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DIGITAL IN THE TIME OF COVID

Trust in the Digital Economy and Its Evolution Across 90 Economies as the Planet Paused for a Pandemic

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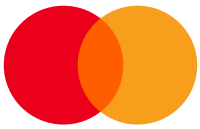
The Fletcher School at Tufts University
December 2020

This research was made possible by generous support from and in collaboration with:



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Acknowledgments

The authors are grateful for the support and guidance of our colleagues and collaborators. Without the advice and critiques of many distinguished experts, this work would not have been possible. The views expressed in this report, the underlying analysis, the visualizations on our interactive site, and any errors within are the authors' alone.

Our near-decade long research partnership with Mastercard has been collaborative in the truest sense of the word. We are immensely grateful to Ajay Bhalla and Paul Trueman for all the insights and unwavering support over the years and for cheering us on as we continue to chart the hitherto unexplored corners of the Digital Planet. We are also grateful to Josephine Wolff, our faculty advisor, for the sage counsel and guidance in shaping this edition of our research.

We are extremely proud and appreciative of the members of our phenomenal research team—the incredibly talented students and recent graduates of The Fletcher School and other schools at Tufts University—who brought their intellectual curiosity and analytical smarts to enrich this research. The year 2020 defies description; it would be an understatement to say this has not been an easy year to conduct research. We doff our hats to all our student analysts—for their immense dedication and their spectacular work ethic amidst all the pandemonium of the pandemic. Aditya Ramachandran, Alyssa Pak, Andrew Vu, Avni Ambalam, Carlo F. Salazar, Christabell Makokha, Christopher Duyos, Devyani Singh, Eda Yilar, Edbert Jao, Eleanor Jenke, Elizabeth Sims, Emmanuel Gebremeskel, Guo Chen, Heidy Acevedo, Henry Fernandez, James Carroll, Joseph Dunbar, Karissa Monteiro, Katy Mayerson, Malavika Krishnan, Mariam Amini, Ming Dongfang, Mohammad Uzair Akram, Oliver Martinez Lopez, Patrick Beliard, Pranav Jain, Ray Marolt, Rebecca Kurland, Reegan Coleman, Samantha Hubner, Siddhant Dayal, Stella Henderson, and Victoria Kulesza, our sincerest thanks to you for all your contributions.

A very special thanks to our colleague Joy Zhang, who supported this work with great diligence. We appreciate the long hours and hard work you put into leading the QA and the red team on this project. Our thanks to you and the team for going through mindboggling amounts of data with a fine-tooth comb and for spotting and squashing bugs on our interactive research platform in record time.

As we unveil our most ambitious endeavor to date—an interactive platform of scorecards measuring various aspects of the global digital economy—we reminisce with great fondness and gratitude the contributions of Sarah Ryan, Ruiruo Wu, Caroline Troein, Cassandra Pagan, and generations of student analysts from across Tufts since 2013 toward building the robust foundations and many layers of this research edifice on which this platform, the Digital Intelligence Index (DII), rests.

Digital Intelligence Index is the beneficiary of data contributions from our partners—Akamai Technologies Inc., Blue Triangle Technologies, Mastercard, the Private Capital Research Institute (PCRI), and GlobalWebIndex. Our grateful

thanks to Claire Le Gal and Din Uppal from Mastercard; Dan Revellese, Emily Creager, Mike Dockins, David Snyder, and Mason Martin from Blue Triangle Technologies; Ari Weil, Anders Hokinson, Chris Stern, and Paul Thompson from Akamai Technologies; Virna Sekuj, Doug Gorman, and Christy Civitanova from GlobalWebIndex; and Leslie Jeng from PCRI for your unconditional help. Over the years, we have been fortunate to cultivate around our research program a growing group of well-wishers and data partners whose input, advice, and insights have been invaluable to us. We are grateful to all of you for your continued partnership with us.

A special shout-out to our technology wizards at Tufts, without whom our interactive platform would not have seen the light of day. João Quintino, Thomas Cox, Steven Garrett, Bill Sivret, Sauyee Wong, and Michael Maciolek, we are deeply grateful to you for your timely help and guidance. We will continue to draw on your kindness as we build more interactivity into this platform.

This report benefited greatly from the keen eye of Julia Magnusson, our editor. We are grateful to the communication and PR teams—for all their efforts in helping us share this work with the world. Dania Saidam and Kerry Cooper-Bradfield from Mastercard; Joseph Nallen, Lindsay Hammes, and Alexandra Bowser from Fletcher; Jen Heady, Kenneth Craig, and Christine Williamson from Greenough; and Lauren Welford, Tom Derrick, Francesca Crias, and Julia Taylor from Ketchum, our sincere thanks to all of you.

A picture is worth a thousand words. Our grateful thanks to our inimitable and immensely talented design team at Sunny Side Up — Anand Krishnan, Aniket Mahajan, Durga Deepak, Hari Krishnan, Mohammad Jahangir, Neeraj Sharma, Poonam Rao, and Riya Chak — for the nifty visualizations of our Digital Planet research and for helping turn the idea of an interactive DII platform into reality.

We would be remiss if we did not thank our colleagues behind the scenes whose support and everyday acts of kindness have created a vibrant space for us and our team to think about and conduct research on the global digital economy. Agnes Hatley, Akiyo Fujii, Ann Cullen, Brad Macomber, Cyndi Rubino, Dorothy Orszulak, Ellen McDonald, Emily Rezendes, Gerard Sheehan, Gregory Simpson, Halley Goldman, James Rollins, Kristen Zecchi, Lupita Ervin, Maria Pereira, Dean Maribel Blanco, Dean Rachel Kyte, Susan Lagasse, Shelley Adams, and Therese Vienot, we are grateful to you.

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Contents

Executive Summary

Suffice it to say, the year 2020—the year of the COVID-19 pandemic—defies description. Indeed, the publisher of Oxford Languages "Word of the Year" declined to select a single word, as "it became quickly apparent that 2020 is not a year that could neatly be accommodated" in just one word.[1] The data do not quite do justice to 2020 either. At the time of writing, there have been over 61 million COVID-19 cases and over 1.4 million deaths worldwide.[2] The fact that the world economy is expected to contract by 4.4 percent,[3] that most countries around the globe are on the brink of recession,[4] or that global consumer confidence is 5 points lower than its historic average[5] does not seem to fully capture the disruption and distress wrought by the pandemic this year. Beneath these statistics are individual lives lost, families displaced, and livelihoods reinvented. As we cautiously look around the corner toward 2021 and beyond, the path to recovery will be "long, uneven and uncertain."[6]

Amidst all of the turmoil of 2020 triggered by the SARS-CoV-2 coronavirus, one trend did emerge clearly: digitalization helped people work, learn, shop, and socialize safely during a pandemic and hold on to some semblance of normalcy. In April, an estimated 1.2 billion children were affected by school closures,[7] with learning mostly moving online—for those who had access. The global e-commerce market is expected to grow by nearly one-third from 2019 to 2020.[8] Social events such as weddings, birthdays, and holidays quickly shifted online; the widely used video conferencing application, Zoom, at this writing, has a market capitalization of $129 billion, making it worth more than IBM.[9] Ninety-three percent of respondents in a global survey of executives reported an increase in remote working and/or collaboration, with over half of those saying they believe that the shift to remote work will stick.[10] At the same time, the pandemic exacerbated existing inequalities,[11,12] leading many participants in the global economy to question how business and policymakers might work together to "build back better."[13] Even as several promising vaccines are on the horizon, and as we collectively navigate a path out of the pandemic and the worldwide "pause" that it gave rise to, we hope this work provides decision-makers with the tools to recognize the role of digital technologies during this pause. We also hope that this study of the evolution and state of trust in digitalization can help us harness these very technologies to ensure a more inclusive and resilient future.

It is in this context that The Fletcher School at Tufts University, in partnership with Mastercard, present the Digital Intelligence Index. The current index encompasses the third edition of the Digital Evolution scorecard, following up on our earlier editions in 2017[14] and 2014,[15] and the second edition of our Digital Trust scorecard.

The Digital Intelligence Index is a data-driven holistic evaluation of the progress of the digital economy across 90 economies, combining more than 358 indicators in two scorecards: Digital Evolution and Digital Trust. Digital Evolution contains four key drivers: Supply Conditions, Demand Conditions, Institutional Environment, and Innovation and Change. The resulting framework captures both the state and rate of digital evolution and identifies implications for investment, innovation, and policy priorities.

The Digital Trust scorecard covers a smaller group of 42 economies and contains four key drivers: Environment, Experience, Behavior, and Attitudes. These measures consider the trustworthiness of the digital ecosystem in each economy, the level and types of friction in digital experiences, the depth of engagement among internet users, and the

level of trust in the digital ecosystem expressed by citizens. Given the rise in misinformation[16] fueled by the pandemic, politics and other societal factors; the accelerating reliance on online technologies and on large technology companies; the waning faith in institutions;[17] and the alarming increase in cyberattacks,[18] the subject of digital trust—how to foster it, how to harness it, and how to think about its presence in a future where decisions are guided by artificial intelligence—is of prime importance.

The Digital Evolution framework segments 90 economies into four zones: Stand Outs, Stall Outs, Break Outs, and Watch Outs. Within the Stand Out segment, three economies are particularly notable for maintaining a high absolute score and fast digital momentum. These "super-Stand Outs" include the South Korea, Singapore, and Hong Kong.[19] These economies, along with other small nations, islands, and entrepôts such as New Zealand, Estonia, Taiwan, and the United Arab Emirates, are consistently top performers in our Index and have demonstrated nimbleness, adaptability to change, and institution-led support for innovation. Remarkably, for an economy of its size and complexity, the US scores second after Singapore in digital evolution.

China[20] is a noteworthy outlier for a very different reason. It is moving faster in digital evolution than all other economies, especially because of its growth in both demand and innovation. In addition to China, other large, populous developing economies including Indonesia and India, Brazil and Nigeria continue to attract investor interest despite institutional and infrastructural gaps, but their digital journeys are quite different: while Indonesia and India experienced high momentum, Brazil and Nigeria experienced slow momentum. This suggests that the role of digitalization in the emergence of these highly significant countries is going to be quite different, and each has opportunities for a lot of catching up in the years ahead.

The nimble entrepôts, digitally advanced developed economies, and high digital momentum populous economies are not the only bright spots on the digital planet. Midsized nations such as Kenya, Vietnam, Bangladesh, Rwanda, and Argentina have been using digital technologies, with potential to leapfrog and transform their economies. These leapfrogs make for ideal role models and benchmarks for those in the Watch Out zone on how to use the digital economy as a lever for change.

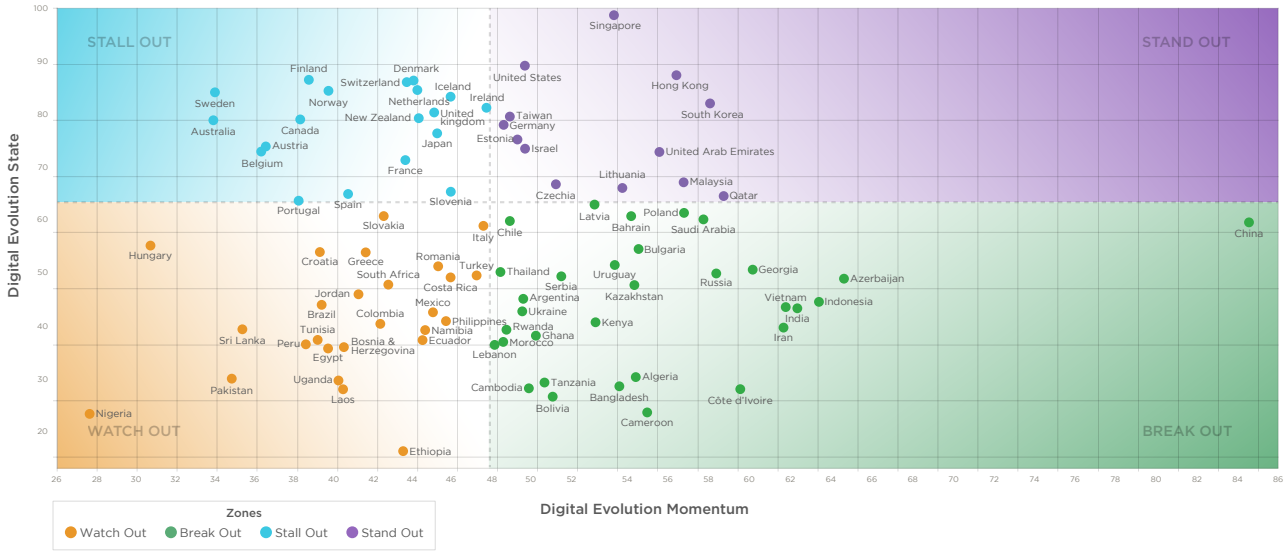
This edition of Digital Evolution and Digital Trust is accompanied by an interactive website facilitating analyses and comparisons across economies and various parameters. They are part of a "platform" of essential measures: Digital Intelligence Index. A study of readiness for emerging technologies, such as artificial intelligence—also a part of this platform—is forthcoming. The index offers data, insights, and international comparisons to guide decision-makers to chart a path out of the challenges of 2020 and toward a data-enabled, artificial intelligence-augmented, and inclusive digital future.

The map below captures how digitalization or digital evolution varies in economies across the globe.

We assess the "competitiveness" of a country's digital economy as a function of two factors: its current state of digitalization and its pace of digitalization over time, as measured by the growth rate of its digitalization score over a twelve-year period (2008-2019). We arrayed countries' latest year (2019) score (state of digitalization) on the vertical axis against the growth rate over a twelve-year period (pace of digitalization) on the horizontal axis to create the Digital Evolution Chart (Figure 1): an atlas for the digital planet. This chart helps to classify economies into four distinct trajectory zones: Stand Out, Stall Out, Break Out, Watch Out.

Figure 1

Digital Evolution: State & Momentum



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By overlaying our Digital Trust scorecard measures on the Digital Evolution chart, we are able to recognize several important patterns across the segments (Figures 2-5).

