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CISCO

# Cisco Global Digital Readiness Index 2019

## Forward

We live in a digital world. Digital technologies are advancing at a rapid pace, connecting people around the world and creating new and exciting opportunities. More than any time in human history, people have greater access to knowledge, services and resources as a result of technological advancements. The impact of automation, artificial intelligence, and the Internet of Things (IoT) is felt almost everywhere, in all countries, industries, and everyday life. However, while the impact of digitization is widespread, the benefits it yields are distributed unevenly. It is important to understand a country's digital readiness to help create a more inclusive future for all.

To uncover key insights and build our understanding on what it means for a country to be digitally ready, a holistic model was created that includes components beyond technology, such as basic needs, human capital development, and the business and start-up environment. Although having access to technology and the infrastructure to support digital technologies is critical, if individuals' basic needs are not met- such as access to clean drinking water, or they lack education or job opportunities-a country cannot fully take advantage of digital opportunities. This holistic model allows for an understanding of a country's level of digital readiness and what interventions and investments could help countries advance in their readiness.

In this second iteration of the study, it was found that globally, countries' scores vary on digital readiness with three stages emerging: **Activate, Accelerate, and Amplify**. No country scored perfectly. For countries in the lower stage of digital readiness (Activate), a focus on basic needs and human capital development is especially important. As technology is consistently advancing, there is a continuous need for developing skilled talent with the most current employable skills for the job market and creating new digital innovations. In addition to these foundational interventions, countries in the middle stage of digital readiness (Accelerate) would also benefit from investing in enhancing the ease of doing business. The study revealed that, no matter the stage of digital

readiness, human capital development is essential to build a workforce capable of utilizing and creating technology on a continuous basis.

At Cisco, we believe it is important to contribute research to help the continuing dialogue on technology's future impact. We hope to serve as a catalyst for driving an inclusive digital economy. To do so, we conduct research to gain a better understanding of what it means to be digitally ready and what would be the most beneficial to help individuals and countries thrive in the digital world. We use these insights to ensure the relevance of our key Corporate Social Responsibility (CSR) investments, such as our Cisco Networking Academy program, where over two million students worldwide gain foundational digital and entrepreneurial skills that improve their career prospects and help fill global demand for technology professionals.

To help take advantage of the opportunities technology can bring, we are working toward empowering global problem solvers--individuals who are innovators and entrepreneurs--who will be key to fueling an inclusive digital economy. Jobs of the future are not fully understood and will change constantly, but individuals who learn innovation and entrepreneurship skills using technology to solve problems will be prepared no matter what the future holds.

We can use research to design our programs and investments to develop and support global problem solvers who apply digital solutions to address social problems and foster economic development. We have a bold goal to positively impact 1 billion people by 2025 through digital solutions.

If we empower global problem solvers and prepare them with the right skills, we can help them participate in the global economy and create economic opportunity for all.

**Tae Yoo**
Senior Vice President, Corporate Affairs

# Introduction

Technology can help solve the world's most pressing problems. It can connect governments to their citizens and provide access to new forms of education and healthcare services. In every corner of the world digital technology is helping us become more connected to each other and to the organizations upon which we rely and opening markets and creating new opportunities for employment. In this digital era, no person should find themselves cut off from education, health, and employment opportunities simply because of where they live. However, while the technologies for creating a strong digitally capable society are becoming mature, not all countries are able to wield them effectively. These countries risk their citizens missing out on the many benefits of the digital era.

These benefits can only be delivered through concerted planning and investment by both the public and private sector in activities that range from lifting basic needs and education to improving technology infrastructure and building digital competency within the workforce. But as investment funds are often limited, it is vital to know which activities can yield the greatest benefit.

The Cisco Global Digital Readiness Index has been created to help nations understand how well-positioned they are to take advantage of the benefits of digitization. A holistic view of digital readiness was taken, examining multiple factors that indicate the progress that a nation has made towards digital maturity, and demonstrating areas of strength while providing guidance as to how they can invest to improve their overall readiness.

In its second iteration, the Cisco Global Digital Readiness Index provides insight into how nations have moved forward on their digital journey. As a global digital technology solution provider, we believe Cisco has a role to play in creating an inclusive digital economy. By conducting research to understand the factors that make a country digitally ready, we are better able to determine the investments needed to help them move forward in their digital journey. It is our hope that these findings will provide guidance for helping nations create more digitally inclusive societies.

One example of this is our desire to create a digitally capable global workforce, which we are building through our Cisco Networking Academy. Each year this program provides more than two million students worldwide with digital and entrepreneurial skills that improve their career prospects and help meet demand for technology professionals.

We are also investing in other drivers of digital readiness, including a focus on critical human needs such as increasing food security and access to affordable housing, clean drinking water, and sanitation. We invest in non-profit and non-governmental organizations that are using technology-based interventions to improve the speed, efficiency, and effectiveness of humanitarian relief, and provide support in the event of disasters. Some of our partners in this space include Mercy Corps, NetHope, Water For People, Akvo, Feeding America, and World Food Programme.

# Methodology

To build our understanding of the factors supporting digital readiness we have developed a framework and model to define, measure, and discover the key interventions that can help countries move forward in their digital readiness journey. This model can also be applied at regional and state levels using corresponding metrics.

Whereas many studies of network or technology readiness have focused solely on technology measures, we have taken a holistic approach that includes seven different components to build a complete picture of a county's digital readiness.

The seven components analyzed to determine a country's digital readiness were:

## 1. Basic Needs

The true value of technology and infrastructure is delivered through a population's ability to take advantage of it. Without a population's basic needs met, communities are not able to reap the benefits of technology. To measure a population's basic needs, we assessed data relating to life expectancy, the mortality rate of children under five years of age, and access to basic services such as electricity and safe drinking water.

## 2. Human Capital

The ability to utilize and create advanced digital services is determined in part by the digital skills level within the workforce. We examined four factors to determine the presence of an appropriately skilled labor force that is available to support digital innovation: the total labor force participation rate, adult literacy rate, and the country's education quality and average years of schooling.

