**

Infrastructure: **65.66**

Adaptability: **89.91**

Human Capital: **80.39**

Size: **44.95**

Innovation Capacity: **68.70**

100
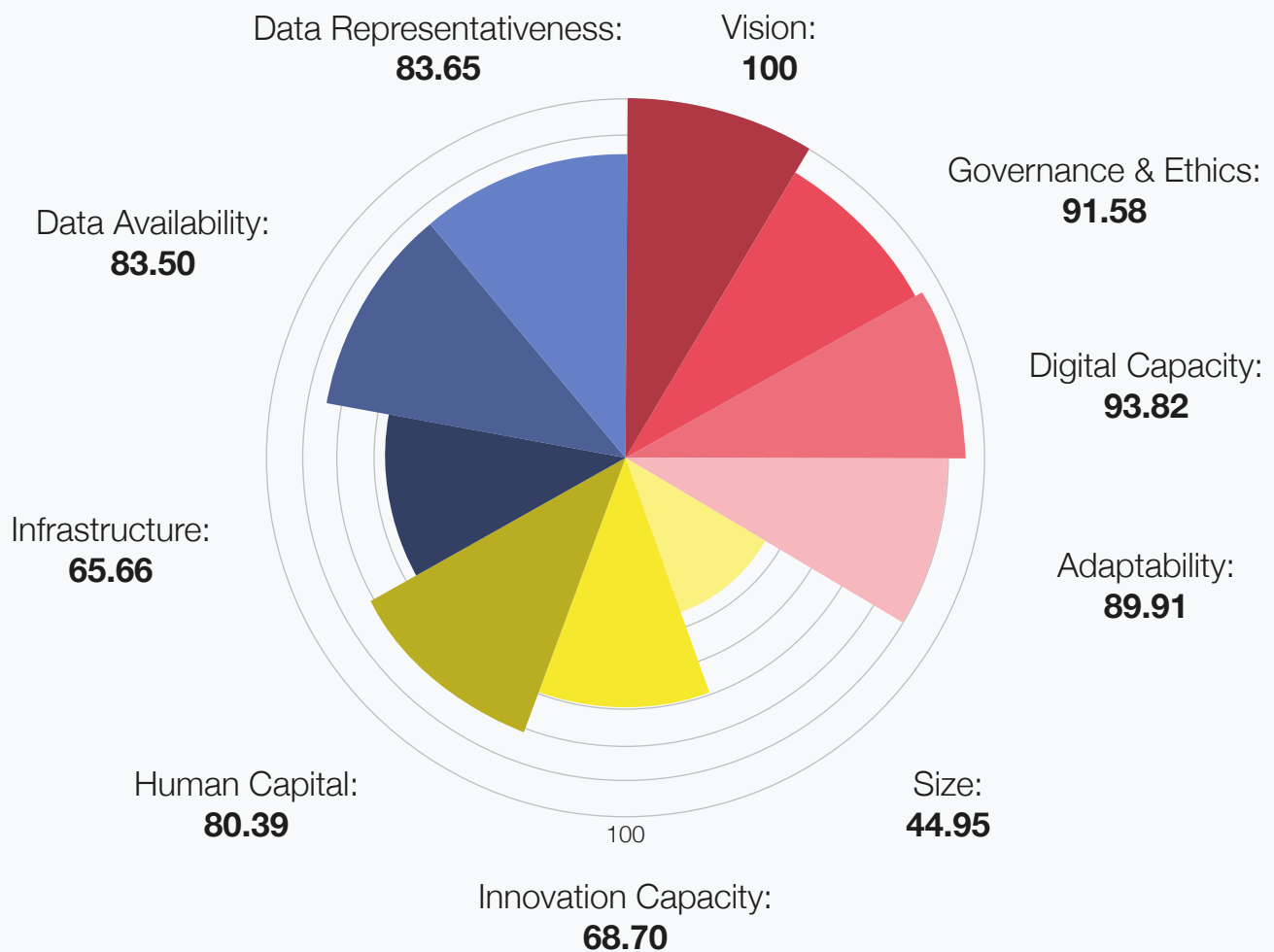
Government

| Score	Rank	Region Rank
93.83/100	**1**/172	**1**/15
		(East Asia)

WORLD AVERAGE: **41.34**
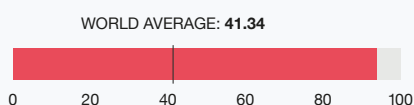
Singapore has the highest score in the world for the Government Pillar, including the highest scores for the Digital Capacity and Adaptability Dimensions. The country has long been a leader in the digital transformation of government: in 2016, it launched the Government Technology Agency (GovTech), which facilitates the adoption of new technology in government. GovTech has produced a Digital Government Blueprint and a Ministry Digitalisation Guide to support its government innovation agenda, and also conducts an annual survey of citizen attitudes to digital government services. This strong foundation in the use of technology in government is a key plank of Singapore's AI readiness.

Singapore published its National AI Strategy in 2019. The strategy sets out 5 initial National AI projects - key sectors where AI could be deployed to improve social and economic outcomes. These include chronic disease prediction and management, intelligent freight planning, and adaptive learning.

Technology Sector

Score	Rank	Region Rank
64.68/100	**7**/172	**1**/15
		(East Asia)

WORLD AVERAGE: **32.76**
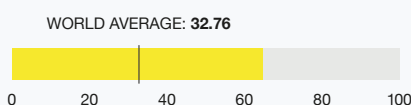
The Technology Sector is Singapore's lowest-scoring pillar, though it still has the highest score in East Asia. It's lowest scoring dimension in any pillar is in the Size dimension, reflecting the fact that the country does not have a technology sector on the scale of other global leaders in AI readiness like the USA. However, Singapore does already boast one Artificial Intelligence unicorn, Trax, founded in 2010, which specialises in computer vision.

The Government has also put in a number of policies and programmes to support innovation and skills development in the technology sector. The TechSkills Accelerator programme supports digital skills development for ICT and non-ICT professionals. SkillsFuture for Digital Workplace is another national initiative that offers adult training in the skills needed for working in an innovative and technology-driven economy.

Supporting collaborations between academia, government and industry is also a key theme in Singapore's policies supporting its AI sector. The AI Singapore programme, hosted by the National University of Singapore, aims to develop the national AI ecosystem and is supported by a government-wide partnership between the National Research Foundation, the Smart Nation and Digital Government Office, the Economic Development Board, the Infocomm Media Development Authority, SGInnovate, and the Integrated Health Information Systems.

In addition, the Punggol Digital District, which is due to open in 2023, will bring together a business park and the Singapore Institute of Technology to stimulate innovation.

Data and Infrastructure

Score	Rank	Region Rank
77.60/100	**31**/172	**3**/15
		(East Asia)

WORLD AVERAGE: **58.64**
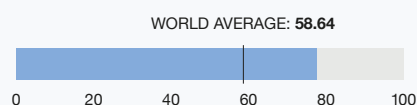
Singapore ranks lowest worldwide out of all three Pillars in the Data and Infrastructure Pillar. Of the other top 6 countries in the Government AI Readiness Index (USA, UK, Germany, Finland, Sweden), Singapore is the only one to not yet have 5G commercially available. However, in April 2020 the Infomedia Comm Development Authority awarded two commercial contracts for developing national 5G networks, and the country plans to have two nationwide networks by 2025.

In terms of data availability, Singapore identifies data architecture as an AI ecosystem enabler in the National AI Strategy. The Government publishes data through its open data portal, data.gov.sg. The Data and Innovation Programme Office also facilitates data sharing between government and industry by overseeing Data Collaboratives that allow certain stakeholders access to data in a regulated way.

Finally, there is a notable gap between Singapore's score for the indicator on the gender gap in Internet use (98.04 out of 100) and that on the socioeconomic gap in Internet use (69.26 out of 100). The country's 'digital divide' has come under the spotlight during the COVID-19 pandemic, where many lower-income households have struggled to access home learning resources or to stay connected to family and friends. If not addressed, this 'digital divide' will make it harder to capture representative data from which AI models can be trained.