Figure 2

Digital Trust: Environment

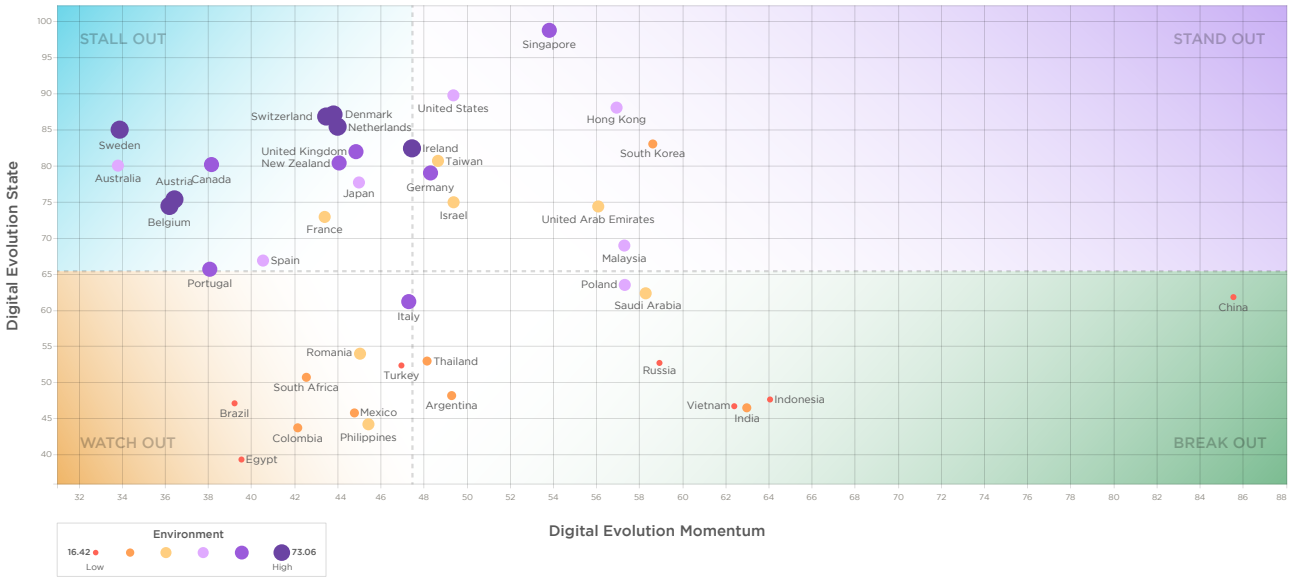

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Figure 3

Digital Trust: Experience

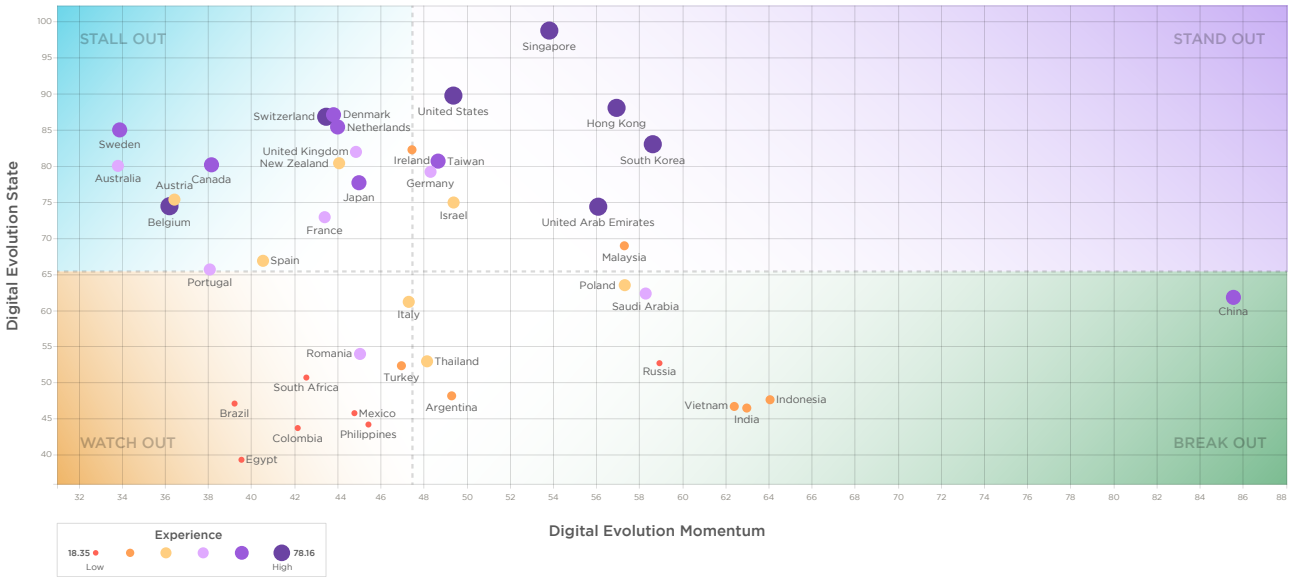

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Figure 4

Digital Trust: Behavior

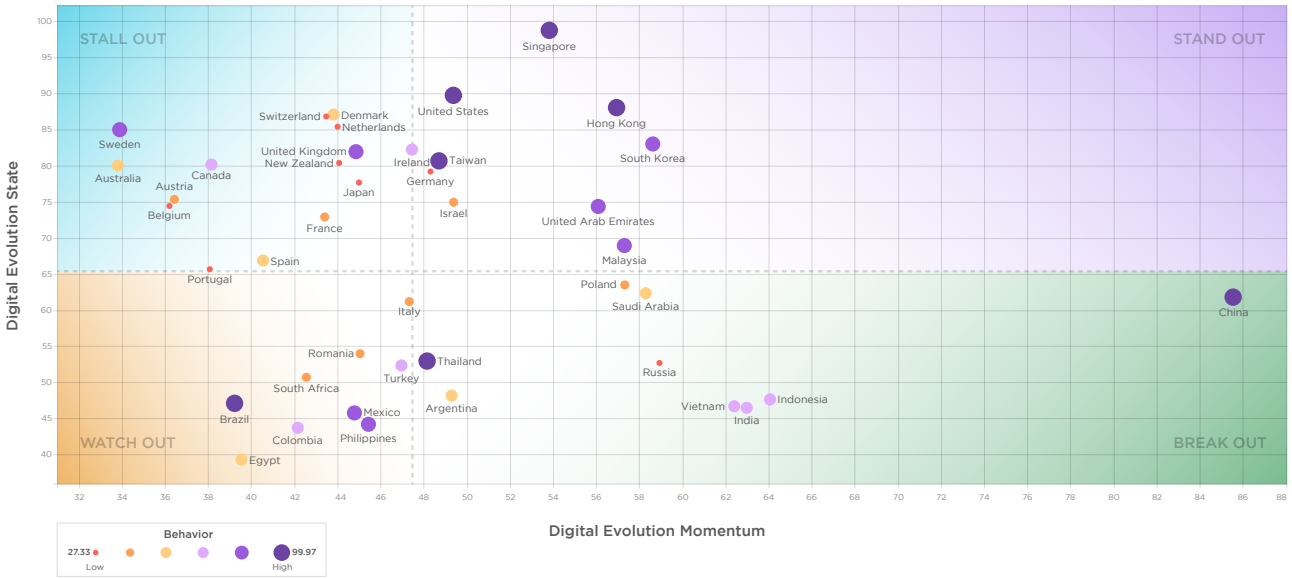

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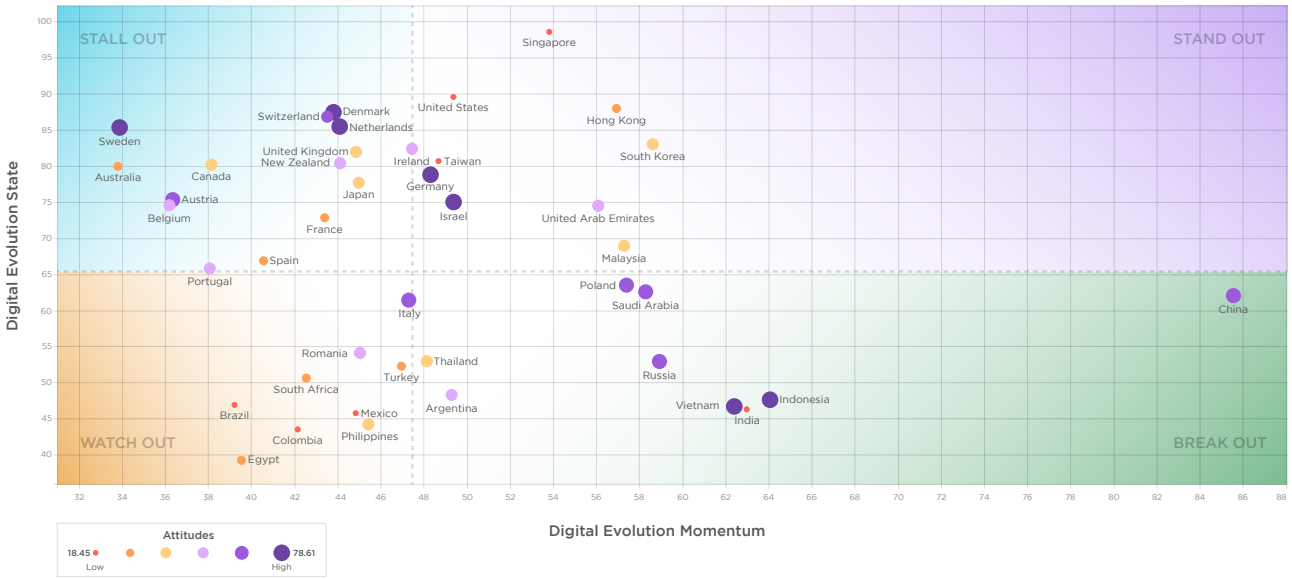
Figure 5

Digital Trust: Attitudes



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Stand Out economies are highly digitally advanced and exhibit high momentum. They are leaders in driving innovation, building on their existing advantages in efficient and effective ways. Their populations exhibit particularly engaged online behavior, and their digital systems provide the most seamless online experience. However, sustaining consistently high momentum over time is challenging, as innovation-led expansions are often lumpy phenomena. To stay ahead, these economies need to keep their innovation engines in top gear and generate new demand or run the risk of stalling out. Moreover, users in Stand Out economies are observed to hold more skeptical attitudes towards technology, digitalization, and the future.

Stall Out economies enjoy a high state of digital advancement while exhibiting relatively slower momentum. Moving past these "digital plateaus" will require a conscious effort by these economies to reinvent themselves, bet on a rising digital technology in which they have leadership, and eliminate impediments to innovation. To keep from falling behind, Stall Out economies may look to Stand Out economies for lessons in sustaining innovation-led growth. Unlike their Stand Out peers, however, users in Stall Outs hold more optimistic attitudes towards technology and digitalization writ large and experience greater rates of digital inclusion. Evidence suggests these economies may be trading off accelerated growth to introduce regulations and policies to sustain greater social equity, data protections, and trusting attitudes.

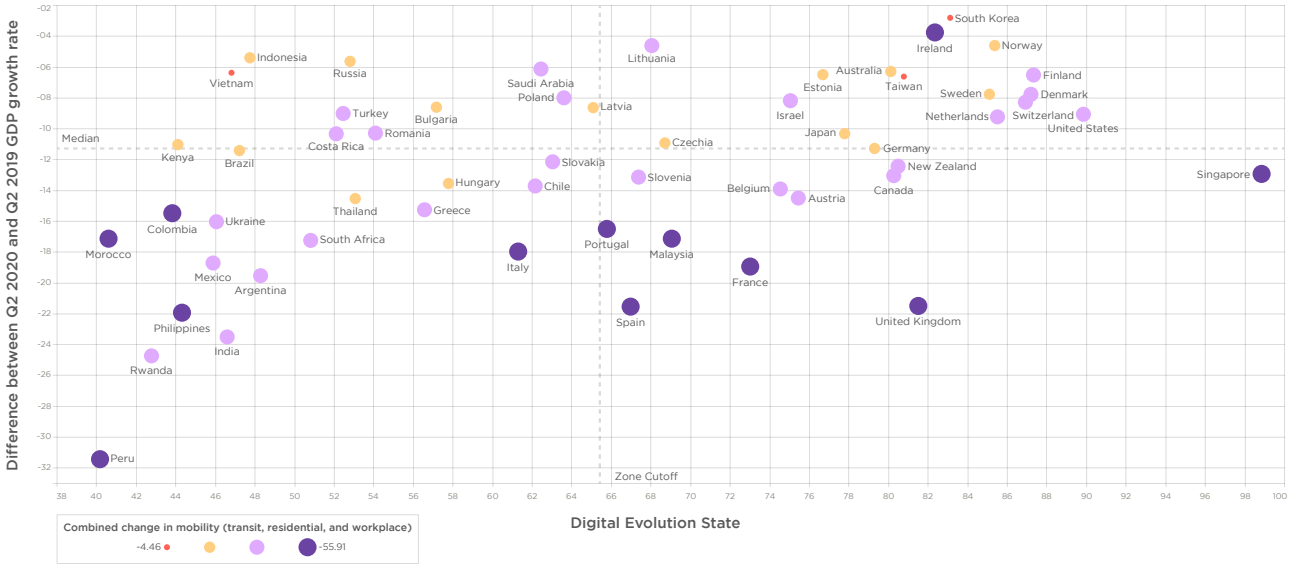
Break Out economies are lower scoring in their present states of digitalization but are evolving rapidly. The strong momentum of Break Out economies and their significant headroom for growth would make them highly attractive to innovators and investors. Break Out economies exhibit some of the most optimistic attitudes towards digitalization and technology. Held back often by relatively weak infrastructure and poor institutional quality, Break Out economies would do well to foster better institutions that can help nurture and sustain innovation and invest in improving the quality and depth of access. Break Out economies have the potential to become the Stand Out economies of the future with economies such as China, India, Indonesia, Saudi Arabia, Kenya, and Russia leading the pack.

Watch Out economies face significant challenges with their relatively lower state of digitalization and lower momentum. With digital weakness on most fronts, Watch Out economies hold the most skeptical attitudes toward digitalization and technology. Still, some of these economies demonstrate creativity in the face of severe infrastructural gaps, institutional constraints, and low sophistication of consumer demand. The surest way for these economies to improve on momentum would be to improve access to the internet for their masses by going beyond merely closing the mobile internet gap[21]—that is, the difference between the number of mobile phones and the number of mobile phones with internet access—into laying down terrestrial broadband infrastructure and bringing more of their citizens into the digital present. Moreover, for the Watch Out economies that demonstrate engaged online behaviors, the key may be in determining how to channel this incipient digital consumption activity into digitally enabled economic growth and gainful employment.

This was the global digital economy that the world inherited as it went on a pause for the pandemic. The experience during the period when much of the world went into lockdown in response to COVID-19 created the purest test of the internet. The exhibit below maps digital evolution with social distancing behaviors, captured by the change in mobility in transit, workplace and residential settings, and the economic impact, captured in terms of change in GDP growth in the second quarter of 2020 relative to 2019 (with some countries excluded from this analysis for data comparability reasons) (Figure 6).