## 3. Ease of Doing Business

Human capital skills can only contribute to the economy if people are gainfully employed, so having a thriving business ecosystem is another key determinant of a country's digital readiness. This was measured by examining the ease of doing business within each country, including factors such as: local rule of law, the Ease of Doing Business Index, the Logistics Performance Index (LPI) infrastructure rating, and the time it takes businesses to obtain access to electricity.

## 4. Business and Government Investment

Building digital infrastructure and capabilities requires significant investment on behalf of both government and business. To measure these investments, we assessed different sources of private and public investment, including foreign direct investment, research and development spending, and investment freedom.

## 5. Start-Up Environment

Start-ups create new innovations that can benefit entire markets and communities. They also demonstrate high levels of agility in terms of their ability to adapt to new market conditions and are often the leading creators of new wealth from digital technologies, and a crucial source of job creation. To assess a country's start-up environment, we examined factors such as its venture capital availability and investment, new business density, and patent and trademark registrations.

## 6. Technology Infrastructure

Infrastructure plays a key role in enabling countries to advance digital services. To measure technology infrastructure, we examined data such as active mobile broadband subscriptions, household internet access, fixed broadband subscriptions, and secure internet servers.

## 7. Technology Adoption

The level of technology availability, utilization, and adoption reflects a country's current level of digital readiness. The general demand for digital products and services was assessed by examining data relating to mobile cellular penetration, internet usage, and cloud services.

In order to have comparable scores across all seven components for each country, we have used data points that were available consistently from sources including the World Bank, the World Economic Forum, and the United Nations (see Appendix C for details). These sources were then verified to ensure all components correlated to each other and their overall impact on digital readiness, and a standardized index was created with a maximum possible score of 25 (see Appendix B for correlation table).

In order to continuously improve the measurement and robustness of the findings, some of the data points were revised in the most recent iteration of the study. This means a degree of leeway must be factored in when comparing changes between this report and the one prior. For example, while many countries recorded a lower score for 2019 compared to the previous report, in real terms no country went backwards in terms of its overall digital readiness. Furthermore, the total number of countries profiled was increased by 23, with 28 being added and five removed, which has also impacted where countries are ranked.

## Key findings

Overall digital readiness scores ranged between 4.32 and 20.26 out of a maximum possible total of 25. The overall average readiness score for this year's report was 11.90. No country obtained a perfect score on any of the seven components examined. The analysis revealed three stages of digital readiness-- Amplify, Accelerate, and Activate -- based on their score's distance from the average result. Countries in the middle stage of digital readiness, Accelerate, were further categorized as Accelerate High if they ranked above the mean for their group of 11.82, or Accelerate Low if they ranked below the mean to yield further insights given the number of countries in this stage.



Legend:
- ■ Activate
- ■ Accelerate (Low)
- ■ Amplify
- □ No data
- ■ Accelerate (High)
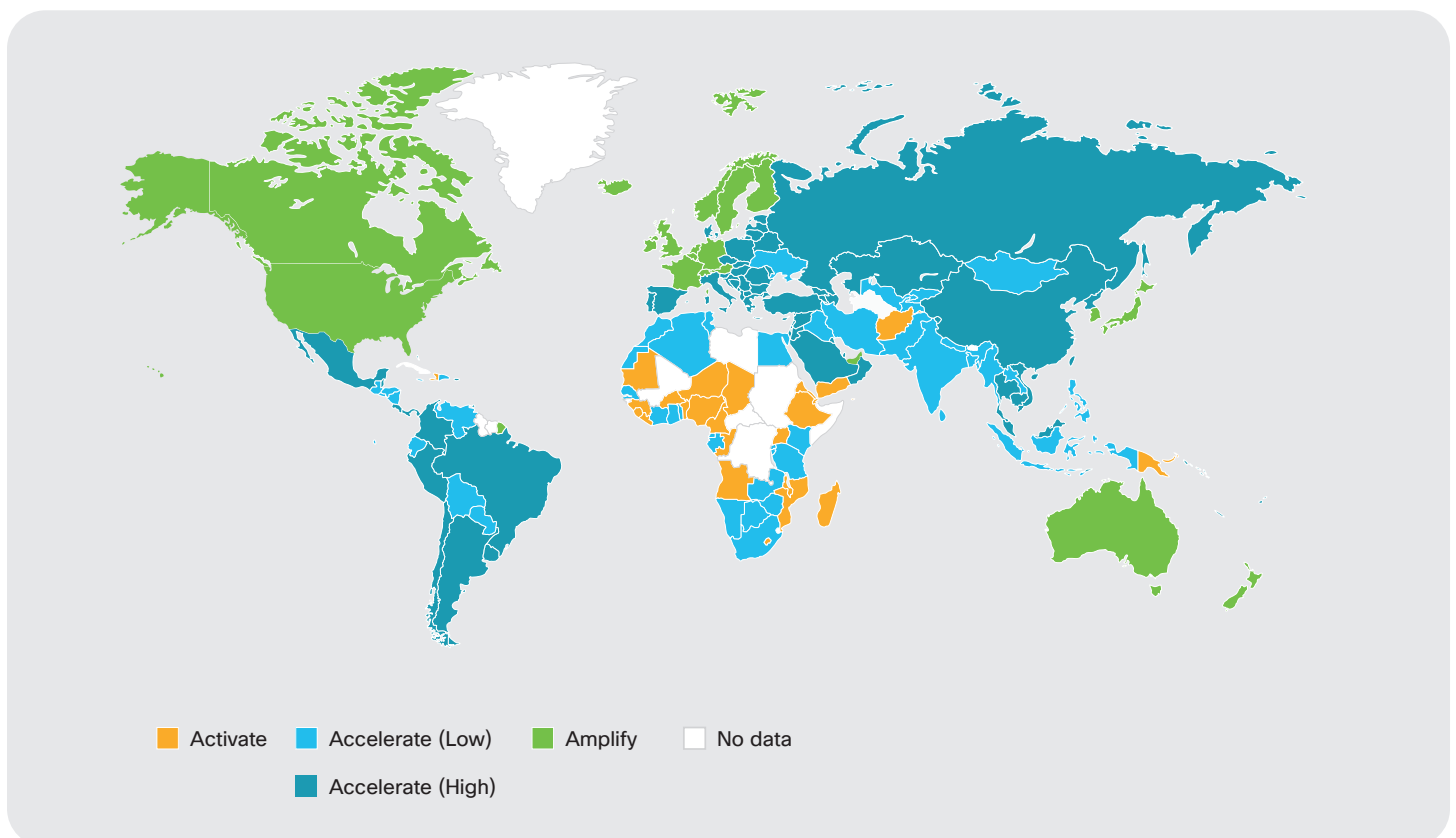
## Activate, Accelerate, Amplify