Republic of Korea

Index Score	Rank	Regional Rank
77.69/100	**7**/172	**2**/15 (East Asia)

Responsible Use Score	Responsible Use Rank
56.48/100	**21**/34

GDP (US$ billion)	Population
1,102.88	51,607,000

Data Representativeness: **89.71**

Vision: **100**

Governance & Ethics: **85.62**

Data Availability: **92.93**

Digital Capacity: **76.53**

Infrastructure: **86.13**

Adaptability: **64.08**

Human Capital: **68.43**

Size: **44.32**

Innovation Capacity: **73.05**

100
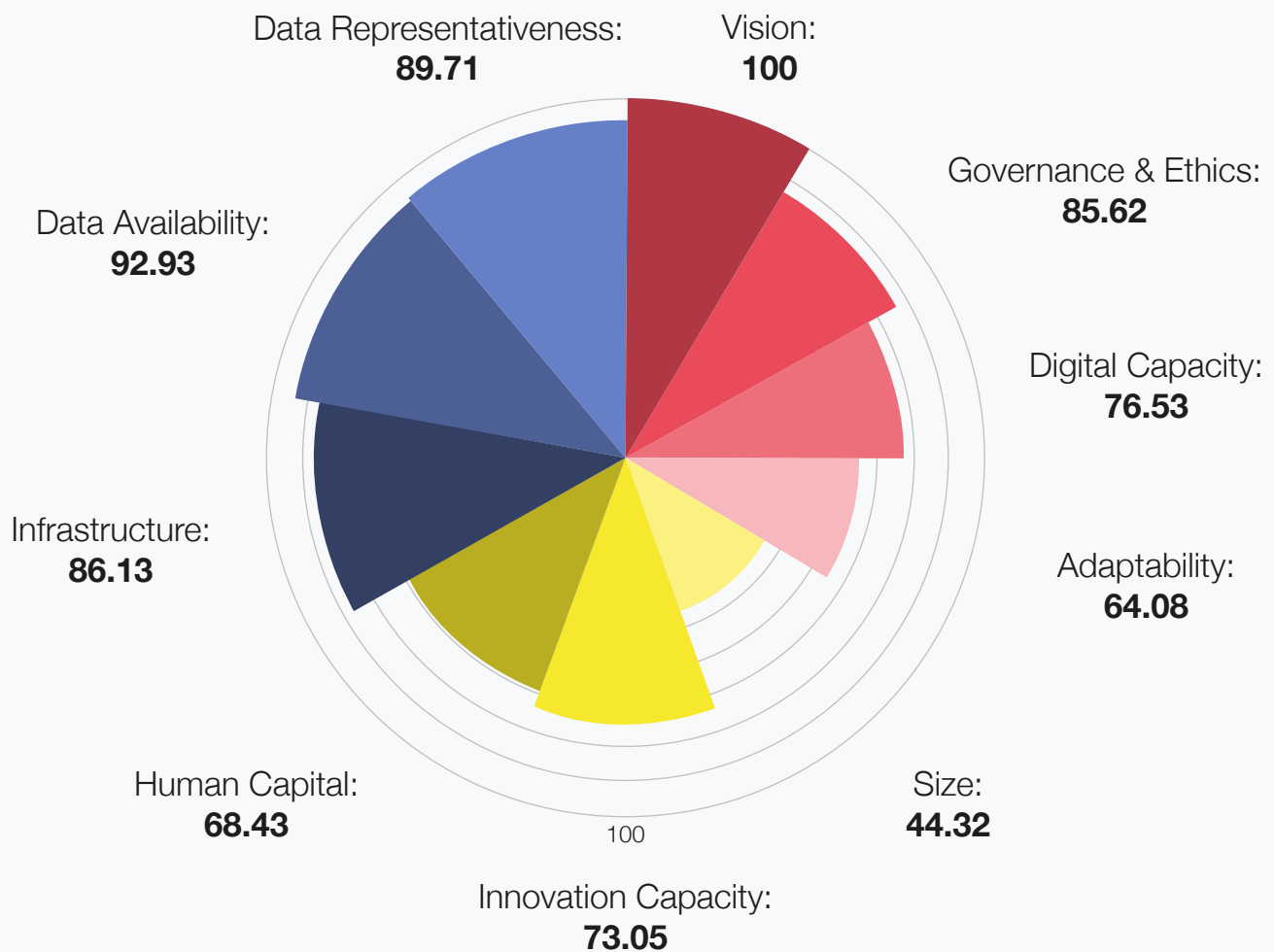
Government

Score	Rank	Region Rank
81.56/100	**9**/172	**2**/15 (East Asia)

WORLD AVERAGE: **41.34**
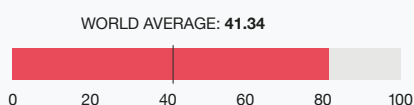
he Republic of Korea launched its National Strategy for AI in October 2019. The COVID-19 pandemic has arguably entrenched government interest in AI, with the announcement of a 'New Deal' to create jobs and support the economy that focuses on AI and 5G.

The Republic of Korea has a particular interest in the use of AI in healthcare because of their rapidly ageing population. One of the use cases mentioned in the strategy is 'Dasomi', a chatbot used for elderly care. In terms of other areas of public services, the People-Centered Response Plan for the Fourth Industrial Revolution to Promote Innovative Growth (I-Korea 4.0 Strategy) outlines a plan to support innovation in 12 different sectors, of which six are targeted towards the resolution of social problems (e.g. in welfare and in transportation).

The Presidential Committee on the 4th Industrial Revolution coordinates policies related to AI and new technologies across the Government. They organise the Regulatory and Institutional Reform Hackathons which bring together stakeholders from government, civil society, and the private sector for two-day workshops on new issues arising from emerging technologies. The Government has also released the Ethics Guidelines for an Intelligent Society, based on the Seoul PACT, as a further indication that the Republic of Korea takes regulatory, ethical and governance issues in AI seriously.

Technology Sector

Score	Rank	Region Rank
61.93/100	**9**/172	**2**/15 (East Asia)

WORLD AVERAGE: **32.76**
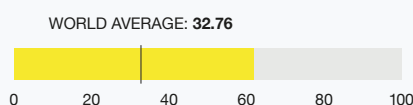
The Republic of Korea has a strong technology industry, coming in a close second behind Singapore for this pillar in East Asia. It has specific expertise in the semiconductor, automotive and electronics sectors, as well as in industrial robotics technology.

The Republic of Korea has seven technology unicorns, but in general SMEs can struggle to attract funding and talent due to the disparity between huge conglomerates (e.g. Samsung) and startups. However, conglomerates have invested in talent attraction and retention from abroad in a way that could boost the Republic of Korea's AI ecosystem in future.

The Republic of Korea has the world's highest level of R&D spending as a proportion of GDP. The Government published a dedicated AI R&D Strategy in 2018, where they committed to investing KRW 2.2T until 2022. Some of this funding will go to the creation of 6 additional AI graduate programmes and 5 AI R&D institutes.

Data and Infrastructure

Score	Rank	Region Rank
88.60/100	**8**/172	**1**/15 (East Asia)

WORLD AVERAGE: **58.64**
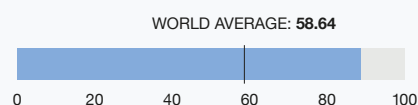
The Republic of Korea is the regional leader in the Data and Infrastructure pillar. The country has high mobile phone and Internet penetration, as well as a relatively small digital divide. It has the highest number of cities covered by 5G networks in the world, and the Government's COVID-19 stimulus package includes plans to create a nationwide 5G network.

The Republic of Korea ranks 4th in the 2017 Leaders' Edition of the Open Data Barometer. The Government has an open data portal, and the Open Data Strategy Council facilitates the provision of open data by government ministries.