Figure 6

Digital Evolution and Economic Resilience



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An analysis of this global digital economy yields 6 key takeaways:

- In the time of a pandemic, digital evolution is an essential contributor to economic resilience, even while it is not a panacea for the negative economic impact of social distancing universally. Whereas a high state of digital evolution was certainly a help for most economies, its potential to cushion the blow was dependent on the makeup of the economy.
- "More data privacy protections and less data protectionism" is the mantra for the highly digitally evolved economies. Open data flow policies that lower the barriers for digital business activity combined with a strong privacy protections and security environment encourage greater digital activity and further data generation. These are key to building competitive and innovative digital economies.
- Mobile internet access is necessary but not sufficient for the economies with potential for further digital evolution. Economies in the "Digital South," i.e., those in the Break Out and Watch Out zones that have not realized the highest levels of digital evolution, would do well to focus on improving access, affordability, and quality of mobile internet and not lose sight of the need to invest in more even access to broadband connectivity and better devices to unlock the full potential of digitalization driven economic growth.
- Economies at all levels of digital evolution must invest in empowering consumers with the necessary "digital hygiene" and literacy skills to combat misinformation and cybersecurity threats. Public-private partnerships focusing on both supply-side and demand-side solutions will strengthen trust in and the resilience of the broader digital ecosystem.
- The more digitally evolved economies must consider a tradeoff between maintaining high levels of momentum—i.e., being at the cutting edge of innovation-driven growth—and investing in strong institutions to foster inclusive and trustworthy digital economies. Policymakers must strike the right balance between fast growth and a strong, sustainable trust environment.
- A select few digital entrepôts are linchpins for global and regional digital advancement through establishing a self-reinforcing ecosystem, attracting global investments and talent. They create a demonstration effect for the rest of the world as to what the future might look like.

Context

At the time of writing, to say we are living through unprecedented times is an understatement. Large swathes of the global economy are at a virtual standstill, and billions of people are sheltering in place or re-entering lockdown mode to protect themselves from the SARS-CoV-2 virus. Economies around the world now depend on citizens practicing safe social distancing and sustaining some semblance of work and well-being. The digital economy is the glue holding this "socially distanced economy" together. Consumers the world over are placing an extraordinary amount of trust in the still evolving digital ecosystem at a time of great fragility even as trust in this digital system is being severely tested. Case in point, the consequences of the recently concluded national election in the United States of America continue to unfold at the time of writing given the residual impact of the sheer volume of misinformation and interference[22] amplified by digital networks.

While these are challenging times, from the perspective of technology, these are also the "it could have been a whole lot worse" of times, compared to any other era of human history. At least we have a state of digital evolution that enables such social distancing. We are experiencing the purest test of the internet imaginable even as we endure the unimaginable—and are quickly discovering how able the internet and its applications are to recreate a facsimile of life as usual, as well as their limitations. This forced dependence on digital systems will, no doubt, accelerate the process of evolution and have a profound impact on the state of trust in all things digital. An additional essential lesson this pandemic has taught economies around the world is that the reach and resilience of digital infrastructure and quality of digital inclusion may not be an option anymore but an obligation that nations owe to their citizens.

Over the years since we first started tracing the digital evolution of economies around the world, we have observed the narrowing of supply—e.g., digital infrastructure—gaps between economies and burgeoning growth in digital adoption at an aggregate level, even though many intra-market gaps persist. Across many parts of the world, the pandemic has accelerated the digital transformation of the ways we buy, sell, dwell, socialize, work, play, and pay, hastening our transition from a physical past to a digital present. While the digital present is surely upon us, participation in all things digital is far from even or equitable. The pandemic has exposed the many gaps not only in developing economies, such as India, where school lessons are being distributed over WhatsApp and not all households have access to a smartphone,[23] but in advanced economies, such as the United States, where schoolchildren have to huddle outside a Taco Bell to access Wi-Fi[24] to finish their homework.

While closing supply gaps and continuing to invest in next-generation bandwidth capabilities such as 5G and associated applications, along with a secure digital environment, still remain a vital aspect of realizing the digital present, the determinants of digital competitiveness are shifting. We are witnessing an evolution from mere existence of access as a key driver to more nuanced demand-side aspects such as quality of access, sophistication and digital literacy of users, and trust in the digital system. Consequently, economies that nurture positive attitudes and engaged behaviors among their users by providing a secure environment and frictionless experiences are poised to remain digitally active. More active digital ecosystems generate more data, which, in turn, is the lifeblood of the competitive digital economies of the future.

In a time of waning trust in institutions around the globe,[25] it is incumbent on decision-makers in business and government and technologists to do their utmost to uphold users' trust in the digital system. The journey ahead from the digital present to a data-enabled, "artificial intelligence-augmented," and more inclusive digital future will depend on the strength of the bridge of digital trust that connects the two.

We introduce the Digital Intelligence Index, a research platform, at this extraordinary juncture in human history to provide evidence-driven, actionable insights on how to enhance digital competitiveness; nurture trust in the digital economy; and foster responsible use of data, AI, and other advanced technologies for enhanced productivity and the greater good. The Digital Intelligence Index can also guide decision making by technologists, innovators, investors, policymakers, and business leaders on this journey from a digital present towards a data enriched inclusive artificial intelligence-augmented future.

The questions that guide our work in this edition of the Digital Intelligence report include:

- How did the state of digital evolution have an impact on the ability to maintain social distancing and provide a cushion to the economic blow during the COVID-19 pandemic?
- What are the emerging patterns of digital evolution around the world, and how have they changed since the last time we studied them?
- How are the determinants of digital competitiveness evolving, and which economies are the most digitally competitive?
- What is the state of digital trust around the world, and how are the drivers of digital trust impacting competitiveness?
- What is the relationship between the digital trust environment and digital advancement?

The Digital Intelligence Index Platform: An Overview

The Digital Intelligence Index platform is built to encompass several scorecards measuring various aspects of the global digital economy. As the foundational measure, the Digital Evolution scorecard tracks the state and historical momentum of 90 economies—comprising 95% of the world's online population—over twelve years (2008-2019), to provide business and policy guidance for digital growth. This third edition of Digital Evolution builds on our prior editions (2014 and 2017) to represent a data-driven evaluation of the progression of the global digital economy, combining 160 unique indicators across four key drivers: Supply Conditions, Demand Conditions, Institutional Environment, and Innovation and Change. The resulting framework captures both the state and rate (momentum) of digital evolution and identifies implications for investment-, innovation-, institutions-, inclusion-, and infrastructure-related business and policy priorities.

The Digital Trust scorecard represents the bridge to "what's next," comparing national outlooks and behaviors around emerging technologies and evaluating the performance of the givers and guarantors of trust across 42 economies. This second edition of Digital Trust builds on our prior edition (2017) to examine the trustworthiness of the digital environment for each economy, the trustworthiness of the experience that users have, attitudes towards key institutions and organizations, and user behavior when interacting with the digital world and what it reveals about their trust in the digital system. The subject of Digital Trust is of emerging importance to participants and stakeholders in the digital economy, given growing concerns on many fronts: the security of essential information, cyberattacks, consumers' apprehensions about digital systems and their reliability, concerns about data privacy and the spread of misinformation, worries about the power of digital businesses and their growing dominance, and the outsized influence of founders and leaders of digital enterprises.

The Digital Evolution scorecard segments the 90 economies in our study into Stand Outs, Stall Outs, Break Outs and Watch Outs. Five economies are particularly notable even within the Stand Out zone: Singapore, Taiwan,[26] Estonia, South Korea, and the UAE. Each has a unique policy-led digital strategy and approaches that are worthy of emulation. Singapore, the United States, Hong Kong,[27] Switzerland, and the Nordics top the Digital Evolution rankings. As in the two previous editions of Digital Evolution, China[28] remains the fastest-moving economy in terms of the pace of change in its digital evolution—i.e., digital momentum. Our two previous digital evolution studies generated policy, executive, and investor interest worldwide. This edition offers new insights and directions for decision-makers at a time when the world is experiencing uncertainty on multiple fronts—public health, geopolitics, and economic outlook—combined with the certainty of the steady incursion of digital technology into every aspect of human endeavor.

In this edition of the Digital Intelligence Index, we draw upon a combined total of 358 indicators—in the Digital Evolution scorecard (90 economies; 160 comparable indicators over 12 years) and Digital Trust scorecard (42 economies; 198 indicators from the latest available year)—from a combination of more than 45 data sources comprising public databases such as the World Bank and World Economic Forum; subscription services such as GSMA Intelligence and Euromonitor; and proprietary sources such as Akamai, Blue Triangle, Mastercard, GlobalWebIndex, and Private Capital Research Institute. The patterns, surprises, and constants this research produced underscore how nurturing growth of the digital economy is distinct from nurturing business-as-usual and why healthy digital economies require targeted interventions by policymakers and business builders. The full scores, notable patterns, and a summary of the implications are discussed below.

Digital Intelligence Index: A Platform of Scorecards

Figure 7
The roadmap

The Digital Evolution scorecard captures an economy's state and historical momentum from the physical past to the digital present...

...and Digital Trust is the bridge that connects the journey from the digital present to an artificial intelligence augmented and inclusive digital future.

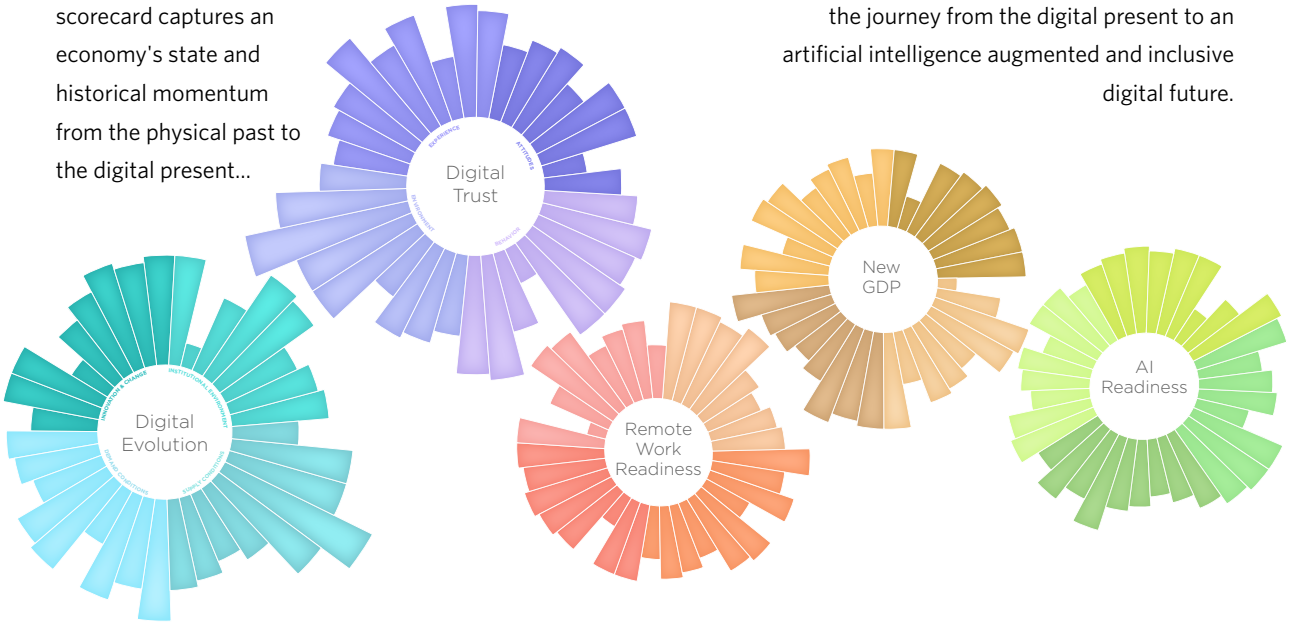

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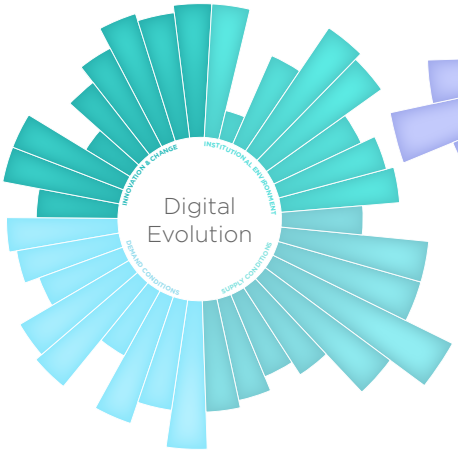
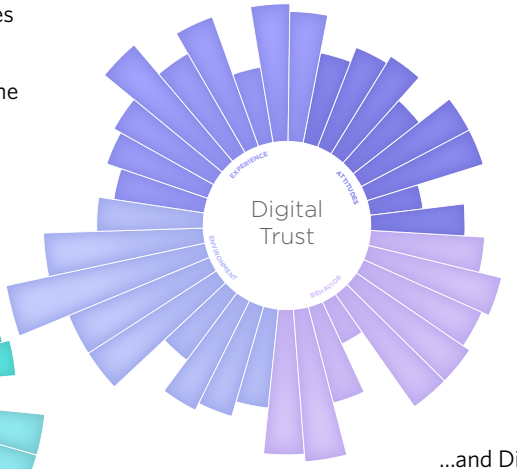
Figure 8

The focus of this report

The Digital Evolution scorecard captures an economy's state and historical momentum from the physical past to the digital present...





...and Digital Trust is the bridge that connects the journey from the digital present to an artificial intelligence augmented and inclusive digital future.