Each country's score provides insight into its overall progress towards digital readiness. Countries that ranked in the Activate stage were in the earliest steps of their digital journey, with an average score of 6.24. Those in the middle Accelerate stage had a group average score of 11.82 and represented countries that had taken some steps forward, but had significant opportunities to accelerate or improve in their digital readiness. Countries in the Amplify stage averaged a digital readiness score of 17.89, but as the findings showed, scoring in the Amplify stage is no guarantee of ongoing digital readiness leadership. The rapid pace of technological advancement ensures there is always more work to be done to enhance digital readiness, especially in terms of the need to develop new skills in emerging fields. While these countries have made significant strides in developing various components of their economy that support digital maturity, no country scored perfectly for any component, and only Singapore scored higher than 20 out of a possible maximum score of 25.

A country's digital readiness score broadly mirrored its overall economic development, with countries in the earliest Activate stage primarily found in Africa, while those in the Accelerate stage could be found all over the world, especially in emerging economies. Countries in the Amplify stage generally represented developed economies in North America, Europe, and Asia Pacific. Each country's score can be found in Appendix A.

There was strong correlation between countries' digital readiness scores and other performance indicators. Digital readiness scores were generally aligned to national GDP per capita and countries with higher digital readiness also tended to enjoy a healthier natural environment and vital ecosystem as measured against the Environmental Performance Index.

## A never-ending journey to maturity

While all countries that were included in the 2017 report moved ahead in their overall digital readiness, achieving digital maturity is a moving target. Even those countries in the Amplify stage face a constant need to develop their digital readiness if they are to retain their ranking relative to their peers and keep ahead of up-and-coming nations that desire to take a leading position.

This was most clearly demonstrated by the rise of Singapore into the number one position. The addition of 23 countries to the study (28 were added and five removed) further impacted the rankings. For example, the small European nation of Luxemburg was a new inclusion and claimed second place, while two other countries, Iceland and Estonia, were ranked in 9th and 19th positions respectively. This altered the ranking of leading countries from the previous report. The United States for instance which moved from first position into third, while Australia shifted from 10th to 12th, despite both countries having maintained their performance across most components (once adjustments to scoring metrics are considered).

Several Amplify countries showed significant improvements in their overall scores. Denmark stood out for increasing its score by 1.71 from 17.27 to 18.98 – the largest single increase of any country barring Singapore – and moved up from 12th to 4th position. This was due largely to a significant increase in Technology Infrastructure and in Business and Government Investment. Similarly, Bangladesh showed strong improvement in Ease of Doing Business to rise out of the Activate stage into the Accelerate stage.

## Factors for moving ahead

While the study examined seven different components to determine each country's digital readiness score, some had a stronger overall impact. For example, Human Capital is critical across every stage of digital readiness to build a workforce capable of both utilizing and creating technology.

The factors that impact a country's digital readiness differ depending on which of the three categories into which it falls. For example, those countries in the Activate stage would primarily benefit from interventions focused on improvements in Basic Needs and Human Capital development. In addition to these foundational interventions, countries in the Accelerate stage would also benefit from investing in areas related to Ease of Doing Business.

Countries in the leading Amplify group showed there was still plenty of room for advancement. They universally scored well for Basic Needs and Ease of Doing Business, but needed to continue investing in these components

to retain their position. There was however significant variation in terms of Business and Government Investment, with some countries barely achieving half of the score of their leading peers for this component. Countries in the Amplify stage could also all benefit from additional investment in Technology Infrastructure. Hence these results indicated areas where immediate investment could result in significant development of digital readiness.

## Snapshot – Singapore

Covering a landmass of just 722 square kilometers, the Republic of Singapore leapt into the lead position for overall digital readiness, thanks in large part to a concerted effort by the Singaporean Government over several decades to invest in digital capabilities and initiatives. Singapore ranked highest of all countries for Business and Government Investment, fourth for Ease of Doing Business, and fifth for Technology Infrastructure.

Despite its small area, Singapore is home to 5.6 million people, and boasts the third highest GDP per capita, and places highly for life expectancy, and education. What sets Singapore ahead of other nations, however, is its government's strategy for becoming the technology hub of Asia. It initially focused on attracting global technology companies to make Singapore their regional headquarters through a combination of low taxation and heavy investment in technology infrastructure, and more recently that attention has focused more on direct investment in infrastructure and research initiatives. The Singaporean Government has made a commitment to maintain spending on research and develop at 1 percent of GDP, which includes S$19 billion for scientific and technological research as part of its Research Innovation and Enterprise 2020 plan. The Singaporean Government was also one of the first to adopt an e-government strategy and is expected to invest US$1 billion in smart city initiatives in 2019[1].

## Snapshot – Estonia

A debutant in this year's expanded list of countries, the European Republic of Estonia ranked 19th in terms of its digital readiness, making it unique as the only Eastern European country to reach the Amplify stage. A former republic of the Soviet Union situated on the Baltic Sea south of Finland, Estonia gained its independence in 1991 and since then has boasted one of the fastest growing economies in Europe.

Estonia performed well in many categories on the Index, scoring highly in Ease of Doing Business and Human Capital, despite its small population of just 1.3 million people. Part of Estonia's success in embracing digital technology is born from the original necessity to build new social infrastructure at its rebirth into independence. Since that time the government has adopted a digital-first strategy and was named by *Wired* magazine in 2018 as 'the world's most digitally advanced society'. Notable initiatives include being the first nation to offer internet voting in a nationwide election in 2005, while 95 percent of the data generated by hospitals and doctors has been digitized. Estonia also provides a transnational digital identity called e-Residency, which gives anyone, anywhere access to Estonia's public digital services.