China

Index Score

69.08/100

Rank

19/172

Regional Rank

4/15 (East Asia)

Responsible Use Score

34.47/100

Responsible Use Rank

34/34

GDP (US$ billion)

7,260.33

Population

1,392,730,000

Data Representativeness:
74.14

Vision:
100

Governance & Ethics:
85.58

Data Availability:
57.93

Digital Capacity:
77.67

Infrastructure:
69.75

Adaptability:
54.69

Human Capital:
61.88

Size:
59.99

Innovation Capacity:
59.57

100
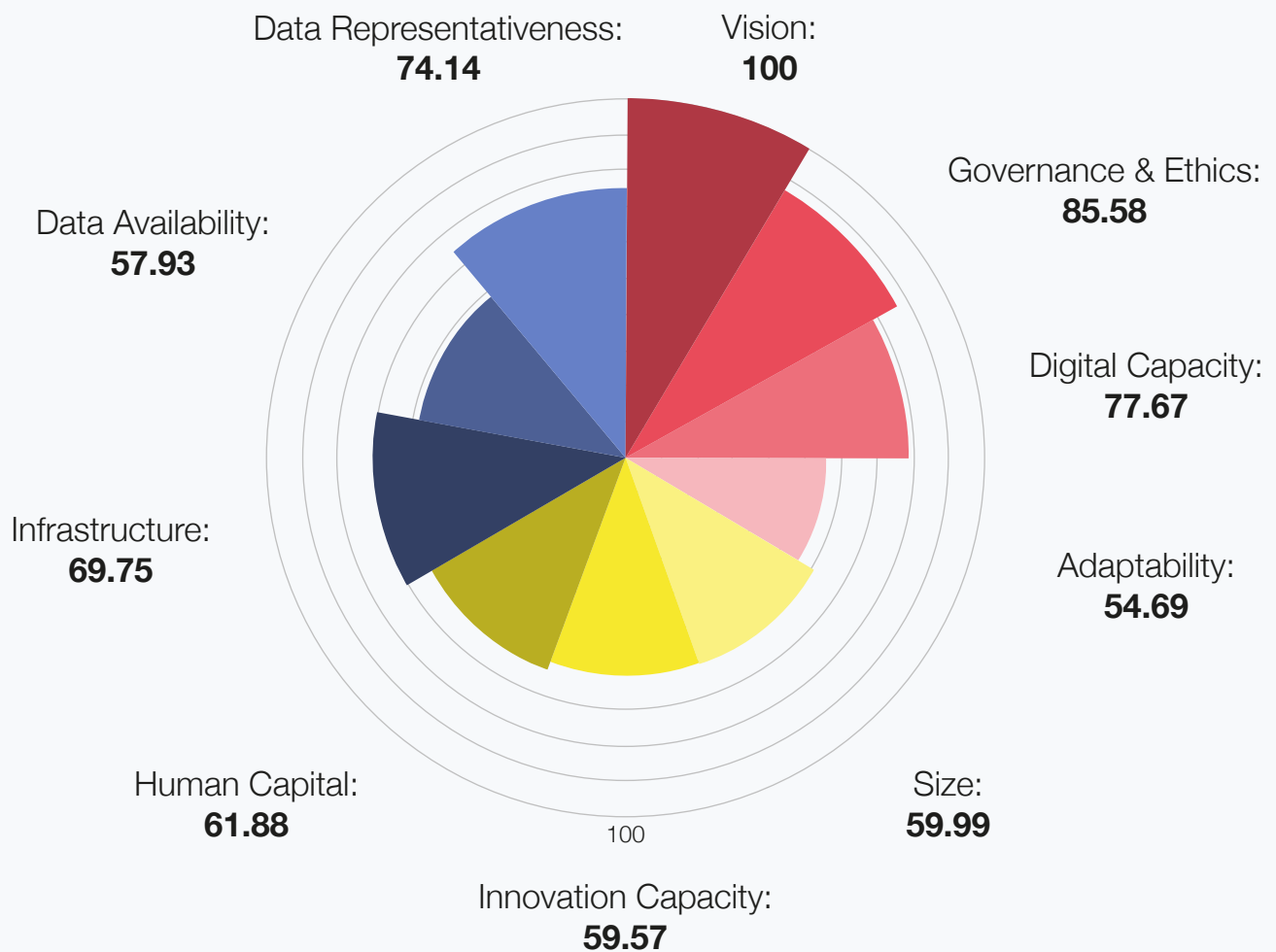
Government

Score	Rank	Region Rank
79.49/100	**14**/172	**4**/15
		(East Asia)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
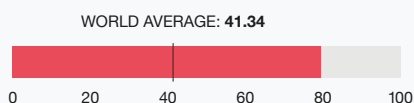
China is widely recognised as one of the world's great AI powers, but quantifying their AI remains a challenge in this year's Index. In the government pillar, they fall behind the US and other world leaders in AI on the adaptability dimension, suggesting that the central government does not have the effective policy levers to support AI that others might. China does have an AI strategy - the Next Generation AI Development Plan was published in 2017, and outlines China's ambition to be the world's primary AI innovation centre by 2030. However, the document should arguably be read as a 'wish-list' designed to stimulate local mayors to look for ways to achieve some of the goals.

Local governments such as Shanghai or Nanjing are responding with their own development plans and strategies. This suggests that China may be able to work around some of the limitations in central government, and also that there may be regional clusters that excel in AI that may not emerge in data that looks at China as a whole.

China's New Generation of Artificial Intelligence Development Plan Implementation Office to coordinate inter-ministry implementation. The Government has also set up a New Generation AI Strategic Advisory Committee to drive forward the adoption of AI.

China scores reasonably well in the Governance and Ethics dimension, and has published its own set of Governance Principles to regulate the use of AI. However, China's vision of AI as a way to promote 'social harmony' has often led to intensive social intensive social surveillance. A 2018 survey in the country showed that over 75% of respondents felt AI was a threat to privacy.

Technology Sector

Score	Rank	Region Rank
60.48/100	**11**/172	**3**/15
		(East Asia)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
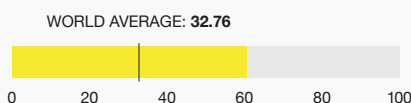
Although the Chinese state has a history of centrally-planned engineering achievements, including the country's high-speed rail network, in AI the Government's vision seems to be for the private sector to play more of a central role. Tech giants Baidu, Alibaba and Tencent have been named 'national champions in AI' to help stimulate innovation. In 2017, Chinese tech company ByteDance launched TikTok / Douyin which has become the most downloaded app in 2019 with almost 800 million active users. TikTok has sparked international controversy surrounding users' privacy and even national security concerns. Some countries including India have banned TikTok and similar discussions were conducted within the US. It remains to be seen how this will play out, but clear is that China has been able to offer an alternative and popular platform to the American social media companies.

In terms of size, China ranks third in the world after the US and Ireland (which scores higher on the per capita measures as a smaller country with a large technology sector). It has the second highest number of technology unicorns after the US, and SenseTime, a Beijing-based facial recognition company, is the world's most valuable startup at US$4.5 billion. There are even some signs that China might be challenging the USA for tech supremacy: Chinese AI startups won more funding than US startups in 2017.

In some of the other dimensions of this pillar, such as human capital, China lags behind some of the other world leaders in AI readiness. The Government has recognised that access to AI talent is an area of concern, and the AI Innovation Action Plan aims to support Chinese universities in becoming world-leading centres of research and training for AI.

Data and Infrastructure

Score	Rank	Region Rank
67.27/100	**52**/172	**6**/15
		(East Asia)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
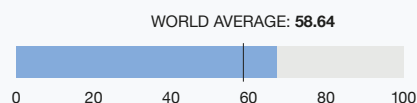
China's score in this pillar is perhaps deceptively low, given the methodology measures the capture and use of data with assumptions that most data will be gathered from citizen's interactions with the state online or through mobile phones, and that this data needs to be made open by the Government to allow private sector use. China is known for its mass surveillance, meaning it is probably able to capture and use much more data than this methodology will capture.