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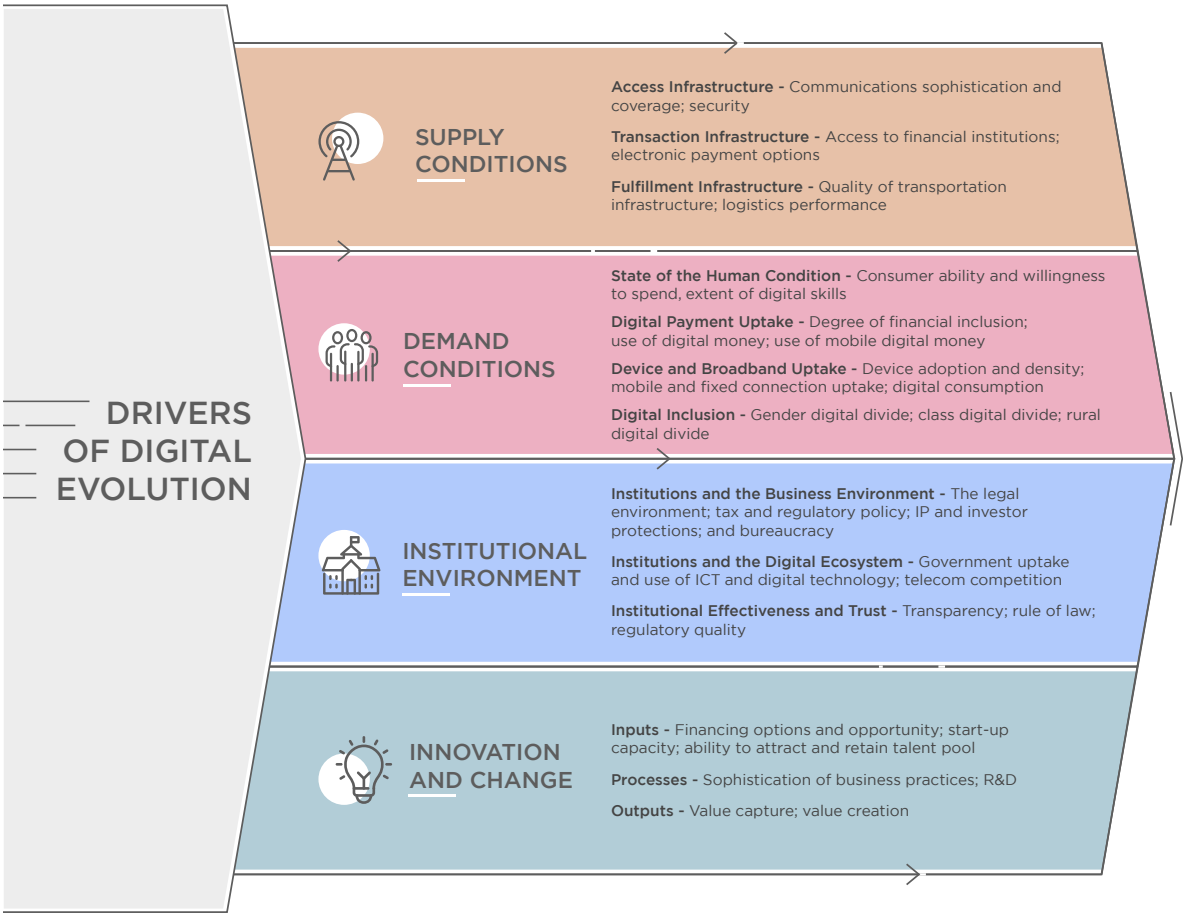
The Drivers of Digital Evolution

The Digital Evolution scorecard is a data-driven evaluation of the progression of the global digital economy. The central hypothesis of our Digital Evolution scorecard is that four drivers—Supply Conditions, Demand Conditions, Institutional Environment, and Innovation and Change—govern the progress of the digital economy (Figure 9). In this edition, we study the evolution of 90 digital economies, using 160 comparable indicators over a 12-year period (2008-2019).

Figure 9

Digital Evolution Methodology Explained



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Supply Conditions: How developed is the infrastructure to facilitate digital interactions and transactions? This driver measures the quality and readiness of digital and underlying analog infrastructure to facilitate access, enable interaction and transactions online, and ensure fulfilment and delivery of physical and digital goods and services.

Demand Conditions: Are consumers willing and able to engage in the digital ecosystem? What is the state of the human condition online? What is the state of digital inclusion across race, class, and gender? The indicators underpinning Demand Conditions help address additional questions, such as:

• Do consumers have the means and instruments necessary to plug into the digital economy?

• Do consumers have the willingness and continued interest to remain actively engaged in the Digital Economy?

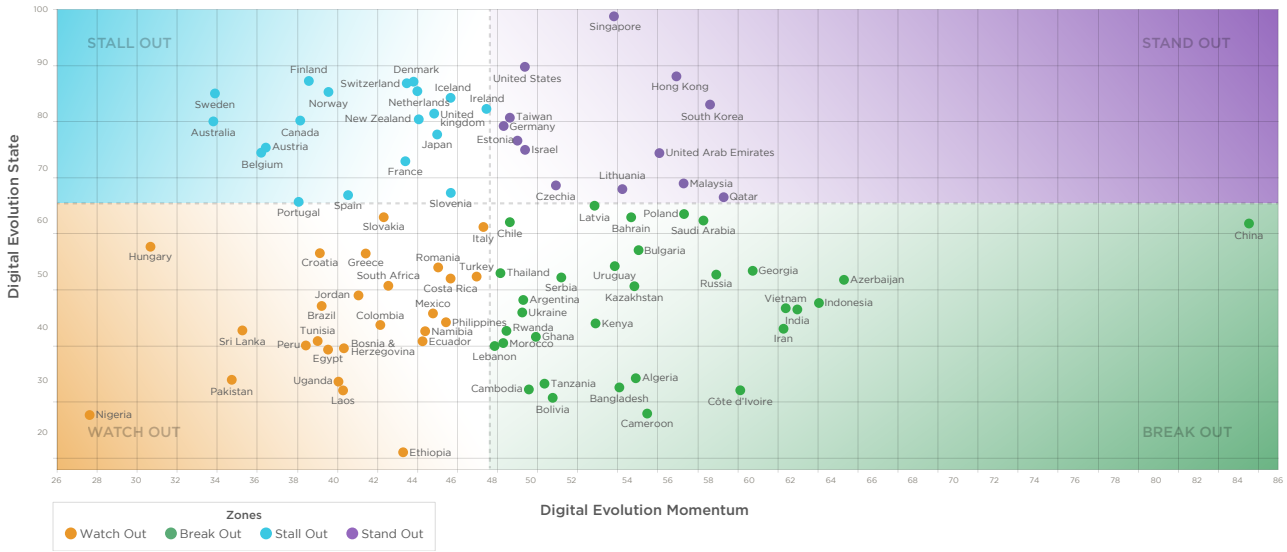
Institutional Environment: In addition to directly investing in infrastructure and establishing laws and regulations, government actions and policies play an essential role in either supporting or hindering the business engine that creates and distributes digital technologies. At the same time, governments are key to determining the climate for investment and innovation in digital technologies and their applications. By providing a stable environment that encourages investment and protects consumers, governments create enabling conditions or even the technologies themselves that foster digitalization. The indicators underpinning the Institutional Environment driver also help address questions such as: Are governments taking deliberate steps towards advancing and adopting digitalization? Do they have policies and regulations in place to foster digital ecosystems?

Innovation and Change: Innovation is the key to finding new solutions to global, national, and local challenges. Innovation and the resulting change push the boundaries of the digital ecosystem and what it can do; it is in equal parts the most impactful and challenging driver to jumpstart. By breaking down the systems of innovation into inputs such as availability of talent and capital; processes, such as university and industry collaboration in R&D; and outputs, such as new digital products and services created, we measure the vitality of innovation in a country and identify opportunities for improvement. The indicators associated with this driver focus on the core issue of: What is the extent of innovation taking place in the country's digital economy?

Charting Digital Evolution

Figure 10

Capturing the State and Rate of Digitalization



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The Four Zones of Digital Evolution

Starting with a baseline of Digital Evolution, the index overlays a momentum score to provide the most comprehensive index to date. The index is then segmented into the following categories:

- **Stand Out** economies are both highly digitally advanced and exhibit strong momentum. They are leaders in driving innovation, building on their existing advantages in efficient and effective ways.
- **Stall Out** economies enjoy a high state of digital adoption despite slowing momentum. They tend to trade off speed for sustainability and are typically invested in expanding digital inclusion and building robust institutions.
- **Break Out** economies, while lower scoring in their current states of digitalization, are evolving rapidly. With such momentum and significant headroom for growth, they are often highly attractive economies to investors.
- **Watch Out** economies face significant challenges with their low state of overall digitalization and low momentum. But despite severe infrastructure gaps, younger demographics in these economies display enthusiasm for a digital future with increased use of social media and mobile payments.

Scores and Rankings

The tables in this section list the 90 economies in the order of their Digital Evolution Scores and Digital Momentum Scores. A higher score represents a higher level of digital advancement.

To analyze and compare economies across a variety of parameters including performance across drivers, please visit our Digital Intelligence Index interactive site.

Figure 11

Digital Evolution: State

Rank	Economy	State
1	Singapore	98.82
2	United States	89.82
3	Hong Kong	88.12
4	Finland	87.30
5	Denmark	87.17
6	Switzerland	86.89
7	Netherlands	85.48
8	Norway	85.34
9	Sweden	85.07
10	Iceland	84.29
11	South Korea	83.09
12	Ireland	82.32
13	United Kingdom	81.48
14	Taiwan	80.75
15	New Zealand	80.46
16	Canada	80.24
17	Australia	80.09
18	Germany	79.27
19	Japan	77.76
20	Estonia	76.66
21	Austria	75.42
22	Israel	75.02
23	Belgium	74.51
24	United Arab Emirates	74.44
25	France	72.99
26	Malaysia	69.03
27	Czechia	68.68
28	Lithuania	68.02
29	Slovenia	67.35
30	Spain	66.95
31	Qatar	66.58
32	Portugal	65.75
33	Latvia	65.06
34	Poland	63.58
35	Slovakia	63.01
36	Bahrain	63.00
37	Saudi Arabia	62.42
38	Chile	62.13
39	China	61.89
40	Italy	61.27
41	Hungary	57.75
42	Bulgaria	57.14
43	Croatia	56.60
44	Greece	56.54
45	Uruguay	54.29

Rank	Economy	State
46	Romania	54.06
47	Georgia	53.46
48	Thailand	53.04
49	Russia	52.78
50	Turkey	52.43
51	Serbia	52.27
52	Costa Rica	52.08
53	Azerbaijan	51.85
54	South Africa	50.79
55	Kazakhstan	50.71
56	Jordan	49.07
57	Argentina	48.26
58	Indonesia	47.72
59	Brazil	47.19
60	Vietnam	46.79
61	India	46.57
62	Ukraine	46.03
63	Mexico	45.86
64	Philippines	44.29
65	Kenya	44.08
66	Colombia	43.80
67	Iran	43.13
68	Sri Lanka	42.83
69	Rwanda	42.75
70	Namibia	42.69
71	Ghana	41.69
72	Tunisia	40.94
73	Ecuador	40.90
74	Morocco	40.58
75	Peru	40.15
76	Lebanon	40.05
77	Bosnia & Herzegovina	39.65
78	Egypt	39.41
79	Algeria	34.31
80	Pakistan	34.03
81	Uganda	33.70
82	Tanzania	33.34
83	Bangladesh	32.67
84	Cambodia	32.31
85	Côte d'Ivoire	32.16
86	Laos	32.14
87	Bolivia	30.82
88	Cameroon	28.01
89	Nigeria	27.75
90	Ethiopia	21.11

Figure 12

Digital Evolution: Momentum

Rank	Economy	Momentum
1	China	85.51
2	Azerbaijan	65.28
3	Indonesia	64.03
4	India	62.95
5	Vietnam	62.37
6	Iran	62.26
7	Georgia	60.72
8	Côte d'Ivoire	60.10
9	Qatar	59.27
10	Russia	58.90
11	South Korea	58.59
12	Saudi Arabia	58.26
13	Poland	57.29
14	Malaysia	57.27
15	Hong Kong	56.91
16	United Arab Emirates	56.06
17	Cameroon	55.45
18	Bulgaria	55.02
19	Algeria	54.88
20	Kazakhstan	54.81
21	Bahrain	54.65
22	Lithuania	54.21
23	Bangladesh	54.06
24	Uruguay	53.83
25	Singapore	53.79
26	Kenya	52.87
27	Latvia	52.82
28	Serbia	51.16
29	Czechia	50.89
30	Bolivia	50.73
31	Tanzania	50.32
32	Ghana	49.89
33	Cambodia	49.54
34	Israel	49.35
35	United States	49.34
36	Argentina	49.26
37	Ukraine	49.21
38	Estonia	48.97
39	Chile	48.59
40	Taiwan	48.59
41	Rwanda	48.42
42	Germany	48.28
43	Morocco	48.26
44	Thailand	48.12
45	Lebanon	47.83

Rank	Economy	Momentum
46	Ireland	47.42
47	Italy	47.27
48	Turkey	46.93
49	Slovenia	45.64
50	Iceland	45.63
51	Costa Rica	45.63
52	Philippines	45.40
53	Romania	45.01
54	Japan	44.96
55	United Kingdom	44.81
56	Mexico	44.75
57	Namibia	44.36
58	Ecuador	44.23
59	New Zealand	44.04
60	Netherlands	43.97
61	Denmark	43.78
62	Switzerland	43.44
63	France	43.37
64	Ethiopia	43.26
65	South Africa	42.52
66	Slovakia	42.29
67	Colombia	42.12
68	Greece	41.39
69	Jordan	41.03
70	Spain	40.51
71	Bosnia & Herzegovina	40.30
72	Laos	40.26
73	Uganda	40.03
74	Norway	39.53
75	Egypt	39.51
76	Brazil	39.19
77	Croatia	39.10
78	Tunisia	38.99
79	Finland	38.55
80	Peru	38.40
81	Canada	38.12
82	Portugal	38.04
83	Austria	36.40
84	Belgium	36.17
85	Sri Lanka	35.23
86	Pakistan	34.70
87	Sweden	33.86
88	Australia	33.78
89	Hungary	30.64
90	Nigeria	27.60

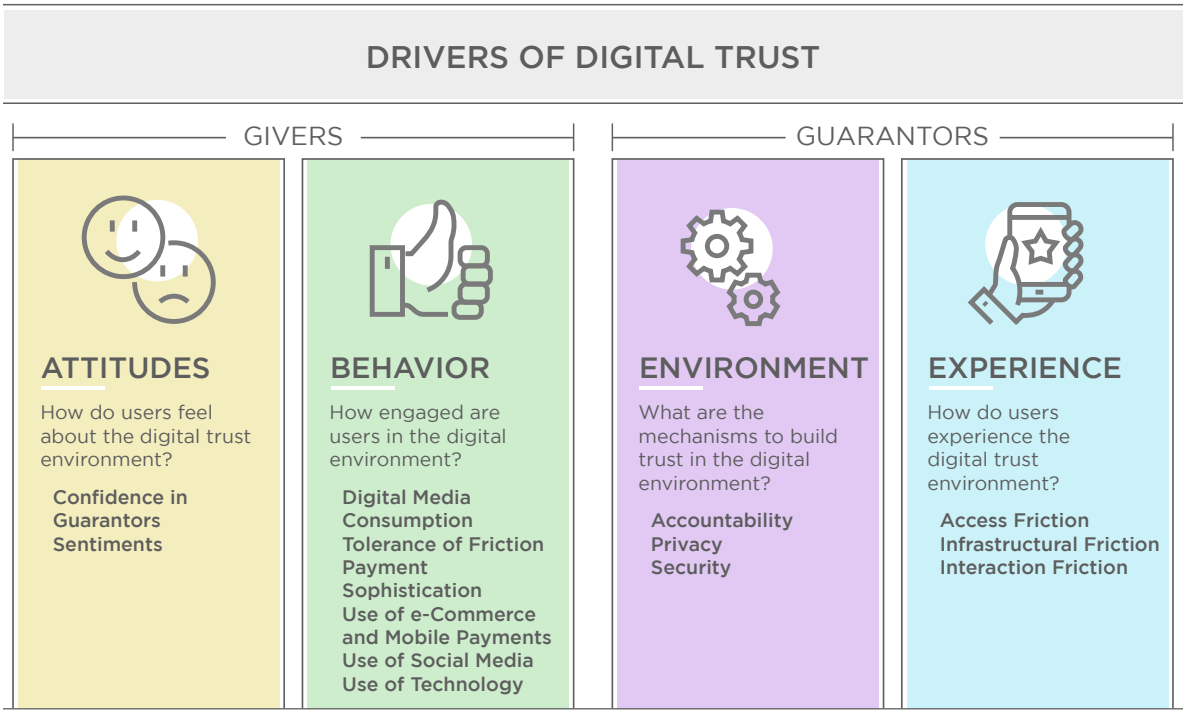
The Drivers of Digital Trust

In the context of the digital economy, we define trust as the leap of faith and the confidence that causes users to exercise a choice to interact, transact, and consume online. Fundamentally, it determines the quality of the interaction between those who give trust and those who guarantee to uphold said trust.