## Snapshot – Botswana

Another new addition to this year's list of countries, the Republic of Botswana debuted within the Accelerate group at the 76th position, as the second highest ranking African nation, behind the island nation of Mauritius. Located to the north of South Africa, Botswana is a landlocked country that has been independent from British rule since 1966.

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[1] Worldwide Semiannual Smart Cities Spending Guide https://www.idc.com/getdoc.jsp?containerId=IDC_P37477

Botswana boasted the highest ranking for any African nation in terms of its Start-up Environment and performed strongly across all other categories in comparison to other African nations.

Part of Botswana's success can be attributed to its political stability, being Africa's oldest continuous democracy. Botswana is ranked by Transparency International's Corruption Perceptions Index as the least corrupt nation in Africa in 2018.

Despite being home to just 2 million people, Botswana has become one of the world's fastest growing economies, with one of the highest GDPs in Africa and the highest Human Development Index score of any Sub-Saharan nation on the African mainland. However, its development is to some extent held back by the nation still suffering one of the highest infection rates for HIV/AIDS.

While Botswana's wealth is based around agriculture, mining, and tourism, the government has identified science and technology as a key area for investment to diversify the country's economy. The country has created six Innovation Hubs, and UNESCO has ranked it as having an evolving national innovation system.

## Conclusion

Creating a digitally ready society requires a holistic approach across multiple components, from meeting a citizen's basic needs and improving their education to creating a thriving business and start-up environment and investing in advanced technology infrastructure. Critical amongst these is the need for a vibrant, creative, and technologically sophisticated workforce to provide both the consumers and the creators of the technological innovations that can take a nation forward.

The value of being a digitally ready nation is immediately reflected in the strong correlation that leading nations show against other indicators such as GDP per capita and environmental outcomes.

As this research has shown, technology alone is not the answer. Ensuring basic human needs, developing skills, creating a business-friendly environment with support for start-ups, and investment by business and government all aid countries in progressing towards their digital future.

At Cisco, we believe that digital technology has a strong role to play in advancing society on a global scale, and that no one should miss the advantages of the digital age simply because of where they live. We work to empower global problem solvers who apply digital solutions to address social problems and foster economic development. These problem solvers embody both the technological and human skills needed to be successful. They innovate as technologists, think as entrepreneurs, and act as social change agents, and are critical to creating an inclusive digital economy.

Through the Cisco Global Digital Readiness Index, we gather intelligence on those actions which can most readily develop digital readiness and use this knowledge to design better programs and direct investments to develop and support these global problem solvers. Ultimately, we hope that these actions will assist us in our own goal of positively impacting 1 billion people by 2025.

Though we do not fully know what the future holds, by empowering people to become global problem solvers and preparing them with the right skills, we can help them more ably participate in the global economy and create economic opportunity for all.

We hope that through projects such as the Cisco Global Digital Readiness Index we can demonstrate to governments, business leaders, and citizens around the world what is possible through the deployment of digital technology, and how investments in the basic underpinnings of a digital society can serve to raise the quality of life for all citizens, and ensure the creation of a digitally inclusive society.

For questions about the Digital Readiness Index research, please contact ciscodigitalreadiness@cisco.com.

**Appendices:**

A) List of countries and overall score and stage in alphabetical order by country name

B) Correlation table for components

C) Measures, definitions and sources

# Appendix A. Country digital readiness scores and stages

| Country | Score | Stage | Basic Needs (4) | Business and Gov't Investment (3) | Ease of Doing Business (4) | Human Capital (4) | Start-up Envir. (3) | Tech Adoption (3) | Tech Infrastructure (4) |
|---------|-------|-------|-----------------|-----------------------------------|----------------------------|-------------------|---------------------|-------------------|-------------------------|
| Afghanistan | 5.96 | Activate | 2.20 | 0.64 | 1.53 | 1.15 | 0.01 | 0.33 | 0.10 |
| Albania | 12.02 | Accelerate | 3.66 | 1.28 | 2.21 | 2.51 | 0.29 | 1.21 | 0.86 |
| Algeria | 9.99 | Accelerate | 3.49 | 0.89 | 2.03 | 1.61 | 0.27 | 0.89 | 0.81 |
| Angola | 6.14 | Activate | 1.26 | 0.85 | 1.56 | 1.84 | 0.20 | 0.27 | 0.16 |
| Argentina | 13.06 | Accelerate | 3.70 | 1.17 | 2.40 | 2.70 | 0.23 | 1.34 | 1.51 |
| Armenia | 12.76 | Accelerate | 3.61 | 1.33 | 2.30 | 2.65 | 0.37 | 1.15 | 1.35 |
| Australia | 17.89 | Amplify | 3.96 | 1.87 | 3.49 | 3.31 | 1.30 | 1.62 | 2.34 |
| Austria | 17.25 | Amplify | 3.92 | 2.27 | 3.68 | 3.11 | 0.42 | 1.82 | 2.03 |
| Azerbaijan | 12.77 | Accelerate | 3.26 | 1.19 | 2.37 | 2.86 | 0.44 | 1.18 | 1.48 |
| Bangladesh | 8.53 | Accelerate | 3.10 | 1.02 | 1.65 | 1.70 | 0.20 | 0.51 | 0.35 |
| Belarus | 12.95 | Accelerate | 3.61 | 0.91 | 2.44 | 3.01 | 0.10 | 1.21 | 1.68 |
| Belgium | 16.22 | Amplify | 3.90 | 1.90 | 3.12 | 3.00 | 0.67 | 1.51 | 2.13 |
| Benin | 6.87 | Activate | 1.44 | 1.27 | 2.08 | 1.45 | 0.11 | 0.41 | 0.12 |
| Bolivia | 10.12 | Accelerate | 3.11 | 0.69 | 1.89 | 2.69 | 0.27 | 0.81 | 0.66 |
| Bosnia and Herzegovina | 12.13 | Accelerate | 3.72 | 1.23 | 2.22 | 2.39 | 0.28 | 1.08 | 1.21 |
| Botswana | 11.53 | Accelerate | 2.51 | 1.27 | 2.61 | 2.46 | 0.95 | 0.96 | 0.76 |
| Brazil | 12.31 | Accelerate | 3.60 | 1.17 | 2.47 | 2.45 | 0.24 | 1.13 | 1.26 |
| Bulgaria | 13.72 | Accelerate | 3.66 | 1.35 | 2.19 | 2.84 | 0.73 | 1.12 | 1.84 |
| Burkina Faso | 6.26 | Activate | 1.16 | 1.22 | 1.90 | 1.20 | 0.07 | 0.49 | 0.23 |
| Cambodia | 9.27 | Accelerate | 2.45 | 1.17 | 1.59 | 2.54 | 0.27 | 0.77 | 0.47 |
| Cameroon | 7.63 | Activate | 1.66 | 0.85 | 1.94 | 2.14 | 0.25 | 0.52 | 0.27 |
| Canada | 17.33 | Amplify | 3.91 | 1.78 | 3.27 | 3.32 | 0.70 | 2.05 | 2.30 |