However, China has seen some moves to open up government data, especially at the local level. Moves to open up data at the open government level. Between 2017 and 2018 the number of local governments with open data portals rose from 18 to 82.
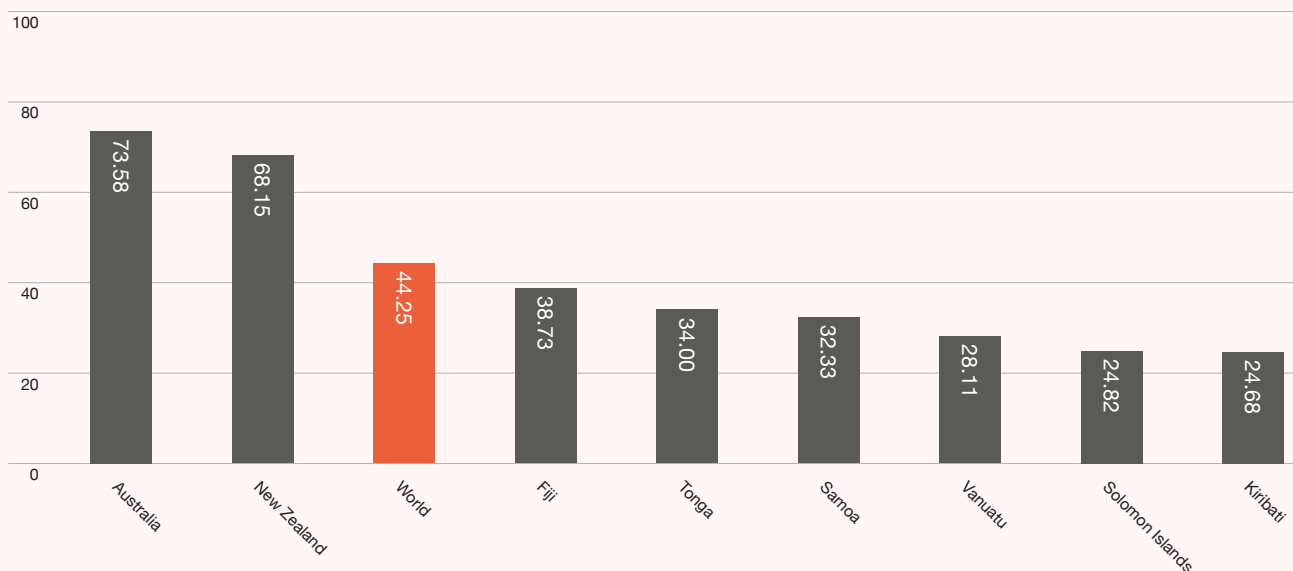
China suffers from a stark digital divide that has been laid bare by coronavirus. Many rural areas left without adequate internet connections. As mentioned above, aggregate scores for China in areas such as telecommunications infrastructure will therefore underscore the more developed areas of the country where the infrastructure is far more advanced.

PACIFIC

Pacific

A bar chart titled with the following values:

Country	Score
Australia	73.58
New Zealand	68.15
World	44.25
Fiji	38.73
Tonga	34.00
Samoa	32.33
Vanuatu	28.11
Solomon Islands	24.82
Kiribati	24.68

Regional Analysis

by Emma Martinho-Truswell

Australia (ranking 12th) and New Zealand (ranking 23th) both benefit in their rankings from having wealthy and highly-educated populations, centres of academic excellence in AI technologies and ethics, and relatively tech-savvy governments. Australia and New Zealand are founding members of the new Global Partnership on AI launched in June 2020, a small group of countries including Singapore, Korea, the US and the UK. The Global Partnership is seeking to encourage ethical and responsible use of AI, and both countries are lending academic expertise to the group.

Australia
In Australia, AI policy is part of the national innovation strategy. In the last 12 months, both a national AI Ethics Framework and a national AI Roadmap have been developed to help guide development, use, and government investment in AI. While both of these documents were commissioned by the Government, they were produced by Data61, the expert data team in Australia's national science agency, rather than by bureaucrats. The results are detailed and pragmatic. The Ethics Framework includes the principles of promoting wellbeing and providing contestability for decisions impacted by AI outputs, with further guidance forthcoming on how the framework can be deployed. The Roadmap recommends that Australia specialises in areas in which it already has academic and industry expertise, especially the health sector, city technologies, and natural resource management. Already,

Australia has developed areas of AI particular to its industry structure, such as advances in self-driving vehicles used in Australian mining sites.

The last year has also seen some of Australia's state governments take steps to declare policy approaches to AI, especially New South Wales. As part of an ambitious programme of service delivery and digitisation reform, the Minister for Customer Service convened an AI Summit in December 2019, and NSW has announced it will be producing its own state-level AI strategy (originally planned for early 2020, and now delayed). Queensland is building a new AI Hub in Brisbane, and Victoria has an All-Party Parliamentary Group on AI.

New Zealand
There have been fewer policy developments in New Zealand explicitly on AI policy over the last twelve months, and New Zealand does not yet have a national AI strategy. However, AI is being widely used by New Zealand-based companies and in its universities, according to a 2018 report produced by the AI Forum New Zealand, the New Zealand Ministry of Business, Innovation and Employment, and other partners. Companies including AIr New Zealand, Soul Machines and Xero are listed as examples of companies developing and using AI as a significant part of their operations.

In 2020, the New Zealand Government Chief Data Steward is leading work to improve transparency and ensure ethical use of algorithms by government agencies. This work involves a Government Algorithm Charter, currently in draft, which sets out a list of principles the New Zealand

Government will follow in their use of algorithms to influence decision making. The draft Charter, for example, includes the commitment that the Government will "[c]learly explain how significant decisions are informed by algorithms and be clear where this isn't done for reasons of greater public good (for example, national security)". Suggesting an intention to show leadership in the ethical and transparent use of AI by governments, the draft Charter undertakes to "clearly explain who is responsible for automated decisions and what methods exist for challenge or appeal via a human",

Pacific Island States

Of a group of smaller Pacific states, Tonga was ranked the highest at 114th, followed closely by Samoa at 122nd, and with Vanuatu, Fiji, the Solomon Islands and Kiribati all ranking among the lowest 25 of ranked countries for Government AI Readiness. None of these countries have an AI strategy. It is likely that for these nations, like many smaller developing countries, use of AI by government will likely come from solutions purchased from elsewhere, rather than produced domestically. Nonetheless, savvy digital procurement will help poorer states to get good value, such as by purchasing from smaller companies that may be more willing to tailor their offerings to the needs of small Pacific nations.

The Impact of COVID-19

A novel dimension in considering the AI readiness of governments in the Pacific region in 2020 has been the impact of COVID-19 in this region. At the time of writing, states in this region had among the lowest case numbers of COVID-19 in the world, and are likely to see relatively less economic devastation from the pandemic. While the connection between the experience of the pandemic and government AI readiness is a difficult one to predict, it may be that these countries' relatively better health outcomes could also provide the fiscal space for greater investment in technology. Pacific countries may also see their workforces returning to offices - and to in-person collaboration, research and development - faster than in other countries, perhaps leading to corresponding relative increases in innovation.

These are countries, however, that already experience challenges due to their geographic distance (and relatively inconvenient timezones). The COVID-19 pandemic has exacerbated some of the challenges of physical remoteness, especially because many of these nations have, at the time of writing, closed their borders. The impact of this isolation may particularly affect the AI sectors of Australia and New Zealand, which otherwise benefit from immigration programs that prioritise those with skills such as machine learning.