To capture some of digital trust's complexity and the interplay between the givers (users, consumers, citizens) and the guarantors (businesses and institutions), we studied trust along four key dimensions: Environment and Experience, provided by the guarantors; and Attitudes and Behavior of the givers. These four elements comprise the major axes around which digital trust between the givers and guarantors revolve.

In this edition of the Digital Trust scorecard, we study the state of trust across 42 economies—a subset of the 90 economies from our Digital Evolution scorecard—using 198 comparable indicators (Figure 13).

Figure 13
Drivers of Digital Trust



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Digital Environment

What are the mechanisms that build trust in the digital environment, and how robust are these mechanisms?

Through evaluating privacy, security, and accountability measures, we estimated the maturity and extent of trust-building features of the digital environment as provided by the guarantors. These three features—privacy, security, and accountability—are fundamental trust-building elements that contribute to the digital trust environment. Additionally, they are elements that businesses and institutions are able to shape in meaningful ways.

Digital User Experience

How do users experience the digital trust environment?

The upholders of the trust environment (businesses and institutions) face a constant tradeoff between providing the highest level of privacy, security, and accountability and ensuring a seamless, friction-free experience. Some frictions exist to guarantee safety, security, and privacy and are therefore necessary. However, when overused, these "positive" frictions can make the user less willing to engage online. In addition, the clearly negative frictions can make users question the reliability of the service and their willingness to go through with online interactions or transactions. The ultimate goal ought to be "intelligent friction": balancing a seamless experience with proper security protections. We measure three major sources of friction under Experience: infrastructural, access, and interaction.

Attitudes

How do users feel about the digital trust environment?

A different approach to measuring trust is to simply ask consumers. Most of us, in the natural course of day-to-day life, experience trust as a "gut feeling." This feeling can be about the people associated with the digital industry, those associated with science and technology, the value we place on technology as an integral part of life, or the credibility of the information that comes through to the digital environment and the institutions governing it. These perceptions and beliefs can span a wide range of questions: How do users say they feel about the digital environment? Do they trust and find value in their transactions and interactions? Do they trust the leaders of major technology companies? Do they trust their governments to keep their data secure? Do they trust technology companies to use their data in an ethical manner?

We compiled the most relevant and credible survey data on questions that help us to gain insight the confidence users have in guarantors and their sentiments towards a variety of aspects pertaining to technology in their lives.

Behavior

How engaged are users in the digital system?

One could reasonably make the case that users who are engaging online, particularly those who make transactions online, can be seen as demonstrating a higher level of trust behavior than those who do not. Moreover, such engagement behavior does not necessarily correlate with attitudes; one is not a proxy for the other. This is an important distinction.

We measure behavior by examining engagement across a variety of parameters: consumer use of technology, social media, e-commerce, and mobile payments. In addition, we look at media consumption patterns, payment sophistication, and tolerance for friction in the online experience, i.e., how tolerant users are to a given level of friction in the digital system and whether they persist in completing said transaction. The higher the proportion of users that complete said transaction in an economy for a given level of friction, we interpret it as behavior that is more trusting through an application of the principle of "revealed preference"—that is, the users' preferences with regard to interacting with the digital system are revealed by their actual actions.[29] One could also interpret this as "digital trust-in-action."

Scores and Rankings

Our Digital Trust scorecard provides an in-depth look at the most up-to-date indicators measuring four dimensions of digital trust—Environment, Experience, Behavior, Attitudes—across 42 of the 90 Digital Evolution economies.

Overlaying the drivers of Digital Trust on the Digital Evolution grid (Figure 15) offers insights into the relationship between the state and rate of digitalization and the state and attributes of trust in any given economy.

Digital Trust: Environment

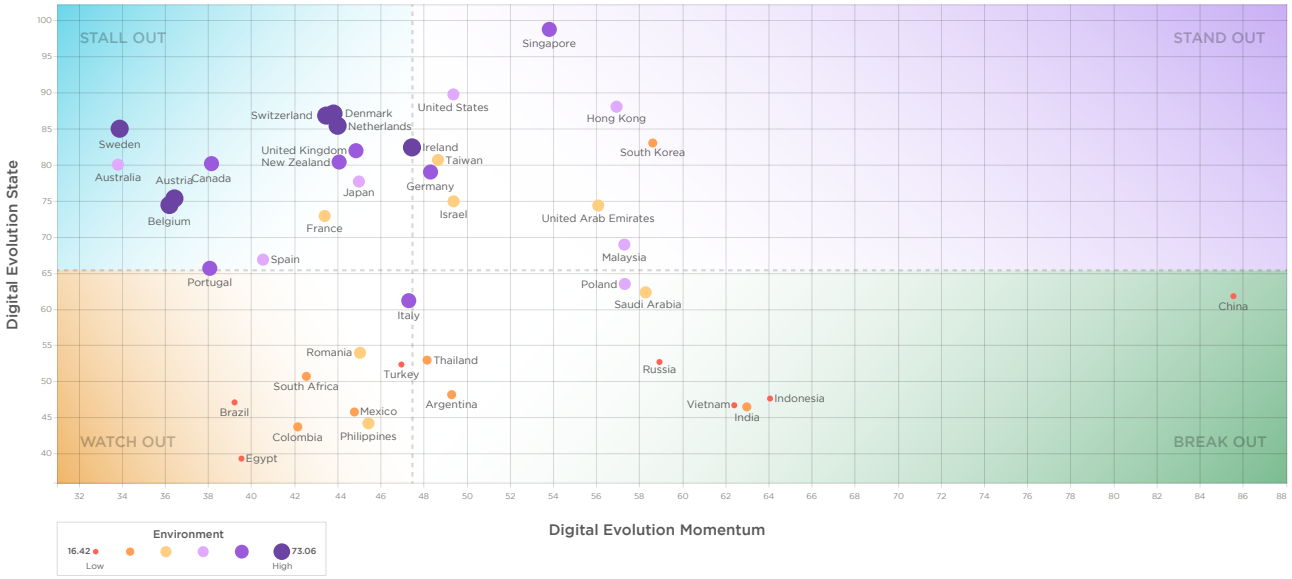
Figure 14
Digital Trust: Environment

Rank	Economy	Environment
1	Denmark	73.06
2	Switzerland	67.98
3	Sweden	67.65
4	Netherlands	67.13
5	Austria	66.77
6	Ireland	65.15
7	Belgium	65.09
8	United Kingdom	65.00
9	Germany	64.96
10	Canada	62.24
11	New Zealand	62.22
12	Singapore	61.66
13	Portugal	61.50
14	Italy	60.40
15	Australia	59.22
16	Japan	58.67
17	United States	58.41
18	Poland	58.31
19	Spain	57.82
20	Hong Kong	55.15
21	Malaysia	54.14

Rank	Economy	Environment
22	France	54.05
23	Taiwan	53.45
24	United Arab Emirates	52.45
25	Israel	49.07
26	Romania	47.81
27	Saudi Arabia	42.45
28	Philippines	42.22
29	South Korea	41.68
30	South Africa	40.89
31	Colombia	37.95
32	India	37.02
33	Mexico	36.57
34	Thailand	34.00
35	Argentina	33.08
36	Vietnam	31.35
37	Indonesia	30.81
38	Turkey	30.37
39	Brazil	29.62
40	Russia	28.52
41	China	17.67
42	Egypt	16.42

Figure 15

Digital Trust: Environment



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Environment asks the questions: What are the mechanisms to build trust in the digital environment? How are guarantors of trust performing in ensuring a safe and secure online ecosystem? The Environment score includes three key components: accountability, privacy, and security. A high environment score is correlated with a high Digital Evolution score—a high score on Institutions. In fact, it appears that a strong environment score is nearly always necessary to make it to the northern part of the Digital Evolution grid. Stall Out economies with strong environment scores, such as Switzerland, Denmark, the Netherlands, and Sweden, also have more optimistic attitudes.

Environment has a strong negative correlation with momentum, driven primarily by accountability and privacy factors, suggesting a tradeoff between high momentum and a strong trust environment. This pattern is most prominent in issues around privacy.

While privacy and security are frequently considered at odds, our analysis reveals that privacy vs. security is indeed a false dilemma,[30] with a strong correlation between the two. A robust trust environment is a sign of digital maturity and sustainability.

Digital Trust: Experience

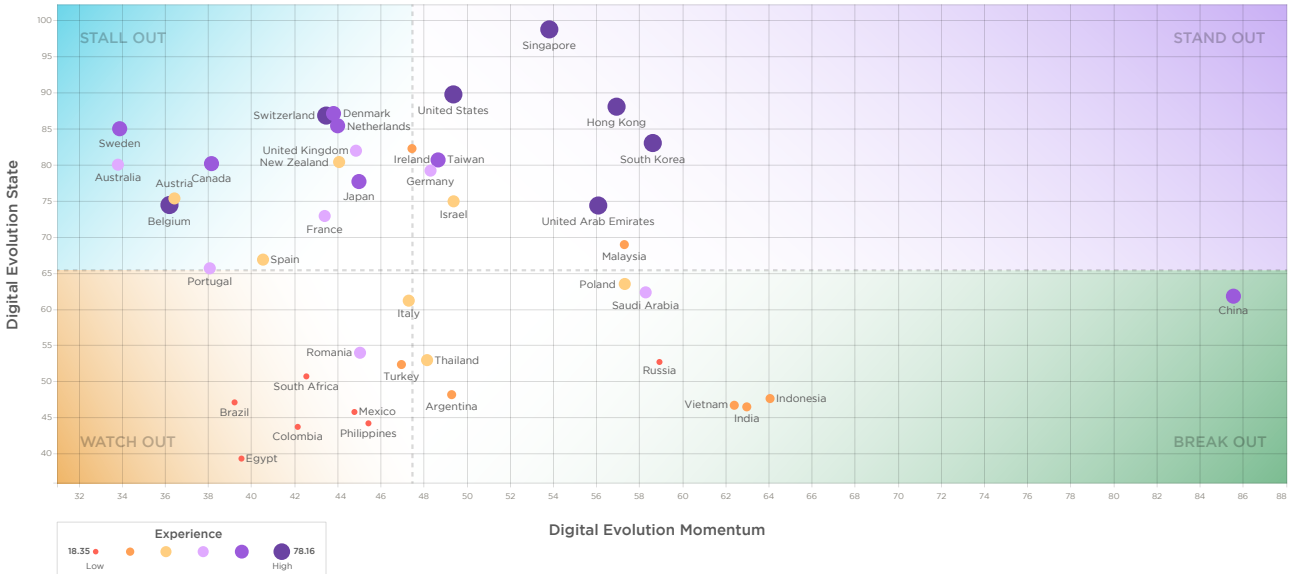
Figure 16
Digital Trust: Experience

Rank	Economy	Experience
1	United States	78.16
2	United Arab Emirates	73.59
3	Hong Kong	68.71
4	Singapore	68.68
5	Switzerland	67.65
6	Belgium	64.79
7	South Korea	64.20
8	China	63.70
9	Denmark	61.76
10	Taiwan	61.67
11	Japan	60.37
12	Sweden	59.64
13	Netherlands	58.50
14	Canada	57.17
15	Saudi Arabia	56.80
16	Romania	56.57
17	Germany	55.99
18	United Kingdom	55.33
19	Australia	54.76
20	Portugal	54.68
21	France	54.39

Rank	Economy	Experience
22	New Zealand	53.41
23	Austria	51.41
24	Israel	51.26
25	Poland	51.25
26	Spain	50.81
27	Thailand	48.22
28	Italy	48.14
29	Ireland	47.84
30	Vietnam	42.80
31	Malaysia	42.27
32	India	37.77
33	Turkey	35.43
34	Indonesia	30.96
35	Argentina	30.88
36	South Africa	30.42
37	Brazil	29.37
38	Egypt	27.20
39	Russia	26.96
40	Colombia	25.57
41	Mexico	22.57
42	Philippines	18.35

Figure 17

Digital Trust: Experience



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Experience measures the quality of user experience in the digital trust environment. We study three major sources of friction under Experience: infrastructural friction, access friction, and interaction friction. These three types of friction, in that order, represent the increasingly challenging hurdles economies must overcome to move into the Stand Out zone.

First, infrastructure friction looks at whether the basic infrastructure is in place to allow for access. For instance, what is 4G coverage like in a country? Could a user access it if they had the means? Second, access friction measures cost and coverage: how affordable is access to the internet, and how many people are actually accessing it? Third, interaction friction measures the experience once connected: What are broadband and mobile performance like? How smooth is the experience of purchasing an item online?

While most economies have adequate basic digital infrastructure, a handful of economies toward the bottom of the grid—Russia, Mexico, Colombia, Philippines, and Egypt—could reduce their infrastructure friction. Access friction is the measure most correlated with Digital Evolution, with several fast-moving economies such as Indonesia, India, and Vietnam showing a weakness in access. Interaction friction shows that most of the Stand Out economies—and China—excel in providing seamless online interaction and transaction experiences.