| Country | Score | Stage | Basic Needs (4) | Business and Gov't Investment (3) | Ease of Doing Business (4) | Human Capital (4) | Start-up Envir. (3) | Tech Adoption (3) | Tech Infrastructure (4) |
|---|---|---|---|---|---|---|---|---|---|
| Chad | 4.32 | Activate | 0.32 | 1.17 | 1.49 | 0.89 | 0.16 | 0.18 | 0.11 |
| Chile | 14.86 | Accelerate | 3.82 | 1.47 | 2.99 | 2.84 | 0.72 | 1.37 | 1.64 |
| China | 13.22 | Accelerate | 3.65 | 0.97 | 2.98 | 2.70 | 0.68 | 0.97 | 1.28 |
| Colombia | 12.44 | Accelerate | 3.54 | 1.40 | 2.42 | 2.65 | 0.35 | 1.13 | 0.94 |
| Congo | 6.92 | Activate | 2.16 | 1.01 | 1.25 | 2.04 | 0.00 | 0.43 | 0.03 |
| Costa Rica | 13.58 | Accelerate | 3.81 | 1.32 | 2.70 | 2.56 | 0.37 | 1.46 | 1.35 |
| Côte d'Ivoire | 8.02 | Accelerate | 1.62 | 1.32 | 2.36 | 1.20 | 0.23 | 0.94 | 0.35 |
| Croatia | 14.01 | Accelerate | 3.78 | 1.42 | 2.78 | 2.78 | 0.38 | 1.08 | 1.79 |
| Cyprus | 15.37 | Accelerate | 3.89 | 1.64 | 2.56 | 3.00 | 0.86 | 1.46 | 1.96 |
| Czech Republic | 15.78 | Accelerate | 3.82 | 1.68 | 3.18 | 3.16 | 0.52 | 1.30 | 2.12 |
| Denmark | 18.98 | Amplify | 3.88 | 2.14 | 3.76 | 3.26 | 0.79 | 1.70 | 3.44 |
| Dominican Republic | 10.93 | Accelerate | 3.39 | 1.28 | 2.19 | 2.20 | 0.29 | 0.97 | 0.62 |
| Ecuador | 11.29 | Accelerate | 3.57 | 0.93 | 2.27 | 2.64 | 0.20 | 0.91 | 0.78 |
| Egypt | 10.24 | Accelerate | 3.42 | 1.20 | 2.21 | 1.55 | 0.25 | 0.84 | 0.77 |
| El Salvador | 10.76 | Accelerate | 3.47 | 1.33 | 2.26 | 2.03 | 0.23 | 0.93 | 0.51 |
| Eritrea | 4.91 | Activate | 1.50 | 0.53 | 1.14 | 1.74 | 0.00 | 0.00 | 0.00 |
| Estonia | 17.14 | Amplify | 3.79 | 1.67 | 3.16 | 3.27 | 1.24 | 1.50 | 2.50 |
| Ethiopia | 6.48 | Activate | 1.58 | 0.90 | 1.76 | 1.43 | 0.29 | 0.28 | 0.23 |
| Finland | 17.95 | Amplify | 3.92 | 2.06 | 3.67 | 3.23 | 0.89 | 1.63 | 2.55 |
| France | 16.25 | Amplify | 3.94 | 1.81 | 3.41 | 2.92 | 0.55 | 1.42 | 2.19 |
| Gabon | 9.77 | Accelerate | 2.82 | 1.23 | 1.48 | 2.17 | 0.31 | 1.01 | 0.76 |
| Georgia | 13.75 | Accelerate | 3.51 | 1.40 | 2.73 | 2.97 | 0.59 | 1.15 | 1.40 |