Australia

Index Score	Rank	Regional Rank
73.58/100	**12**/172	**1**/8 (Pacific)

Responsible Use Score	Responsible Use Rank
58.77/100	**18**/34

GDP (US$ billion)	Population
1,084.25	24,983,000

Data Representativeness: **93.97**

Vision: **100**

Governance & Ethics: **86.44**

Data Availability: **90.15**

Digital Capacity: **64.56**

Infrastructure: **83.95**

Adaptability: **67.46**

Human Capital: **65.69**

Size: **27.62**

Innovation Capacity: **61.99**

100
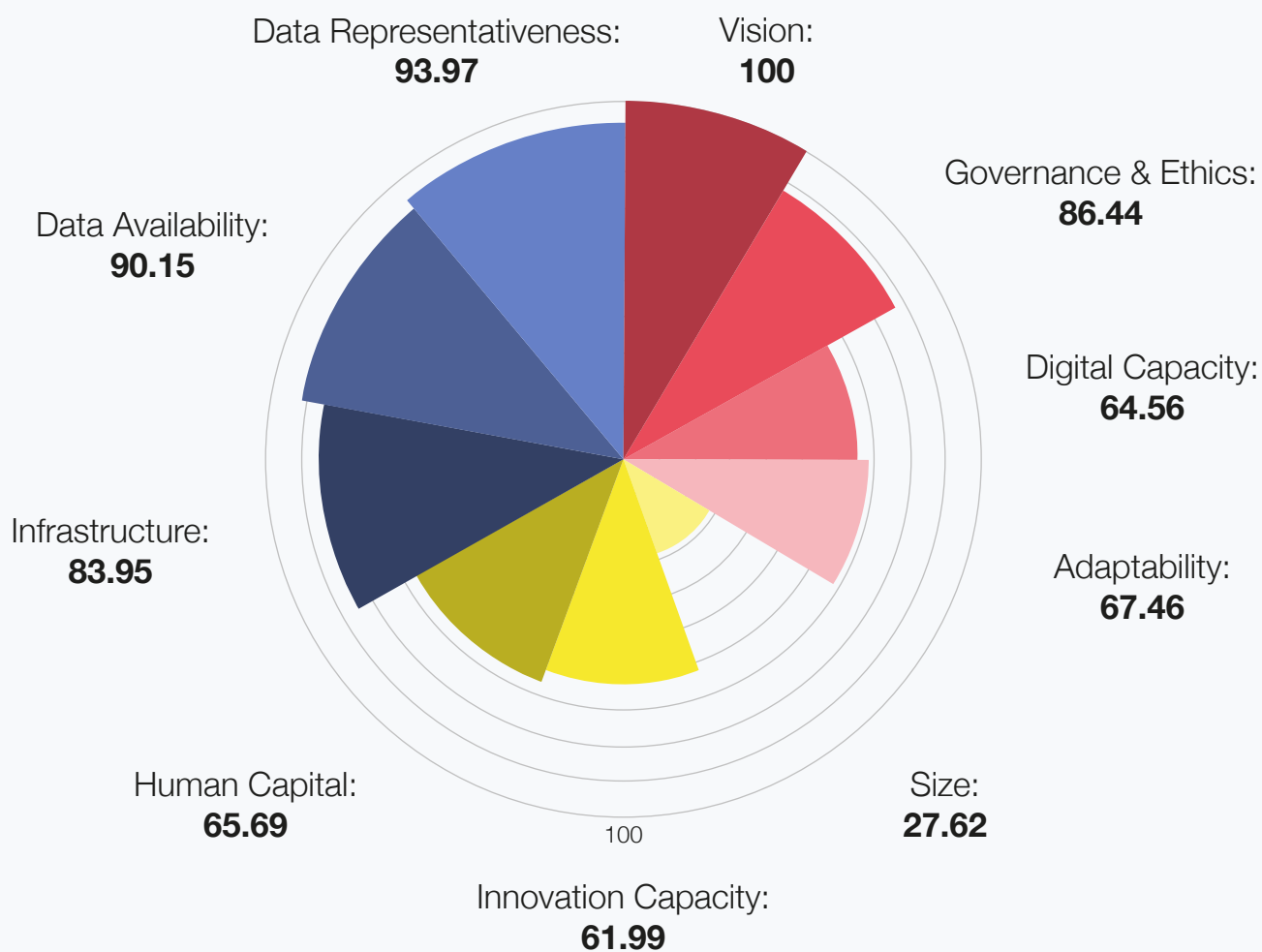
Government

Score	Rank	Region Rank
79.61/100	**13**/172	**1**/8 (Pacific)

WORLD AVERAGE: **41.34**

0   20   40   60   80   100
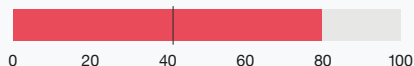
The Australian Government has recognised the economic potential of AI in the country. In November 2019, they published their Artificial Intelligence Roadmap, which sets out how Australian can boost its national AI capability. The roadmap identifies three areas in which Australia could specialise: Natural Resources and Environment; Health, Ageing and Disability; and Cities, Towns and Infrastructure. This specialisation would allow the country to solve significant domestic social problems domestically, as well as become a global leader in those areas of AI.

The Government has also put thought into the responsible and ethical deployment of AI. In March 2020, Standards Australia published a report summarising how the development of new standards can shape 'responsible AI' deployment. The Government has also developed a set of voluntary AI Ethics Principles for those developing and using AI.

Australia scores notably highly in terms of its online services, and has been in the top 5 countries in the UN e-Government Survey for the last four editions. This suggests that Australia has a strong digital government ethos on which to build in the deployment of AI. The Digital Transformation Agency is responsible for coordinating digital innovation in public services, and one of its objectives is to harness the potential of emerging technologies such as AI. It is also

Technology Sector

Score	Rank	Region Rank
51.77/100	**22**/172	**1**/8 (Pacific)

WORLD AVERAGE: **32.76**

0   20   40   60   80   100
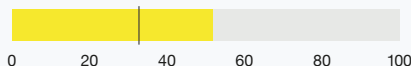
Australia scores lower in the technology sector pillar than other major Western economies such as the US (77.55), Canada (58.65) and the UK (65.64). This reflects a slightly less well-developed private sector, although Australia does have two technology unicorns, graphic design platform Canva and FinTech company Airwallex).

One of the country's priorities is trying to draw on expertise in academia and the public sector and commercialise that research. The Commonwealth Science and Industrial Research Organisation provides funding for such commercialisation efforts, and also runs an accelerator for publicly-funded researches to develop their projects further.

Like many countries across the world, Australia suffers from a lack of skilled STEM graduates. One of the ways the Government is trying to plug this skills gap is through scholarship funding for data-science PhDs.

Data and Infrastructure

Score	Rank	Region Rank
89.35/100	**9**/172	**2**/8 (Pacific)

WORLD AVERAGE: **58.64**

0   20   40   60   80   100
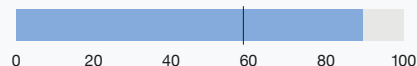
Australia scores uniformly highly across this pillar, suggesting that its well-developed technological infrastructure and access to data could be one of its main assets in terms of AI readiness. The Government has made clear that it sees the value of data, with the Office of the National Data Commissioner streamlining how public sector data is used and shared. Australia came 6th in the 2016 edition of the Open Data Barometer, and 3rd in the 2017 Leaders' Edition. The Government's policy is to make all non-sensitive data open by default, available through Australia's open data portal.