Digital Trust: Behavior

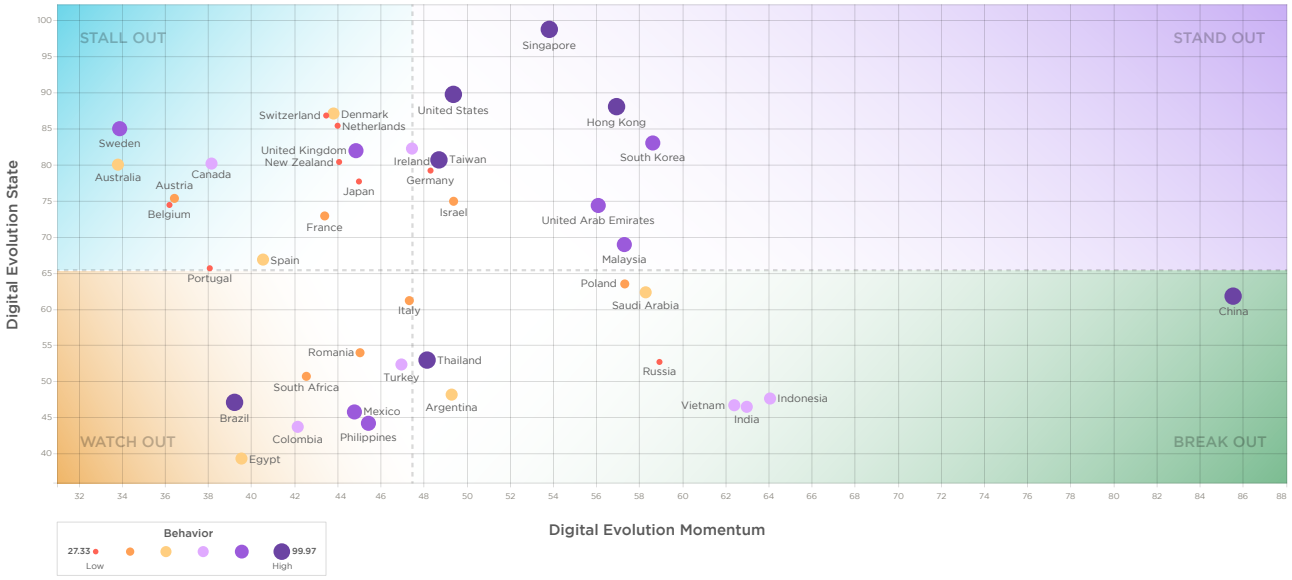
Figure 17
Digital Trust: Behavior

Rank	Economy	Behavior
1	China	99.97
2	Hong Kong	75.77
3	United States	72.16
4	Singapore	68.87
5	Taiwan	65.62
6	Brazil	65.18
7	Thailand	63.59
8	Malaysia	61.32
9	Mexico	61.25
10	Philippines	59.71
11	South Korea	59.48
12	Sweden	59.12
13	United Arab Emirates	57.88
14	United Kingdom	55.68
15	India	55.17
16	Indonesia	53.88
17	Vietnam	52.65
18	Turkey	52.58
19	Ireland	51.97
20	Canada	51.50
21	Colombia	51.40

Rank	Economy	Behavior
22	Australia	50.97
23	Saudi Arabia	50.56
24	Argentina	47.35
25	New Zealand	47.19
26	Denmark	46.30
27	Spain	43.86
28	Egypt	42.32
29	South Africa	41.48
30	Poland	39.26
31	Italy	38.45
32	France	35.78
33	Israel	34.91
34	Romania	34.38
35	Austria	34.23
36	Portugal	33.79
37	Germany	32.46
38	Netherlands	32.36
39	Japan	31.12
40	Belgium	30.97
41	Russia	30.17
42	Switzerland	27.33

Figure 18

Digital Trust: Behavior



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Behavior asks the question: How do users (givers of trust) react and interact with the digital environment and experience? We measure behavior through examining consumer use of technology, social media, e-commerce, and mobile payments. In addition, we look at media consumption patterns, payment sophistication, and tolerance for friction in the online experience. Through these various metrics, we can determine a level of engagement with the digitalizing world.

Behavior correlates with momentum, and this pattern is even starker at the northern part of the Digital Evolution grid. It appears that one thing that sets Stand Out economies apart from Stall Outs is highly engaged behavior. At the bottom part of the grid, the top four fastest-moving economies—China, Indonesia, India, and Vietnam—all have high levels of digital engagement.

Several Watch Out economies—Brazil, Colombia, Mexico, and the Philippines—all display highly engaged behavior, despite their low momentum scores. High levels of engagement are seen through social media and technology use, a potential bright spot for technologists, policymakers, and business leaders to convert this demand into future growth.

Digital Trust: Attitudes

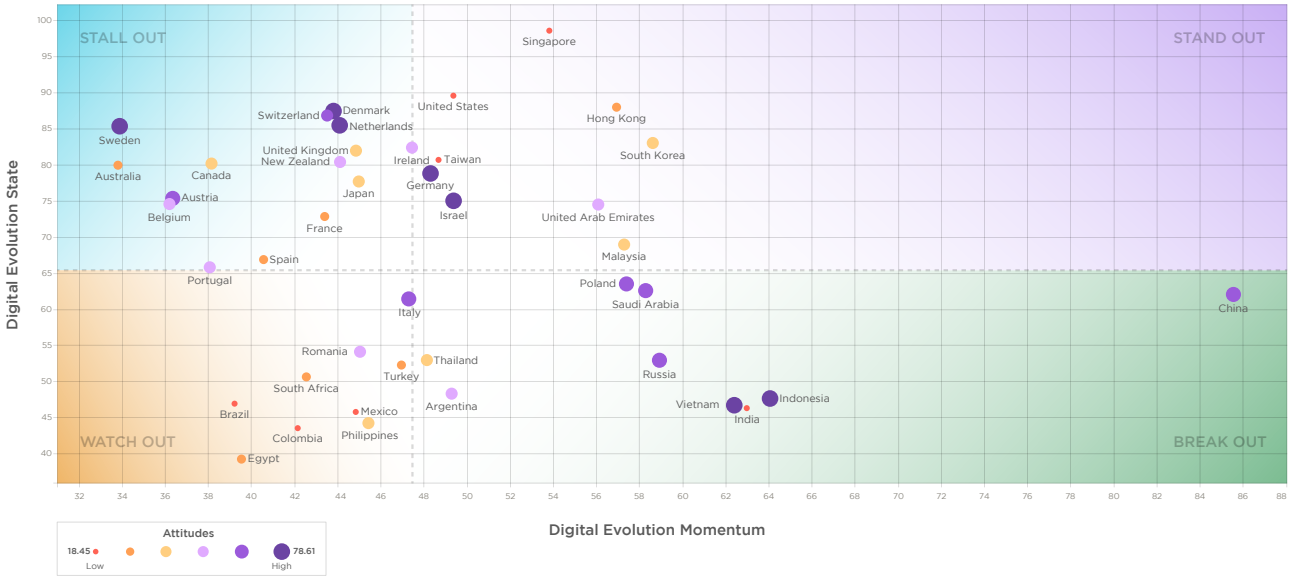
Figure 19
Digital Trust: Attitudes

Rank	Economy	State
1	Netherlands	78.61
2	Sweden	77.19
3	Vietnam	76.38
4	Indonesia	75.84
5	Israel	73.21
6	Denmark	69.23
7	Germany	64.23
8	Switzerland	63.46
9	Russia	63.19
10	Saudi Arabia	62.73
11	China	60.66
12	Italy	58.47
13	Poland	58.25
14	Austria	57.20
15	Portugal	53.78
16	Belgium	53.26
17	Ireland	50.81
18	New Zealand	50.25
19	United Arab Emirates	49.95
20	Romania	49.33
21	Argentina	49.27

Rank	Economy	State
22	Japan	49.16
23	Malaysia	46.95
24	Canada	46.82
25	South Korea	46.82
26	United Kingdom	46.74
27	Thailand	45.74
28	Philippines	45.60
29	Egypt	45.13
30	Spain	44.12
31	France	41.17
32	Australia	39.65
33	South Africa	38.29
34	Hong Kong	34.93
35	Turkey	33.26
36	Taiwan	33.05
37	United States	33.03
38	Singapore	32.42
39	Mexico	30.39
40	Brazil	28.53
41	India	24.46
42	Colombia	18.45

Figure 20

Digital Trust: Attitudes



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The attitudes measure asks the question: How are citizens (givers of trust) feeling about their experiences with digitalization? We examine survey data around trust in science and technology, concerns over new technologies and job prospects, sentiments around privacy, and trust in technology companies and leaders. Mapping these attitudes on the Digital Evolution zones reveals that the Break Out and Stall Out economies tend to have more optimistic attitudes than their Stand Out and Watch Out peers.

Stall Out economies, which tend to have higher incomes and better institutional environments, have more positive user attitudes than their Stand Out peers, despite their lack of momentum. The trend is the opposite in the southern part of the chart, where high momentum accounts for more positive attitudes, despite a lower absolute Digital Evolution score.

Inclusion may provide one explanation. Indeed, there is a mild inverse correlation between momentum and digital inclusion: the fastest-moving economies also tend to be less inclusive. Two major exceptions are Singapore and Egypt. Singapore—perhaps due to its small geographic footprint and population size—ranks highest on our measure of digital inclusion, while maintaining strong momentum. Egypt, on the other hand, has both slow momentum and poor inclusion.

On the northern part of the chart in particular, there appears to be a tradeoff between momentum and investments in strong institutions to foster inclusive and trustworthy digital economies, as well as a population that appears to be satisfied with more inclusion at the risk of losing a little speed. On the southern portion of the chart, economies such as Vietnam and Indonesia are two examples of fast movers with optimistic attitudes, suggesting surging demand conditions are fueling a more positive outlook towards technology and the future, despite lower inclusion.

Integrating Digital Evolution and Trust

To recap the learnings from an integrative analysis of evolution and trust, consider each of the four key zones:

Stand Out economies are both highly digitally advanced and exhibit high momentum. They are leaders in driving innovation, building on their existing advantages in efficient and effective ways. Their populations exhibit particularly engaged online behavior, and their digital systems provide the most seamless online experience. However, sustaining consistently high momentum over time is challenging, as innovation-led expansions are often lumpy phenomena. To stay ahead, these economies need to keep their innovation engines in top gear and generate new demand or run the risk of stalling out. Moreover, Stand Out economies are observed to hold more skeptical attitudes towards technology, digitalization, and the future.

Stall Out economies enjoy a high state of digital advancement while exhibiting relatively slower momentum. Moving past these "digital plateaus" will require a conscious effort by these economies to reinvent themselves, bet on a rising digital technology in which they have leadership, and eliminate impediments to innovation. To keep from falling behind, Stall Out economies may look to Stand Out economies for lessons in sustaining innovation-led growth. Unlike their Stand Out peers however, users in Stall Outs hold more optimistic attitudes towards technology and digitalization writ large and experience greater rates of digital inclusion. Evidence suggests these economies may be trading off accelerated growth to sustain greater social equity, inclusion, and trusting attitudes.

Break Out economies are lower scoring in their present states of digitalization but are evolving rapidly. The strong momentum of Break Out economies and their significant headroom for growth would make them highly attractive to investors. Break Out economies exhibit some of the most optimistic attitudes towards digitalization and technology. Held back often by relatively weak infrastructure and poor institutional quality, Break Out economies would do well to foster better institutions that can help nurture and sustain innovation and invest in improving the quality and depth of access. Break Out economies have the potential to become the Stand Out economies of the future with China, India, Indonesia, Saudi Arabia, Kenya, and Russia leading the pack.

Watch Out economies face significant challenges with their low state of digitalization and low momentum. With multiple sources of digital weakness, Watch Out economies hold the most skeptical attitudes toward digitalization and technology. Still, some of these economies demonstrate remarkable creativity in the face of severe infrastructural gaps, institutional constraints, and low sophistication of consumer demand. The surest way for these economies to improve on momentum would be to improve access to the internet for their masses by going beyond merely closing the mobile internet gap[31]—that is, the difference between the number of mobile phones and the number of mobile phones with internet access—into laying down terrestrial broadband infrastructure and bring more of their citizens into the digital present. Moreover, for the Watch Out economies that demonstrate engaged online behaviors, the key may be in determining how to channel this incipient digital consumption activity into digitally enabled economic growth and gainful employment.

Successful Stand Out economies have prioritized:

- Deepening digital engagement: ecommerce, payments, entertainment;
- Attracting, training, and retaining digital talent;
- Fostering digital entrepreneurial ventures;
- Providing fast, universal, terrestrial and mobile broadband internet access;
- Specializing in the export of digital goods, services, or media; and
- Coordinating innovation between universities, businesses, and digital authorities.

Successful Break Out economies have prioritized:

- Improving mobile internet access, affordability, and quality and fostering adoption;
- Strengthening institutional environments and developing digital authorities;
- Generating investment in digital enterprises, funding digital R&D, and training digital talent; and
- Reducing digital inequities.

Potential Actions to take

While economies face different combinations of demographic considerations and other challenges, the Digital Intelligence Index points to some emerging patterns, implications, and broadly applicable short- and long-term actions that can be tailored to meet the needs and priorities of the economy in question.

Watch Out and Break Out economies, particularly those demonstrating emerging or sustained digital demand, should:

- Make long-term investments in whole-population access infrastructure and digital education;
- Work towards creating an institutional environment which supports digital innovation and wide-scale and safe consumer adoption of digital products and services; and
- Promote initiatives to broaden digital inclusion across gender, class, geographic, and ethnic divides.
- Watch Out economies should look to emulate the success of Break Outs in promoting the adoption of mobile payment platforms.
- Economies must begin this journey to avoid being left behind; whole population access should be treated as a priority intervention, without which the multiplier effects created by digital innovations are difficult to realize.

Stand Out economies are already succeeding and recognize they are entering the "after-access" phase—while several of these economies still need to expand access, they would do well to focus on what this access facilitates and where barriers, if any, are. To maintain their global leadership positions, Stand Out economies should:

- Expand digital inclusion, focusing on improving quality access across gender, geographic, and class measures;
- Continue to promote and pilot digital innovations which challenge conventional wisdom and drive humankind forward;
- Prioritize universal and affordable high-speed internet, both fixed and mobile, to prepare for the next generation of digital innovation.

These innovations, and the institutional environments and ecosystems that foster them, are all exportable and will become increasingly important sources of political, economic and soft power in the coming decade.

Stall Out economies are highly developed and have mature digital landscapes but have less momentum. This could be a point of weakness, but they must:

- Safeguard against digital plateaus by continuing to invest in the institutional environment (a competitive advantage already);
- Ensure that access is inclusive and that consumers are protected from the risks of unchecked digital change;
- Attract, train, and retain professionals with digital skills; and
- Crucially, to stimulate momentum again, seek to find new technological or digital niches, specialize in them further, and foster environments friendly to innovation.

Main Takeaways and Implications

01. In the time of a pandemic, digital evolution is a contributor to economic resilience, while not a panacea for the negative economic impact of social distancing universally. Whereas a high state of digital evolution was certainly a help for most economies, its potential to cushion the blow was dependent on the makeup of the economy.