| Country | Score | Stage | Basic Needs (4) | Business and Gov't Investment (3) | Ease of Doing Business (4) | Human Capital (4) | Start-up Envir. (3) | Tech Adoption (3) | Tech Infrastructure (4) |
|---|---|---|---|---|---|---|---|---|---|
| Germany | 17.85 | Amplify | 3.90 | 2.11 | 3.76 | 3.25 | 0.68 | 1.63 | 2.53 |
| Ghana | 9.55 | Accelerate | 2.45 | 1.28 | 2.32 | 1.71 | 0.25 | 0.86 | 0.68 |
| Greece | 13.77 | Accelerate | 3.89 | 1.25 | 2.81 | 2.73 | 0.17 | 1.24 | 1.67 |
| Guatemala | 10.31 | Accelerate | 3.29 | 1.27 | 2.19 | 2.03 | 0.31 | 0.86 | 0.35 |
| Guinea | 6.31 | Activate | 1.45 | 1.06 | 1.71 | 1.21 | 0.28 | 0.44 | 0.17 |
| Haiti | 5.96 | Activate | 1.67 | 1.01 | 1.35 | 1.39 | 0.09 | 0.30 | 0.15 |
| Honduras | 10.14 | Accelerate | 3.31 | 1.22 | 2.16 | 2.15 | 0.28 | 0.64 | 0.38 |
| Hungary | 14.13 | Accelerate | 3.73 | 1.49 | 2.38 | 2.95 | 0.46 | 1.23 | 1.89 |
| Iceland | 18.16 | Amplify | 3.96 | 1.46 | 3.26 | 3.43 | 1.45 | 1.75 | 2.85 |
| India | 9.46 | Accelerate | 2.89 | 0.97 | 2.57 | 1.53 | 0.47 | 0.66 | 0.37 |
| Indonesia | 11.68 | Accelerate | 3.19 | 1.01 | 2.63 | 2.45 | 0.42 | 0.97 | 1.01 |
| Iran | 11.02 | Accelerate | 3.58 | 0.61 | 2.22 | 2.12 | 0.28 | 1.01 | 1.20 |
| Iraq | 7.84 | Accelerate | 3.15 | 0.64 | 1.48 | 1.01 | 0.01 | 0.81 | 0.75 |
| Ireland | 17.01 | Amplify | 3.90 | 1.87 | 3.11 | 3.28 | 0.74 | 1.59 | 2.51 |
| Israel | 16.67 | Amplify | 3.94 | 2.24 | 2.84 | 3.13 | 1.27 | 1.32 | 1.93 |
| Italy | 14.84 | Accelerate | 3.96 | 1.66 | 3.12 | 2.75 | 0.29 | 1.31 | 1.75 |
| Jamaica | 11.55 | Accelerate | 3.53 | 1.38 | 2.35 | 2.39 | 0.28 | 0.90 | 0.71 |
| Japan | 17.69 | Amplify | 3.98 | 1.95 | 3.44 | 3.25 | 0.89 | 1.69 | 2.49 |
| Jordan | 12.14 | Accelerate | 3.56 | 1.29 | 2.48 | 2.05 | 0.39 | 1.04 | 1.33 |
| Kazakhstan | 13.49 | Accelerate | 3.38 | 1.08 | 2.57 | 3.33 | 0.31 | 1.35 | 1.46 |
| Kenya | 9.15 | Accelerate | 2.11 | 1.12 | 2.32 | 2.31 | 0.31 | 0.48 | 0.50 |
| Kuwait | 13.36 | Accelerate | 3.66 | 1.14 | 2.38 | 2.52 | 0.42 | 1.69 | 1.55 |
| Kyrgyzstan | 11.00 | Accelerate | 3.28 | 1.16 | 2.23 | 2.60 | 0.28 | 0.84 | 0.59 |

| Country | Score | Stage | Basic Needs (4) | Business and Gov't Investment (3) | Ease of Doing Business (4) | Human Capital (4) | Start-up Envir. (3) | Tech Adoption (3) | Tech Infrastructure (4) |
|---|---|---|---|---|---|---|---|---|---|
| Laos | 8.58 | Accelerate | 2.58 | 0.90 | 1.75 | 2.22 | 0.30 | 0.43 | 0.40 |
| Latvia | 15.00 | Accelerate | 3.67 | 1.49 | 2.77 | 3.18 | 0.59 | 1.34 | 1.97 |
| Lesotho | 7.43 | Activate | 1.26 | 1.11 | 1.87 | 2.00 | 0.15 | 0.54 | 0.49 |
| Liberia | 5.03 | Activate | 1.49 | 1.11 | 0.87 | 1.03 | 0.22 | 0.25 | 0.06 |
| Lithuania | 14.78 | Accelerate | 3.65 | 1.50 | 2.76 | 3.14 | 0.46 | 1.40 | 1.86 |
| Luxembourg | 19.54 | Amplify | 3.93 | 2.41 | 3.24 | 2.89 | 2.56 | 2.03 | 2.48 |
| Macedonia | 12.78 | Accelerate | 3.61 | 1.24 | 2.59 | 2.25 | 0.54 | 1.14 | 1.41 |
| Madagascar | 6.48 | Activate | 1.64 | 1.11 | 1.07 | 2.18 | 0.19 | 0.17 | 0.12 |
| Malawi | 7.03 | Activate | 1.54 | 1.06 | 2.04 | 1.84 | 0.11 | 0.25 | 0.20 |
| Malaysia | 14.31 | Accelerate | 3.64 | 1.35 | 2.98 | 2.74 | 0.64 | 1.35 | 1.60 |
| Malta | 15.54 | Accelerate | 3.87 | 1.75 | 2.47 | 2.69 | 1.02 | 1.58 | 2.17 |
| Mauritania | 6.41 | Activate | 1.70 | 1.06 | 1.86 | 0.83 | 0.17 | 0.53 | 0.25 |
| Mauritius | 13.61 | Accelerate | 3.60 | 1.40 | 2.81 | 2.64 | 0.70 | 1.13 | 1.33 |
| Mexico | 12.34 | Accelerate | 3.67 | 1.37 | 2.45 | 2.49 | 0.35 | 0.99 | 1.01 |
| Moldova | 11.65 | Accelerate | 3.33 | 1.12 | 2.25 | 2.22 | 0.26 | 1.10 | 1.37 |
| Mongolia | 10.85 | Accelerate | 3.01 | 1.08 | 2.28 | 2.65 | 0.40 | 0.71 | 0.72 |
| Montenegro | 13.31 | Accelerate | 3.74 | 1.37 | 2.27 | 2.49 | 0.68 | 1.39 | 1.37 |
| Morocco | 10.87 | Accelerate | 3.36 | 1.24 | 2.47 | 1.41 | 0.29 | 1.09 | 1.01 |
| Mozambique | 6.53 | Activate | 1.15 | 0.90 | 2.07 | 1.72 | 0.17 | 0.31 | 0.20 |
| Myanmar | 8.08 | Accelerate | 2.20 | 0.85 | 1.72 | 1.92 | 0.11 | 0.63 | 0.64 |
| Namibia | 9.95 | Accelerate | 2.26 | 1.24 | 2.60 | 2.17 | 0.32 | 0.76 | 0.60 |
| Nepal | 9.27 | Accelerate | 3.07 | 0.64 | 2.19 | 2.03 | 0.28 | 0.67 | 0.40 |
| Netherlands | 18.66 | Amplify | 3.92 | 2.48 | 3.49 | 3.27 | 0.72 | 1.67 | 3.12 |