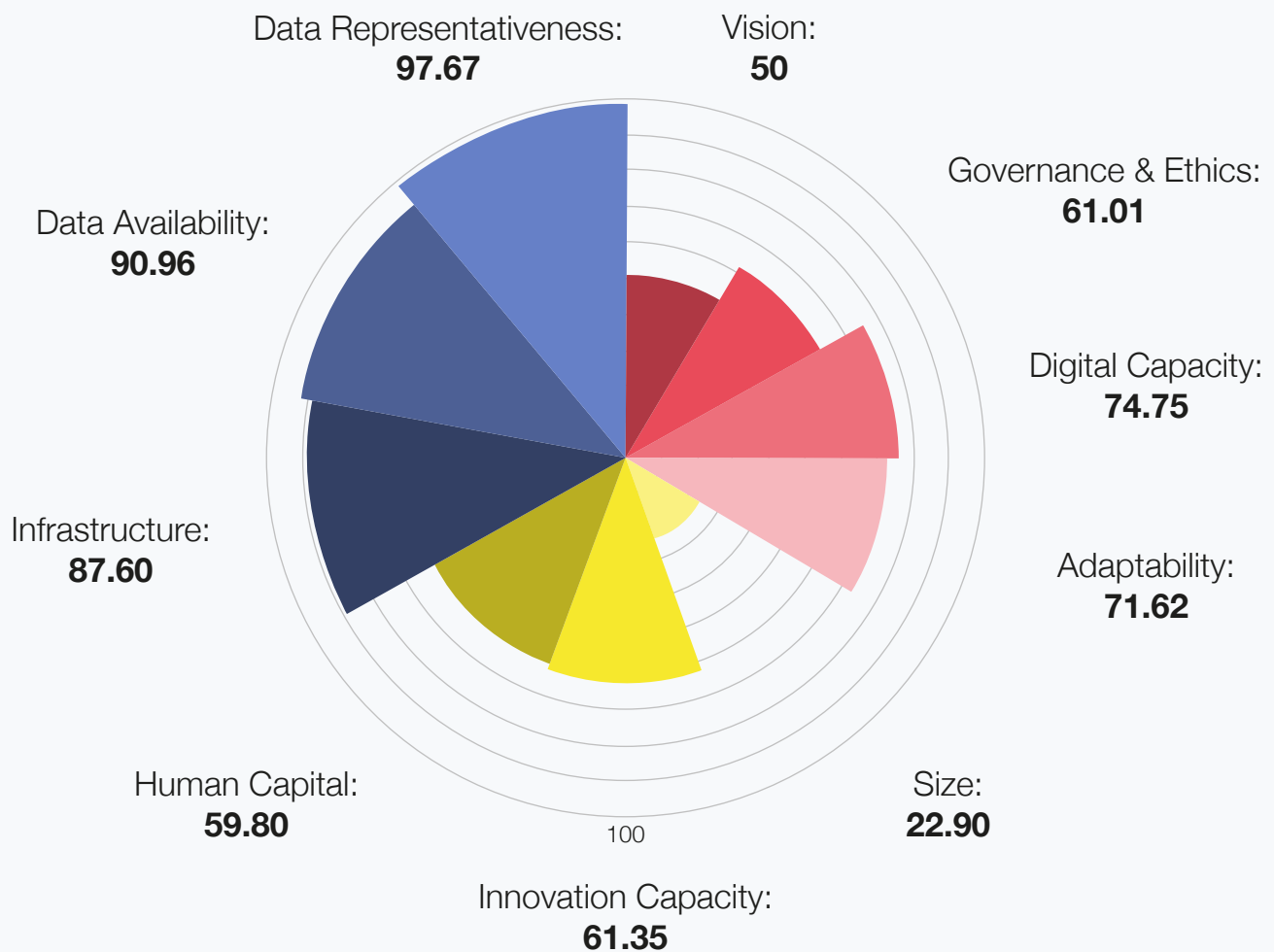Australia sits just outside the top 20 countries in terms of telecommunications infrastructure according to the 2020 version of the UN eGovernment Survey. The arrival of 5G in the country in 2019 shows a commitment to developing its advanced technology infrastructure. However, Australia's National Broadband Network has suffered from rising costs and lowering of expectations in terms of the speeds it may be able to deliver.

New Zealand

Index Score	Rank	Regional Rank
68.15/100	**23**/172	**2**/8 (Pacific)

Responsible Use Score	Responsible Use Rank
68.26/100	**7**/34

GDP (US$ billion)	Population
158.402	4,841,000

Data Representativeness: **97.67**

Vision: **50**

Governance & Ethics: **61.01**

Data Availability: **90.96**

Digital Capacity: **74.75**

Infrastructure: **87.60**

Adaptability: **71.62**

Human Capital: **59.80**

Size: **22.90**

Innovation Capacity: **61.35**

100

Government

| Score	Rank	Region Rank
64.34/100	**29**/172	**2**/8
		(Pacific)

WORLD AVERAGE: **41.34**
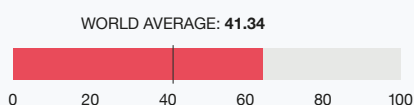
Although the Government of New Zealand does not yet have an AI strategy, it does have a Digital Government Strategy that sets out how new technologies and new ways of working collaboratively between ministries can improve public services. This strategy also sets out New Zealand's strong commitment to good governance of emerging technologies: for example, the strategy suggests that the Government move from seeing ICT procurement solely in terms of value for money and instead consider issues of privacy, security and digital rights.

The Data Ethics Advisory Group helps the Government of New Zealand address risks and ethical concerns in new, data-intensive technologies. New Zealand is also developing an Algorithm Charter that would commit government agencies to using algorithms in a fair, ethical and transparent way. The Government carried out an Algorithm Assessment in 2018 reviewing case studies of algorithm use in government, and also considering existing safeguards and how they could be improved. New Zealand is closely involved in the WEF Centre for the Fourth Industrial Revolution with work on 'reimagining regulation in the age of AI'.
To encourage innovation in public services, New Zealand ran an All of Government Innovation Showcase in 2019, highlighting the best local and national initiatives that used innovation and collaboration to improve public services. The GovTech Accelerator offers support for public innovation projects.

Technology Sector

| Score	Rank	Region Rank
48.02/100	**28**/172	**2**/8
		(Pacific)

WORLD AVERAGE: **32.76**
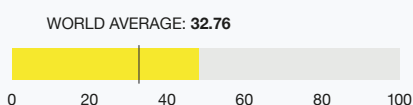
New Zealand's lowest score in any dimension is for the size of its technology sector (22.90 out of 100). However, in spite of a technology sector that is currently small, the Government has put policies in place to try and boost innovation. The New Zealand Technology Incubator Programme, coordinated by the Government's innovation agency Callaghan Innovation, helps startups commercialise complex technologies. The government-supported Innovation Fund also helps support innovation, and is specifically targeted at companies and government agencies designing solutions to public problems.

The New Zealand AI Forum is another initiative to try and boost the country's AI ecosystem, by bringing together stakeholders from government, academia and industry. Some of New Zealand's universities conduct AI and machine learning research: the Auckland University of Technology has a Centre for Artificial Intelligence Research; and the University of Auckland, ranked 100th in the world for Engineering and Technology in the QS rankings, currently has a network of 24 AI and ML researchers.

Data and Infrastructure

Score	Rank	Region Rank
92.08/100	**3**/172	**1**/8
		(Pacific)

WORLD AVERAGE: **58.64**
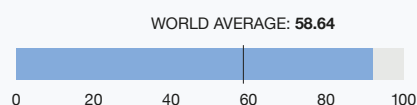
In spite of ranking 24th in the Index overall, New Zealand places 3rd worldwide in the Data and Infrastructure pillar, suggesting that the dimensions and indicators measured here comprise some of the country's greatest strengths in terms of AI Readiness. New Zealand scores particularly well on the indicators for Data Representativeness, and the Government has a number of policies around digital inclusion. The Digital Inclusion Blueprint sets out plans for digital inclusion, with particular focus on Māori inclusion. The Government also performed a Digital inclusion stocktake of May 2019 built an evidence base of digital inclusion initiatives.

New Zealand came joint 7th on the 2017 Leaders' Edition of the Open Data Barometer, and published Data Strategy that prioritises government openness and the publication of open data.

Annex 1: Full Rankings

Rank	Country	Score
1	United States of America	85.479
2	United Kingdom	81.124
3	Finland	79.238
4	Germany	78.974
5	Sweden	78.772
6	Singapore	78.704
7	Republic of Korea	77.695
8	Denmark	75.618
9	Netherlands	75.297
10	Norway	74.430
11	France	73.767
12	Australia	73.577
13	Japan	73.303
14	Canada	73.158
15	Luxembourg	72.616
16	United Arab Emirates	72.395
17	Estonia	69.922
18	Switzerland	69.219
19	China	69.080
20	Israel	68.825
21	Ireland	68.244
22	Austria	68.230
23	New Zealand	68.146
24	Spain	68.041

Rank	Country	Score
25	Italy	65.391
26	Lithuania	65.024
27	Portugal	63.920
28	Malaysia	63.663
29	Belgium	63.137
30	Malta	62.434
31	Poland	62.416
32	Czech Republic	61.522
33	Russian Federation	60.847
34	Slovakia	58.160
35	Iceland	57.631
36	Latvia	57.584
37	Qatar	56.780
38	Saudi Arabia	56.226
39	Slovenia	55.986
40	India	55.983
41	Hungary	55.818
42	Uruguay	55.565
43	Bahrain	54.749
44	Cyprus	54.082
45	Mauritius	53.864
46	Serbia	53.431
47	Chile	53.089
48	Oman	52.099
49	Brunei Darussalam	51.470
50	Bulgaria	51.424
51	Colombia	51.262