On March 11, 2020, the World Health Organization declared what had already become apparent to government leaders and health experts: the SARS-CoV-2 outbreak was a global pandemic.[32] Countries in Asia had already begun to lockdown as early as January, and by mid-March localized lockdowns shifted to national lockdowns, quickly becoming widespread around the globe.[33] Declines in economic activity were drastic enough to be seen from space.[34] Even as lockdowns began to lift, health experts continued to encourage those who were able to work from home to do so, and major companies like Google and Microsoft announced long-term work-from-home policies.[35] As countries shifted into various versions of "The Dance"[36]—the more modest policy measures to increase social distancing and limit transmission—and some were soon forced to go back into lockdown, policymakers began to grapple with how to limit the health and economic damage inflicted by the seemingly never-ending pandemic.

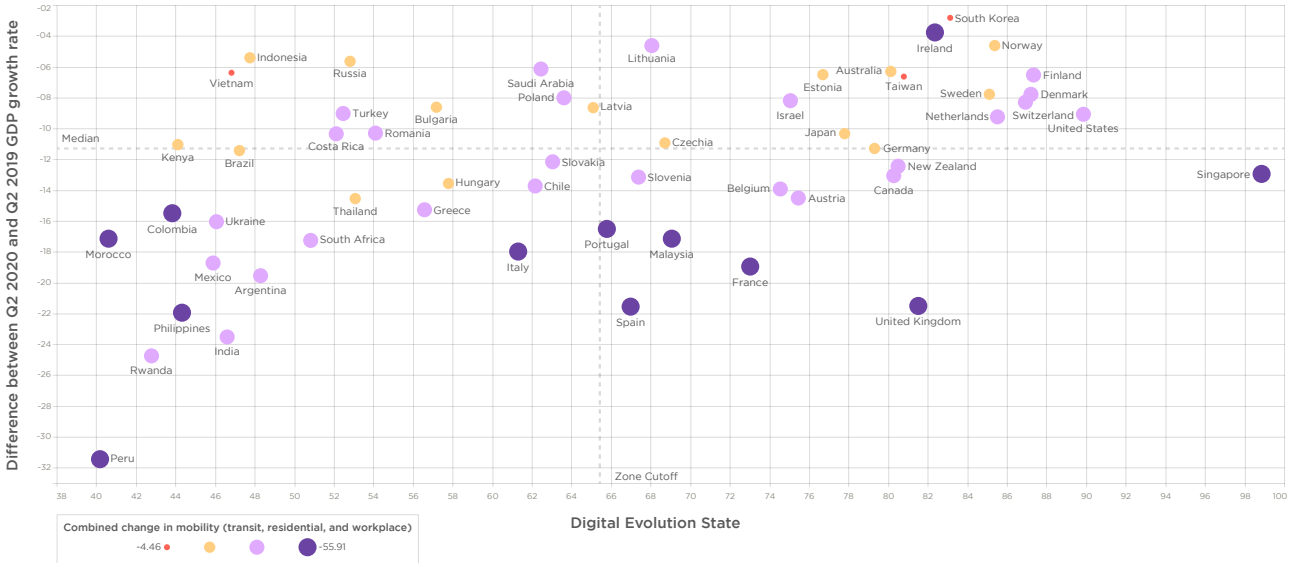
Which economies were most effective in limiting the negative impact, and how did they do so? What role did digital evolution play in boosting economic resilience? While researchers and academics will be studying these questions for years to come, and the full economic impact of the pandemic is not yet clear, we can begin an initial exploration into how digitalization interacted with pandemic response, social distancing, and ultimately the economic resilience across countries.

We found that while a high state of digital evolution was certainly a help for most economies, its potential to cushion the blow was dependent on the makeup of the economy.

In the exhibit below, we mapped the Digital Evolution score against the percentage fall in GDP growth from Q2 2020 as compared to the same quarter in 2019, adjusted for inflation (Figure 21). It suggests that digital evolution can explain at least 20% of the cushioning of economic impact. Several factors help explain this.

Figure 21

Digital Evolution and Economic Resilience



Digital Intelligence Index is a collaborative research initiative of The Fletcher School at Tufts University and Mastercard.

First, it is important to note that the more digitally evolved economies tend to derive a larger share of their GDP from high-tech and information services sectors; consequently, significant portions of their workforce can shift from offices to working from home.[37] Workers in places like Singapore, Sweden, Switzerland, the United Kingdom, Germany, and parts of the United States faced a smoother transition to telecommuting than workers in Thailand, India, Mexico, and Turkey. See the exhibits below for details (Figures 22-23).

Figure 22

Digital Evolution and Work-From-Home-Ready Workforce

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Figure 23

Economic Resilience and Work-From-Home-Ready Workforce

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Second, digitally evolved economies tend to be better at delivering public services online due to superior infrastructure, a track record of digital transformation of vast parts of the public sector, and accessible, affordable internet.[38] These capabilities are an asset even in normal times and particularly so in the context of a lockdown.

Among countries in the global south, there are a handful of outliers suggesting that it is not entirely necessary to be digitally evolved in order to avoid the worst-case economic scenario. Both Indonesia and Vietnam—two economies scoring relatively low on our digital evolution scorecard, yet high on momentum—avoided the worst outcomes. The Indonesian government was able to increase government spending by nearly 10%; while on a relative basis it is doing much better than other countries, it is still facing its worst recession in over two decades.[39] In Vietnam—the only South East Asian country on track for growth this year[40]—the government was able to keep the virus under control through extremely quick and aggressive measures.[41] Both the government and public have experience in dealing with infectious diseases and were willing to take preemptive actions such as shutting down borders, closing schools, and investing in a resource-intensive contact tracing program. The country was also a primary beneficiary of the manufacturing exodus from China.[42]

On the opposite end of the outlier spectrum, why are digitally evolved countries such as the United Kingdom—with a high contribution of high-tech and information services to GDP and a significant percentage of its labor force who can work from home, more freedom to stimulate the economy, and adequate public health capacity to navigate a pandemic[43]—suffering through an economic decline on par with India or Rwanda? Like many countries around the globe,[44] the UK's unfortunate economic state matches the deadly impact of the virus: more people died in the UK than anywhere else in Europe.[45]

Some of this failure can be attributed to government response. Despite being more digitally ready to lock down, the UK's nationwide lockdown did not begin until late March, weeks after other European countries (and months after Vietnam, which kicked off drastic measures in early January, before it had any confirmed cases). The UK remained locked down through late May, while other countries like Germany were starting their economic recoveries.[46] The services sector as a whole makes up around three quarters of the UK economy.[47] The economy is disproportionately reliant on in-person activities within the service sector, with around 13% of total output based on activities like eating out, going to the cinema, transportation, or attending live sporting events, as opposed to 10% in the euro area.[48] In the UK, 10.9% of GDP is from travel and tourism.[49] While this is a clear disadvantage, the UK was one of the most digitally prepared economies to go into lockdown, but the slow government response and the makeup of the UK economy led to the economic impact being severe despite its high state of digital advancement.

While being highly digitally evolved cannot save a country from a mismanaged government response, it can offer clear advantage. Consider South Korea, with policymakers willing to seize on the advantage of a digitally savvy and well-connected population and with the recent knowledge of a coronavirus scare.[50] South Korea is found on the polar opposite end of the chart below, with a similar level of digital evolution to the UK but a far better economic outcome. The high level of digital evolution in South Korea interacted with some of the country's other advantages to offer a level of resilience missing in most other countries.

In many ways, a high state of digital evolution was a clear advantage. South Korea's contact tracing program is reliant on fairly new technologies. It utilizes a government-issued tracing app, mandatory to all new arrivals to the country.[51] The country had already begun building a smart city database to track traffic and pollution in cities, using credit

card transaction data, CCTV footage, and location data. It is now expanding on that database to prevent COVID-19 transmission.[52] A major feature of the country's containment strategy is publishing anonymized patient routes.[53] With one of the highest smartphone penetration rates in the world,[54] South Koreans are better positioned to implement this kind of approach.

South Korea had a clear digital advantage going into this crisis, but it also had a disadvantage: trust in earlier government responses to epidemics was relatively low.[55] With the recent memory of Middle East Respiratory Syndrome (MERS) in 2015 and the slightly less recent experience of Severe Acute Respiratory Syndrome (SARS), in the end South Koreans appeared to be more amenable to solutions which trade off a level of privacy for avoiding large-scale lockdowns and similarly drastic measures. This is notable given that our measures of digital trust place South Koreans 25th out of 42 countries in their attitudes towards digital systems. Taking the recent lessons of MERS into account, the government paired its high pandemic surveillance approach with a high degree of transparency. This highly competent and transparent approach helped in managing the pandemic and its economic impact.

Digitally evolved countries, especially those with a high degree of digital trust, entered the pandemic with some clear advantages and can be expected to ride out the course of the pandemic. In addition to the benefit of a workforce more ready to shift online as well as digital platforms at-the-ready designed to help people work, learn, shop, and play online, the countries of the Digital North also tend to be richer, with more resources to soften the economic blow.

Digital South economies were at a disadvantage, facing a particularly tough choice on the timing, depth, and duration of lockdowns and social distancing measures. While the digital economies of fast movers in the Digital South, like India and Rwanda, were not quite evolved enough to be a major source of resilience during lockdowns, they do provide a light at the end of the tunnel for policymakers navigating their way out of COVID.[56] These fast-moving economies tend to have quite a bit in common: a youthful demographic bulge, a surge in digital uptake, and an increasingly digitally-savvy and engaged public. Policymakers in the Digital South would do well to harness this enthusiasm and look to digital as a way to jumpstart economic growth moving into 2021 and beyond.

02. "More data privacy protections and less data protectionism" is the mantra for the digitally evolved economies. Open data flow policies that lower the barriers for digital business activity, combined with a strong privacy protections and security environment to encourage greater digital activity and data generation, are key to building competitive and innovative digital economies.

Less data protectionism coupled with stronger data privacy protections will improve competitiveness and innovation. It has become enough of a cliché to refer to data as "the new oil" that the seemingly simple statement is being hotly debated.[57] While the oil analogy certainly has its limits, the growing value of data is clear. As a first step, policymakers would do well to measure, monitor, and understand the value of their Gross Data Product, or as we have called it, "the New GDP."[58] In order to unlock the full of value of the New GDP, economies must encourage an openness to data flows, while providing adequate privacy protections for their citizens. Economies in the Digital North (the northern part of the Digital Evolution grid), such as Singapore, Japan, Canada, and the Netherlands, illustrate this approach well, with greater openness to data flows and strong privacy protections. Economies in the Digital South (the southern part of the Digital Evolution grid), such as China, Russia, Turkey, and Saudi Arabia, score poorly on both these measures.

The growing trend of data localization laws raise barriers to data accessibility and are not only a hindrance to global growth but often diminish the competitiveness of the country in question through raising the costs for digital businesses, reducing competition, and encouraging rent-seeking behavior among domestic actors.[59]

Data privacy protections are key to ensuring the availability of data...and the ability to unlock its value. Economies that nurture positive attitudes and engaged behaviors among their users by providing a secure environment and frictionless experiences are poised to remain digitally active. More active digital ecosystems generate more data, which, in turn, is the lifeblood of the competitive digital economies of the future.

03. Mobile internet access is necessary but not sufficient. Economies in the Digital South would do well to focus on improving access, affordability, and quality of mobile internet and not lose sight of the need to invest in more even broadband access and better devices to unlock the full potential of digitalization driven economic growth.

Mobile internet access has been a strong driver of momentum in the global south and is the fastest route to get the remaining one-third of the global population online. However, mobile internet and the mobile phone are merely the first step in unlocking the benefits of digitalization. One key lesson the pandemic has offered is how the quality of access—that is, superior access (such as reliable terrestrial broadband) and better devices (for example, laptops and tablets are better suited for learning and working)—is a key input to economic resilience in a time of heavy reliance on digital technologies.

The least digitally advanced economies must allocate their limited resources wisely. Enabling internet access on the mobile phone provides the highest return on investment. The closing of the mobile internet gap has contributed to the high momentum demonstrated by economies in the Break Out zone, such as Kenya, India, and Vietnam. China leads the pack globally on this metric, thanks in no small part to a combination of economic growth, massive investments in 4G infrastructure, and a competitive mobile handset marketplace shaped by the likes of Xiaomi, Oppo, Huawei, and Vivo. As such, China is pulling ahead of Western competition in mobile technologies. By outpacing the rest of the world in mobile payments, ecommerce, and peer-to-peer lending via mobile services, China is expected to lead in the creation and export of mobile technologies in the years to come.

While mobile is no doubt important, particularly as a route to access for economies in the global south, policymakers should expand their gaze beyond mobile into an "after access" world in which they recognize quality of connection, experience, and devices as key to contributing to meaningful, productive economic exchanges. Economies in the Digital North are in many ways living in an "after access" world, in which, the vast majority of their populations are online, but the quality of the experience varies. One distinguishing characteristic between Stand Out economies and Stall Outs is experience: A seamless online experience with low friction across infrastructure, access, and interaction is seen in the top Stand Out economies, including Singapore, Hong Kong, South Korea, and the United States.

The pandemic highlighted the importance of fast, reliable broadband access through a laptop or desktop computer. Learning and working online is far easier in this environment than on a smartphone alone. While smartphones work well for more passive lean-back consumption activities such as scrolling through social media, reading the news, et cetera, a personal computer on a reliable broadband connection is vital for lean-in activities and most medium- and high-skilled jobs done online.[60]

04. Economies at all levels must invest in empowering consumers with the necessary "digital hygiene" and literacy skills to combat misinformation and cybersecurity threats. Public-private partnerships focusing on demand-side solutions will strengthen trust in and the resilience of the broader digital ecosystem.

Most discussions around trust in the digital sphere tend to fall back on what institutions and businesses can do to protect users. It is time to move beyond supply-side interventions and recognize that users have an integral role to play in fostering a trustworthy and resilient digital ecosystem as well. From maintaining high levels of cyber hygiene to developing the skills to combat misinformation, policymakers and technologists would do well to invest in nurturing good digital hygiene and habits among users.

Demand-side solutions are a necessary part of improving cybersecurity. One IBM study estimates that 95 percent of IT security breaches were due to human error.[61] A report from Kaspersky Lab suggests that approximately 90 percent of corporate data breaches in the cloud are due to social engineering attacks targeting employees and are not due to errors on the part of the cloud providers.[62] Cyber hygiene and digital literacy should not only be emphasized on the job but should be a part of the broader education system, with curricular changes to impart digital literacy at an early age.

Bad actors preying on human vulnerabilities are visible throughout the broader digital ecosystem. In the last several years, we've witnessed attempts to manipulate elections and public opinion and even incite violence. A 2019 report from the Oxford Internet Institute found that digital propaganda and social media manipulation were present in 70 countries—a 150% increase from the 28 countries just two years prior.[63]

While platforms and policies are important tools in fighting misinformation, relying solely on a guarantor-led approach will not be adequate in developing the digital resilience necessary to guard against misinformation. Online media classes show promise in teaching students of all ages how to spot misinformation and distinguish between fact and falsehoods.[64,65] Investing in a well-educated, digitally literate population will serve as an additional buffer against attempts by bad actors to play on social divisions for nefarious purposes.