| Country | Score | Stage | Basic Needs (4) | Business and Gov't Investment (3) | Ease of Doing Business (4) | Human Capital (4) | Start-up Envir. (3) | Tech Adoption (3) | Tech Infrastructure (4) |
|---|---|---|---|---|---|---|---|---|---|
| New Zealand | 17.75 | Amplify | 3.91 | 1.62 | 3.66 | 3.37 | 1.33 | 1.69 | 2.17 |
| Nicaragua | 9.91 | Accelerate | 3.19 | 1.17 | 2.10 | 2.09 | 0.22 | 0.78 | 0.36 |
| Niger | 5.31 | Activate | 0.99 | 1.11 | 1.92 | 0.94 | 0.00 | 0.21 | 0.16 |
| Nigeria | 6.47 | Activate | 1.40 | 1.01 | 1.99 | 1.16 | 0.14 | 0.54 | 0.24 |
| Norway | 17.98 | Amplify | 3.94 | 1.96 | 3.57 | 3.22 | 1.00 | 1.77 | 2.51 |
| Oman | 13.53 | Accelerate | 3.60 | 1.28 | 2.65 | 2.74 | 0.48 | 1.40 | 1.38 |
| Pakistan | 7.77 | Accelerate | 2.70 | 1.12 | 1.75 | 1.15 | 0.32 | 0.40 | 0.33 |
| Panama | 12.74 | Accelerate | 3.57 | 1.36 | 2.68 | 2.49 | 0.48 | 1.11 | 1.05 |
| Papua New Guinea | 5.54 | Activate | 1.37 | 0.79 | 1.80 | 1.17 | 0.02 | 0.25 | 0.14 |
| Paraguay | 11.00 | Accelerate | 3.47 | 1.33 | 2.00 | 2.46 | 0.23 | 1.04 | 0.47 |
| Peru | 11.93 | Accelerate | 3.43 | 1.33 | 2.34 | 2.75 | 0.43 | 0.97 | 0.67 |
| Philippines | 11.03 | Accelerate | 3.10 | 1.17 | 2.33 | 2.39 | 0.27 | 1.02 | 0.74 |
| Poland | 14.94 | Accelerate | 3.75 | 1.51 | 2.89 | 3.10 | 0.35 | 1.31 | 2.03 |
| Portugal | 14.96 | Accelerate | 3.90 | 1.48 | 3.08 | 2.88 | 0.54 | 1.29 | 1.80 |
| Qatar | 15.10 | Accelerate | 3.77 | 1.52 | 2.78 | 3.04 | 0.67 | 1.60 | 1.71 |
| Romania | 13.34 | Accelerate | 3.68 | 1.32 | 2.57 | 2.60 | 0.37 | 1.10 | 1.71 |
| Russia | 13.63 | Accelerate | 3.50 | 0.96 | 2.59 | 3.18 | 0.46 | 1.39 | 1.55 |
| Rwanda | 9.04 | Accelerate | 1.87 | 1.16 | 2.86 | 2.08 | 0.38 | 0.46 | 0.22 |
| Saudi Arabia | 13.40 | Accelerate | 3.66 | 1.23 | 2.53 | 2.46 | 0.38 | 1.31 | 1.83 |
| Senegal | 8.11 | Accelerate | 2.43 | 1.17 | 2.13 | 1.14 | 0.23 | 0.66 | 0.35 |
| Serbia | 13.13 | Accelerate | 3.59 | 1.34 | 2.39 | 2.87 | 0.30 | 1.19 | 1.45 |
| Sierra Leone | 5.33 | Activate | 0.71 | 1.16 | 1.76 | 0.82 | 0.20 | 0.44 | 0.24 |

| Country | Score | Stage | Basic Needs (4) | Business and Gov't Investment (3) | Ease of Doing Business (4) | Human Capital (4) | Start-up Envir. (3) | Tech Adoption (3) | Tech Infrastructure (4) |
|---|---|---|---|---|---|---|---|---|---|
| Singapore | 20.26 | Amplify | 3.97 | 2.71 | 3.69 | 3.43 | 1.66 | 1.96 | 2.84 |
| Slovakia | 14.44 | Accelerate | 3.72 | 1.47 | 2.64 | 2.98 | 0.50 | 1.36 | 1.78 |
| Slovenia | 15.51 | Accelerate | 3.90 | 1.62 | 3.08 | 3.15 | 0.48 | 1.29 | 2.00 |
| South Africa | 11.39 | Accelerate | 2.71 | 1.06 | 2.62 | 2.10 | 0.67 | 1.18 | 1.06 |
| South Korea | 18.22 | Amplify | 3.93 | 2.18 | 3.51 | 3.32 | 1.20 | 1.69 | 2.39 |
| Spain | 15.74 | Accelerate | 3.97 | 1.64 | 3.25 | 2.96 | 0.52 | 1.44 | 1.97 |
| Sri Lanka | 10.58 | Accelerate | 3.53 | 0.96 | 2.24 | 2.27 | 0.33 | 0.86 | 0.39 |
| Sweden | 18.42 | Amplify | 3.95 | 2.31 | 3.72 | 3.27 | 1.01 | 1.75 | 2.41 |
| Switzerland | 18.86 | Amplify | 3.96 | 2.48 | 3.58 | 3.34 | 0.87 | 1.77 | 2.85 |
| Tajikistan | 8.81 | Accelerate | 3.01 | 0.80 | 1.64 | 2.22 | 0.33 | 0.63 | 0.19 |
| Tanzania | 7.98 | Accelerate | 1.67 | 1.12 | 2.16 | 2.25 | 0.23 | 0.39 | 0.17 |
| Thailand | 13.21 | Accelerate | 3.65 | 1.18 | 2.87 | 2.60 | 0.42 | 1.24 | 1.25 |
| Timor-Leste | 7.36 | Activate | 2.39 | 1.01 | 1.43 | 1.11 | 0.39 | 0.72 | 0.31 |
| Togo | 7.78 | Accelerate | 1.63 | 1.22 | 2.04 | 2.03 | 0.01 | 0.39 | 0.46 |
| Trinidad and Tobago | 12.59 | Accelerate | 3.35 | 1.17 | 2.31 | 2.69 | 0.27 | 1.43 | 1.38 |
| Tunisia | 10.87 | Accelerate | 3.58 | 1.04 | 2.26 | 1.79 | 0.30 | 1.03 | 0.85 |
| Turkey | 12.88 | Accelerate | 3.66 | 1.37 | 2.67 | 2.45 | 0.32 | 1.01 | 1.40 |
| Uganda | 7.29 | Activate | 1.30 | 1.11 | 1.99 | 2.05 | 0.22 | 0.42 | 0.19 |
| Ukraine | 11.47 | Accelerate | 3.54 | 0.92 | 1.85 | 2.79 | 0.26 | 1.09 | 1.02 |
| United Arab Emirates | 16.42 | Amplify | 3.73 | 1.35 | 3.45 | 3.04 | 0.75 | 1.82 | 2.27 |
| United Kingdom | 17.86 | Amplify | 3.91 | 1.87 | 3.60 | 3.21 | 1.25 | 1.63 | 2.39 |