Rank	Country	Score
52	Romania	50.782
53	Argentina	50.754
54	Kuwait	50.607
55	Mexico	49.358
56	Egypt	49.191
57	Ukraine	48.901
58	Croatia	48.615
59	South Africa	48.250
60	Thailand	48.156
61	Greece	47.933
62	Indonesia	47.528
63	Brazil	47.464
64	Kazakhstan	46.554
65	Azerbaijan	46.437
66	Belarus	46.103
67	Turkey	46.010
68	Seychelles	45.117
69	Tunisia	44.386
70	Montenegro	43.664
71	Kenya	43.656
72	Georgia	43.387
73	North Macedonia	42.995
74	Philippines	42.944
75	Iran	42.894
76	Viet Nam	42.824
77	Armenia	42.717
78	Costa Rica	42.552

Rank	Country	Score
79	Jordan	41.759
80	Republic of Moldova	41.739
81	Trinidad and Tobago	41.243
82	Barbados	40.802
83	Saint Kitts and Nevis	40.388
84	Maldives	40.324
85	Albania	39.991
86	Panama	39.591
87	Rwanda	39.567
88	Antigua and Barbuda	39.119
89	Fiji	38.728
90	Sri Lanka	38.655
91	Ghana	38.499
92	Jamaica	38.357
93	Mongolia	37.793
94	Dominican Republic	37.469
95	Uzbekistan	37.171
96	Namibia	37.096
97	Senegal	36.936
98	Peru	36.574
99	Morocco	36.423
100	Bosnia and Herzegovina	36.250
101	Lebanon	35.906
102	Kyrgyzstan	35.810
103	Saint Vincent and the Grenadines	35.717
104	Dominica	35.714
105	Cabo Verde	35.695

Rank	Country	Score
106	Lesotho	35.554
107	Suriname	35.456
108	Bhutan	35.377
109	Paraguay	35.145
110	Gabon	35.064
111	Saint Lucia	35.039
112	Tajikistan	35.007
113	Gambia	34.511
114	Côte D'Ivoire	34.156
115	Tonga	33.997
116	Iraq	33.876
117	Pakistan	33.486
118	Algeria	33.466
119	Grenada	33.450
120	Timor-Leste	33.351
121	Botswana	33.273
122	Bolivia	33.030
123	Bangladesh	33.003
124	United Republic of Tanzania	32.778
125	Ecuador	32.411
126	Samoa	32.327
127	Lao People's Democratic Republic	32.197
128	Cambodia	32.144
129	Zambia	32.053
130	Benin	31.668
131	Myanmar	31.237
132	Guatemala	31.179

Rank	Country	Score
133	Belize	31.015
134	Djibouti	31.007
135	Honduras	30.966
136	Burkina Faso	30.956
137	Uganda	30.902
138	Nigeria	30.864
139	Cuba	30.654
140	Congo	30.651
141	Guyana	30.550
142	Togo	30.318
143	Nicaragua	30.238
144	Mali	30.023
145	Cameroon	29.849
146	Nepal	29.717
147	Niger	29.660
148	El Salvador	29.433
149	Mauritania	29.416
150	Guinea	29.003
151	Vanuatu	28.111
152	Eswatini	27.699
153	Comoros	27.592
154	Zimbabwe	27.321
155	Madagascar	26.760
156	Malawi	26.716
157	Sierra Leone	26.452
158	Sudan	26.354
159	Venezuela	26.270

Rank	Country	Score
160	Ethiopia	26.169
161	Mozambique	25.280
162	Guinea Bissau	25.123
163	Solomon Islands	24.821
164	Afghanistan	24.775
165	Chad	24.687
166	Kiribati	24.677
167	Burundi	24.648
168	Democratic Republic of the Congo	23.797
169	Angola	23.789
170	Haiti	21.107
171	Syrian Arab Republic	19.330
172	Yemen	19.072

Annex 2: Methodology

Dimensions and Indicators

The table below summarises the dimensions and indicators used in the Index.

Government Pillar

Dimension	Description	Indicator	Source
Vision	Does the government have a vision for supporting the development and implementation of AI?	**National AI strategy (Y/N)**	Desk research (e.g. OECD AI Policy Observatory, Future of Life Institute)
Governance and Ethics	Are there the right regulations and ethical frameworks in place to implement AI in a way that builds trust and legitimacy?	**Data protection and privacy legislation**	UN data protection and privacy legislation worldwide.
		Cybersecurity	Global Cybersecurity Index
		National ethics framework (Y/N)	AI Ethics Lab Toolbox[2]
		Legal framework's adaptability to digital business models	Global Competitiveness Index
Digital Capacity	What is the existing digital capacity within government?	**Government procurement of advanced technology**	Networked Readiness Index
		ICT use and government efficiency	Networked Readiness Index
		Online services	UN e-Government Survey
Adaptability	Can the government change, adapt and innovate effectively?	**Effectiveness of government**	World Bank
		Government's responsiveness to change	Global Competitiveness Index

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2 Frameworks were counted where they were issued by a government or government agency (as opposed to an intergovernmental organisation, NGO or private company).

Technology Sector Pillar

Dimension	Description	Indicator	Source
Size	How large is the technology sector that will supply governments with AI technologies?	**Number of technology unicorns**	CB Insights
		Market value of public technology companies	Forbes Global 2000
		Value of trade in ICT services (per capita)	UNCTAD
		Value of trade in ICT goods (per capita)	UNCTAD
		Computer software spending	Global Innovation Index
Innovation Capacity	Does the technology sector have the right conditions to support innovation?	**Entrepreneurial culture**	Global Competitiveness Index
		Ease of doing business	World Bank
		R&D spending	UNESCO
		Company investment in emerging technologies	Networked Readiness Index
Human Capital	Are there the right skills in the population to support the technology sector?	**Graduates in STEM**	UNESCO
		Quality of engineering and technology higher education	QS Engineering & Technology rankings
		Digital skills	Global Competitiveness Index
		Knowledge-intensive employment	ILO

Data and Infrastructure Pillar

Dimension	Description	Indicator	Source
Infrastructure	Does the country have a good technological infrastructure to support AI technologies?	**Telecommunications infrastructure**	UN e-Government Survey
		5G infrastructure	VIAVI Solutions
		Internet bandwidth	ICT Development Index
		Availability of latest technologies	Networked Readiness Index
Data Availability	Is there good availability of data that could be used to train AI models?	**Open government data**	Open Data Barometer
		Statistical capacity	World Bank
		Mobile-cellular telephone subscriptions	ICT Development Index
		Internet users (% of adult population)	ICT Development Index
Data Representativeness	Is the data available likely to be representative of the population as a whole	**Gender gap in Internet usage**	Global Findex Database
		Socioeconomic gap in Internet usage	Global Findex Database

Calculating Scores

Normalisation

All scores were normalised to be between 0 and 100. The formula for normalisation was as follows:

$$\frac{x - x_{min}}{x_{max} - x_{min}}$$

For all indicators except *Effectiveness of government* (where x_{min} = -2.5), the value of x_{min} was set to 0. x_{max} was either the maximum possible value (in the case of data from other indices e.g. the Global Competitiveness Index), or the maximum observed value. The one exception was for the *Mobile-cellular telephone subscriptions* where, following the WEF's practice in the Global Competitiveness Index, we set the maximum value to 120 (i.e. above 120 subscriptions per 100 mobile-cellular telephones are sufficiently widespread to warrant a score of 100, and values any higher would not represent a significant improvement).

Treatment of Skewed Indicators

6 indicators were identified as skewed (either (a) absolute skewness > 2.0 and kurtosis > 3.5 or (b) kurtosis > 10). These were:

- National ethics framework
- Number of technology unicorns
- Market value of public technology companies
- Value of trade in ICT services
- Value of trade in ICT goods
- Internet bandwidth

As *National ethics framework* is a discrete indicator that takes only values 0 or 1, it was left untreated.

The two indicators *Number of technology unicorns* and *Market value of public technology companies* both have large numbers of countries scoring 0 for having no technology unicorns or no public technology companies featured in the Forbes Global 2000. We were therefore willing to tolerate a higher degree of skewness in these indicators. However, looking purely at the countries with a value of > 0 in these indicators, kurtosis was still > 10, so we still felt the need to treat them in some way.

The five skewed indicators treated were using the logarithmic transformation $log\,(1+x)$. For all but two indicators (*Number of technology unicorns* and *Market value of public technology companies*) this brought skewness and kurtosis down to acceptable levels. For the other two indicators, skewness and kurtosis in the subset of countries with values > 0 was brought down to acceptable levels, even if skewness and kurtosis were still higher in the indicator overall.

Following the logarithmic transformation, the indicators were normalised as above.

Total Score

To calculate the total score, we took the arithmetic mean of each dimension. Then we took the arithmetic mean of each pillar. The final score is the arithmetic mean of the three pillars. All indicators, dimensions and pillars were weighted equally.

Missing Values

Only countries with values for **more than 50% of indicators** are included in the final index. Countries not included in the final ranking can be found in Annex 4.

Peer Group Mean Imputation

For the majority of indicators with some data missing, we imputed the value of the peer group mean for each country (where peer group is their geographical region plus their World Bank income group).

For 8 countries, some or all imputation of peer group means was not possible as they were either the sole country in their peer group, or no countries in their peer group had values for that particular indicator. Therefore, no imputation was attempted. These countries were:

- Fiji
- Haiti
- Kiribati
- Samoa
- Seychelles
- Solomon Islands
- Tonga
- Vanuatu

Linear Regression Estimation

The indicator *Statistical capacity* uses data from the World Bank that only covers developing nations. To impute values for this indicator, we used a multiple regression model. The dependent variables were GDP (log), and the values for the indicators *Online Services* and *Effectiveness of government*. The R^2 for this model was 0.5557. The p-values are given below.

Variable	p-value
GDP (log)	0.0022
Online services	1.2531×10^{-5}
Effectiveness of government	0.0048

Limitations in the Data

While the majority of our datasets were from 2019 or 2018, some were older. The ICT Development Index is from 2017, and the last global edition of the Open Data Barometer was in 2016. The ICT Development Index supplies the indicators for Internet and mobile phone penetration, which are valuable proxies for the amount of data that can be captured from citizen's activities online and through their mobile phone use (e.g. sentiment analysis of social media, geolocation data for COVID-19 contact tracing). The Open Data Barometer measures the availability of open government data. Such datasets are a valuable source of training data for GovTech startups and other companies hoping to train AI models for government applications.

As such, we felt that both Indices were important for measuring AI readiness, and without them we would not be able to approximate data availability adequately. While we recognise this means that countries' scores may not reflect the most up-to-date picture, we still chose to include these datasets given their importance, and the lack of a suitable alternative.

For the following indicators, some countries have values missing for 2018 or 2019. Where a country had a value missing, we used the most recent period for that value.

- Value of trade in ICT services per capita
- Value of trade in ICT goods per capita
- R&D spending
- Graduates in STEM
- Knowledge-intensive employment

Although this leads to some countries having values 5 or more years out of date, we felt it was better for these countries to have an old value rather than no value at all.

Annex 3: Responsible Use Sub-Index Methodology

Dimensions

The dimensions for the Responsible Use Sub-Index are loosely based on the OECD Principles on AI, which are as follows:

- AI should benefit people and the planet by driving **inclusive** growth, sustainable development and well-being.
- AI systems should be designed in a way that respects the **rule of law**, **human rights**, **democratic values** and diversity, and they should include appropriate safeguards - for example, enabling human intervention where necessary - to ensure a fair and just society.
- There should be **transparency** and responsible disclosure around AI systems to ensure that people understand AI-based outcomes and can challenge them.
- AI systems must function in a robust, secure and **safe** way throughout their life cycles and potential risks should be continually assessed and managed.
- Organisations and individuals developing, deploying or operating AI systems should be held **accountable** for their proper functioning in line with the above principles.

These map onto four different dimensions (the issue of safety is already covered in the main index through the Cybersecurity indicator):

1. **Inclusivity**
2. **Accountability**
3. **Transparency**
4. **Privacy**

Indicators

In general, the indicators were selected to combine general measurements of a particular principle with specific data relating to uses of AI and technology.

Dimension	Indicator	Source	Description	Hypothesis
Inclusivity	Income Inequality	https://data. worldbank. org/indicator/ SI.POV.GINI	Gini coefficient estimates to give a general picture of income inequality.	AI and automation are most likely to exacerbate inequality in already unequal countries.
	Automation readiness index	https://www. automation readiness.eiu. com/	A composite index measuring automation readiness (including education and labour market policies and protections).	The most automation-ready countries will be best placed to ensure inclusive AI-driven growth.
Accountability	Voice and accountability	https://info. worldbank.org/ governance/ wgi/	General measure of citizens' abilities to hold the government to account.	In societies with higher levels of voice and accountability, citizens will be able to challenge irresponsible uses of AI by governments.
	Freedom on the net	https:// freedomhouse. org/sites/ default/ files/2019- 11/1104 2019_Report_ FH_ FOTN_2019_ final_Public_ Download.pdf	Measures controls on access to information and violations on internet users' rights.	Countries that grant citizens free and unfettered access to the Internet will allow those citizens to access the relevant information to hold governments accountable.

Dimension	Indicator	Source	Description	Hypothesis
Transparency	Corruption Perceptions Index	https://www.transparency.org/en/cpi	Measures perceived corruption in government.	Governments that are perceived as corrupt are less likely to implement AI in transparent and open ways.
	Corporate Political Engagement Index	https://www.transparency.org.uk/cpei/	Ranks companies based on their political engagement is. Each technology company was scored from 0 to 5 (most to least responsible). A country-level score was then derived from the sum of the scores of companies with offices in that country.	Powerful private companies can lobby governments for fewer regulations on AI and less scrutiny of their own irresponsible practices.
Privacy	Rule of Law	https://info.worldbank.org/governance/wgi/	Measures respect for the rule of law and individual rights.	Countries with robust respect for rights and the rule of law will be more likely to implement AI in a way that respects privacy rights.
	Surveillance Industry Index	https://sii.transparencytoolkit.org/docs	A record of a number of different surveillance companies and where they sell their technology to. A country-level score was obtained from the sum of every company with an office in that country and every mention of a sale of technology involving that country.	Countries with extensive existing surveillance industries are at risk of implementing AI in a way that undermines privacy.
	A.I. Surveillance Index	https://carnegieendowment.org/files/AI_Global_Surveillance_Index1.pdf	Records whether countries have used AI for surveillance purposes (smart cities, smart policing, facial recognition).	Countries that use AI more extensively for surveillance are at higher risk of abusing those capabilities.

Calculation of Scores

Scores for the Responsible Use Sub-Index were calculated as in the main Index, except that no imputation was attempted where values were missing.

Annex 4: Unranked Countries

Below is a table summarising the estimated scores of countries that did not meet the threshold for inclusion in the 2020 Government AI Readiness Index. These scores were calculated as above, except that no imputation was attempted where values were missing.

Although, where countries have high numbers of missing values, their scores cannot be reported with confidence, it is still useful to see the estimated score as a rough indicator of the country's AI Readiness.

Country	Number of Missing Values	Estimated Score
Andorra	17	42.98358654
Bahamas	17	42.0976579
Central African Republic	18	18.21766297
Democratic People's Republic of Korea	22	8.613144019
Equatorial Guinea	17	19.9046233
Eritrea	17	12.42680069
Liberia	17	23.77629389
Libya	17	20.61148094
Liechtenstein	20	41.74415124
Marshall Islands	20	15.68342222
Micronesia	19	20.30454614
Monaco	19	42.55318758
Nauru	20	14.27456287
Palau	20	26.60911955
Papua New Guinea	17	20.01265941
San Marino	21	45.68944757
Sao Tome and Principe	18	27.16947019
Somalia	19	14.6475
South Sudan	18	14.7244148
Taiwan	17	51.1557064
Turkmenistan	19	19.33984444
Tuvalu	19	20.37853631

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