| Country | Score | Stage | Basic Needs (4) | Business and Gov't Investment (3) | Ease of Doing Business (4) | Human Capital (4) | Start-up Envir. (3) | Tech Adoption (3) | Tech Infrastructure (4) |
|---|---|---|---|---|---|---|---|---|---|
| United States of America | 19.03 | Amplify | 3.81 | 2.29 | 3.41 | 3.21 | 1.40 | 2.22 | 2.69 |
| Uruguay | 13.88 | Accelerate | 3.74 | 1.46 | 2.60 | 2.73 | 0.35 | 1.30 | 1.69 |
| Uzbekistan | 11.14 | Accelerate | 3.42 | 0.64 | 2.32 | 2.84 | 0.04 | 0.79 | 1.08 |
| Venezuela | 9.52 | Accelerate | 3.43 | 0.56 | 1.07 | 2.60 | 0.20 | 0.94 | 0.71 |
| Vietnam | 12.06 | Accelerate | 3.50 | 0.86 | 2.64 | 3.06 | 0.40 | 0.98 | 0.62 |
| Yemen | 5.78 | Activate | 2.29 | 1.06 | 1.13 | 0.65 | 0.11 | 0.43 | 0.10 |
| Zambia | 8.13 | Accelerate | 1.56 | 1.11 | 2.13 | 2.24 | 0.20 | 0.55 | 0.34 |
| Zimbabwe | 8.02 | Accelerate | 1.81 | 0.79 | 1.67 | 2.59 | 0.17 | 0.57 | 0.42 |

## Appendix B. Correlation table

| Components | Basic Needs | Business and Government Investment | Ease of Doing Business | Human Capital | Start-up Environment | Technology Adoption | Technology Infrastructure |
|---|---|---|---|---|---|---|---|
| Basic Needs | | | | | | | |
| Business and Government Investment | 0.53 | | | | | | |
| Ease of Doing Business | 0.70 | 0.80 | | | | | |
| Human Capital | 0.78 | 0.61 | 0.77 | | | | |
| Start-up Environment | 0.53 | 0.75 | 0.71 | 0.61 | | | |
| Technology Adoption | 0.85 | 0.76 | 0.85 | 0.81 | 0.75 | | |
| Technology Infrastructure | 0.78 | 0.80 | 0.87 | 0.82 | 0.73 | 0.92 | |
| Digital Readiness Score | **0.87** | **0.81** | **0.91** | **0.89** | **0.78** | **0.96** | **0.96** |

**Legend**

Lowest  Lower  Middle  Highest

The correlations across the seven components of Digital Readiness Index show the strength of their relationship with each other, which is one measure of the validity of the Index. The correlations provide evidence that the measures are related to each other. A correlation number at or above .60 is considered a strong correlation.

# Appendix C. Digital readiness measures, definitions, and sources

| Digital readiness components | Definition | Metric | Source |
|---|---|---|---|
| Basic Needs | Basic human needs for a population to thrive | Life Expectancy | UN (2017) |
| | | Mortality Rate (Under Age 5) | UNIGME (2017) |
| | | Population Using Safe Drinking Water Services | World Health Organization and UNICEF (2015) |
| | | Access to Electricity | World Bank (2016) |
| Business and Government Investment | Private and public investment in innovation and technology | Foreign Direct Investment | IMF (2017) |
| | | Research and Development Expenditure | UNESCO (2017) |
| | | Investment Freedom | Heritage Foundation (2019) |
| Ease of Doing Business | Basic infrastructure / policies needed to support business continuity | Ease of Doing Business Index | World Bank (2019) |
| | | Rule of Law | World Justice Project (2019) |
| | | Logistics Performance Index (LPI) – Infrastructure Rating | Transparency International (2018) |
| | | Time to Get Electricity | World Bank (2018) |
| Human Capital | Skilled labor force available to support digital innovation (build and maintain) | Labor Force Participation Rate | World Bank (2018) |
| | | Adult Literacy Rate | UNESCO (2017) |
| | | Education Index (Years of School) | UN Development Program (2017) |
| | | Harmonized Test Score | World Bank (2018) |
| Start-up Environment | Environment which fosters innovation within a community | New Business Density | World Bank (2016) |
| | | Patents Granted and Trademarks Registered | World Intellectual Property Organization (2017) |
| | | Venture Capital Investment and Availability | Center for American Entrepreneurship (2017) WEF (2018) |

| Digital readiness components | Definition | Metric | Source |
|---|---|---|---|
| **Technology Adoption** | Demand for digital products / services | Mobile Cellular Penetration | ITU (2017) |
| | | Internet Usage | ITU (2017) |
| | | Cloud Services (Spend, IT Forecast Data) | Gartner (2018) |
| **Technology Infrastructure** | The infrastructure available to enable digital activities and connected consumers (IoT, Cloud) | Mobile Broadband Subscriptions | ITU (2017) |
| | | Fixed Broadband Subscriptions | ITU (2014) |
| | | Secure Internet Servers | Netcraft (2018) |
| | | Household Internet Access | ITU (2017) |