One potential bright spot: Users, to some degree, are aligning their concerns—that is, their attitudes—with their behavior. We found that economies with more skeptical attitudes (privacy concerns in particular) exhibited higher levels of digital hygiene.

Indeed, evidence points to links between user attitudes and their use of digital technologies for information gathering and social interactions: Active social media use correlates with heightened privacy concerns and apprehensions around technology and job prospects.

Digital literacy will likely look quite different across geographies and demographic groups. The online experience—and the skills needed—for a retiree in The Villages, Florida will differ from a young digital native in Gangnam District, Seoul. There isn't a one-size-fits-all solution. Understanding the primary concerns of users and how those differ

based on geography, age, gender, profession, and other factors will help policymakers, technologists, and educators tie digital literacy programs back to user concerns and ultimately bolster digital resilience. Empowering citizens with the necessary digital hygiene and literacy tools necessary to thrive in the after-access world is a significant challenge requiring collaboration between governments, the private sector, and the third sector. It is a challenge well suited for creative public-private partnerships and solutions.

We take the liberty of adapting the Peter Parker principle to the digital age: "With great access comes great responsibility." Providing the givers (users and consumers) the tools to move towards "intelligent trust"[66] will foster a safer, more secure, and more socially cohesive online experience.

05. The more digitally evolved economies must consider a tradeoff between maintaining high levels of momentum—i.e., being at the cutting edge of innovation driven growth—and investing in strong institutions to foster inclusive and trustworthy digital economies. Policymakers must strike the right balance between fast growth and a strong, sustainable trust environment.

A strong trust environment, with privacy, security, and accountability measures, is essential to make it to the Digital North. Once at the top, there may be a tradeoff between fast growth and fostering a strong trust environment, particularly around issues of privacy and accountability. Many European countries, such as Sweden, the Netherlands, and Denmark, exhibit signs of a sustainable digital maturity. They demonstrate a combination of a trusting environment, positive attitudes towards all things digital, and a high digital evolution score, despite a more modest momentum.

The more optimistic attitudes may be partly explained by greater digital inclusion and a more advanced "after access" ecosystem, which emphasizes quality of access, user sophistication, and trust.

European economies hold six of the top 10 spots for Digital Inclusion, a component of Demand which measures digital equity across class, gender, and geography. This achievement is underpinned by inclusive public policies and a collaboration across the European political and economic community.

Digital inclusion is being used as a tool by the European Union in their "Shaping Europe's Digital Future" strategy, which outlines a clear plan to benefit all Europeans, businesses, and the environment.[67] The plan pledges to invest in the digital competencies of all Europeans, enabling a vibrant community of innovative and fast-growing start-ups and SMEs to access, finance, and empower citizens with better control and protection of their data, among 15 other specific actions. It also aims to become a global role model for the digital economy, support developing economies in going digital, and develop digital standards and promote them internationally.[68]

Outside of Europe, New Zealand and Canada, both members of the Digital Nations group, are hotspots for digital inclusion. New Zealand has been devoting significant efforts and resources toward improving the digital user experience of the disabled.[69] While the US beats Canada on most metrics of the digital economy, Canada leads in digital inclusion. Canada outscores its southern neighbor across all three digital inclusion clusters—gender, geography, and class—which may explain why Canadians express more optimism towards digitalization than their neighbors.

Once economies reach a higher state of digital evolution and find themselves in the Digital North, there often is a tradeoff between maintaining rapid momentum and fostering a strong trust environment. Policymakers would do well to strike the most appropriate balance for their country context.

06. A select few digital entrepôts are linchpins for global and regional digital advancement through establishing a self-reinforcing ecosystem, attracting global investments and talent, and creating a demonstration effect for the rest of the world as to what the future might look like.

We introduced the notion of digital entrepôts in our earlier writings and underlined their embrace of digitalization to upend traditional sources of competitive advantage and create new ones. These digital entrepôts—Singapore, Estonia, New Zealand, Taiwan, Hong Kong, and the UAE—continue to be among the best positioned to compete by establishing a self-reinforcing ecosystem of attendant network effects, attracting global investments and talent, and creating a demonstration effect for the rest of the world as to what the future might look like. These entrepôts are now emerging as the linchpins for corralling talent and investments into innovation and diffusion of digital innovations in their respective regions and beyond. Cases in point include Singapore's emergence as the fintech hub for Asia,[70] building on innovations honed in its sophisticated home market, and Estonia's digital nomad visa program, which builds on its sui generis and successful e-residency initiative.[71] Economies at the periphery of these entrepôts would do well to build spokes to connect to these hubs as a means to developing and advancing their own digital development.

Cross-Cutting Patterns and Insights

Over the period that we have been studying the evolution of the global digital economy and over the three editions we have produced so far, we know a lot more about the many aspects that govern and shape the digital economy and digital competitiveness today than we did ever before. More and better-quality data are available today than ever before. Our methodology has also significantly improved with every successive iteration. That said, there are some noteworthy constants: Small nations, islands, and entrepôts such as Singapore, Hong Kong, UAE, New Zealand, and Estonia have consistently been top performers and have demonstrated nimbleness and adaptability to change. They are truly the leaders and shapers of the best and next practices of the global digital economy.

Another noteworthy pattern is how large, populous economies in the Digital South such as China, India, Indonesia, Brazil, and Nigeria continue to attract investor interest despite their many institutional and infrastructural gaps. The combination of innovation emerging from constraints and their sheer size makes them the linchpins of the global digital economy's overall growth and its future. To the extent that some of these linchpin economies such as China, India, and Indonesia display high digital momentum and others, such as Brazil and Nigeria, have a lot of catching up to do even as all of these economies have unrealized evolution potential suggests that there is enormous headroom for digital growth ahead.

Several midsized nations, including Kenya, Vietnam, Bangladesh, Rwanda, and Argentina, have been using digital technologies to leapfrog and transform their economies. These leapfrogs make for ideal role models and benchmarks for other Watch Out economies on how to use the digital economy as a lever to create a step change in their growth trajectory.

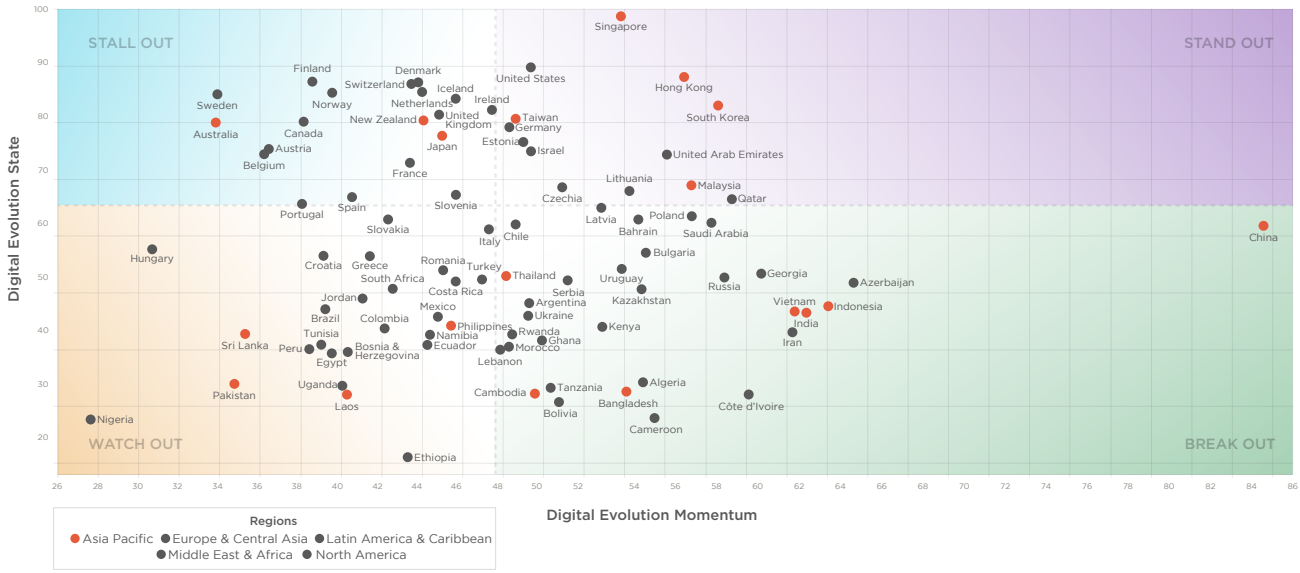
Regional Patterns and Insights

In this section, we present an overview of noteworthy patterns and insights at a regional level and a brief discussion of the underlying phenomena and trends. For the purposes of this analysis, we classified the 90 economies in our Digital Evolution scorecard into five regions: Asia Pacific; Europe and Central Asia; Latin America and Caribbean; Middle East and Africa; and North America.

Our Digital Intelligence interactive tool allows for many more comparisons and analyses across economies by key drivers of evolution, regions, income groups, and digital evolution zones. We encourage and invite our readers to explore these analyses and visualizations.

Figure 24

Noteworthy Patterns & Insights: Asia Pacific



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The Asia Pacific region is home to both the fastest-moving digital economy (China) and the highest scoring (Singapore). Most economies in the region perform well on the Innovation and Change driver. The economies of Singapore, Hong Kong, Taiwan, and South Korea all rank among the highest scoring and fastest growing on Innovation, which measures an economy's dynamism (Figure 24). The following trends are noteworthy:

Access Infrastructure Improvements

- Universal, fast, and reliable internet is increasingly common across the region: Indonesia, Vietnam, and China now approach near universal 4G access,[72] Singapore[73] and Taiwan[74] have some of the fastest internet speeds around the globe, and South Korea is a leader in 5G.[75]
- In South Asia, hundreds of millions of new online consumers have been brought online as the result of disruptive mobile tech ventures like Reliance Jio, who began offering a 4G-enabled smartphone to Indians for just a $21 refundable deposit and data plans starting at $1 per month.[76] 1 GB of data in India now costs an average of just $0.09.[77]

Mobile-First Shopping

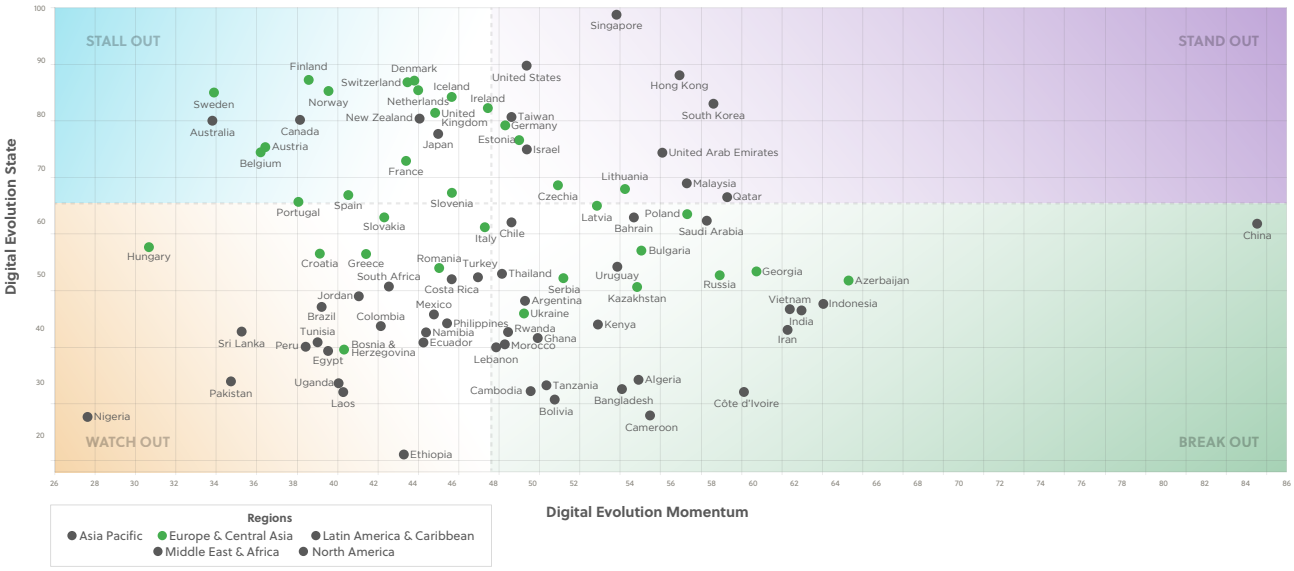
- Improvements in smartphone adoption rates make Asia-Pacific one of the most mobile-ready regions in the world.[78]
- Increased digital engagement is seen around the region; e-commerce and mobile payments are expanding rapidly. In China alone, mobile payments value has skyrocketed from just over $1.3 trillion (9.64 trillion yuan) in 2013 to $51 (347 trillion yuan) trillion in 2019.

Dynamic Innovation Ecosystems

- Innovation is a common thread among the most successful economies in the Index. Increasing coordination between academia, business, and government is seen across the region,[79] spurring additional foreign investment.
- As of 2018, 620,000 Chinese startups had received assistance from the nation's nearly 12,000 incubators,[80] while Vietnamese authorities have collaborated with Microsoft to develop an all-new STEM curriculum, which had reached 11,000 students by 2018.[81]

Figure 25

Noteworthy Patterns & Insights: Europe and Central Asia



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The economies of Europe rank among the most digitally evolved. Europe's strong Institutional Environment and Supply Conditions scores secure its place atop the Digital Evolution scale, with the Nordic nations of Finland, Sweden, and Norway garnering some of the highest marks among both these drivers. Meanwhile, broad improvements in Supply Conditions have lifted the positions of economies in Central Asia and Eastern Europe such as Bulgaria, Kazakhstan, Poland, Georgia, Azerbaijan, and Russia (Figure 25). The following phenomena are mention-worthy:

Access Infrastructure Improvements

- Nordic economies like Sweden, Finland, Norway and Denmark have leading broadband infrastructure capacities, which provide universal,[82] high-speed internet at an affordable cost.[83] The Netherlands, Norway, Bulgaria, Switzerland, and Denmark all experience mobile download speeds averaging over 60 Mbps, faster than the Digital Evolution scorecard's top-scoring economy Singapore.[84]
- In Eastern Europe and Central Asia, mobile internet access is expanding and improving rapidly. Over 90% of the population in Poland, Georgia, Romania, and Azerbaijan are now covered by 4G mobile networks, while 4G access in Ukraine jumped from 2% to 75% just since 2017.[85]

Equitable, Advanced Digital Societies

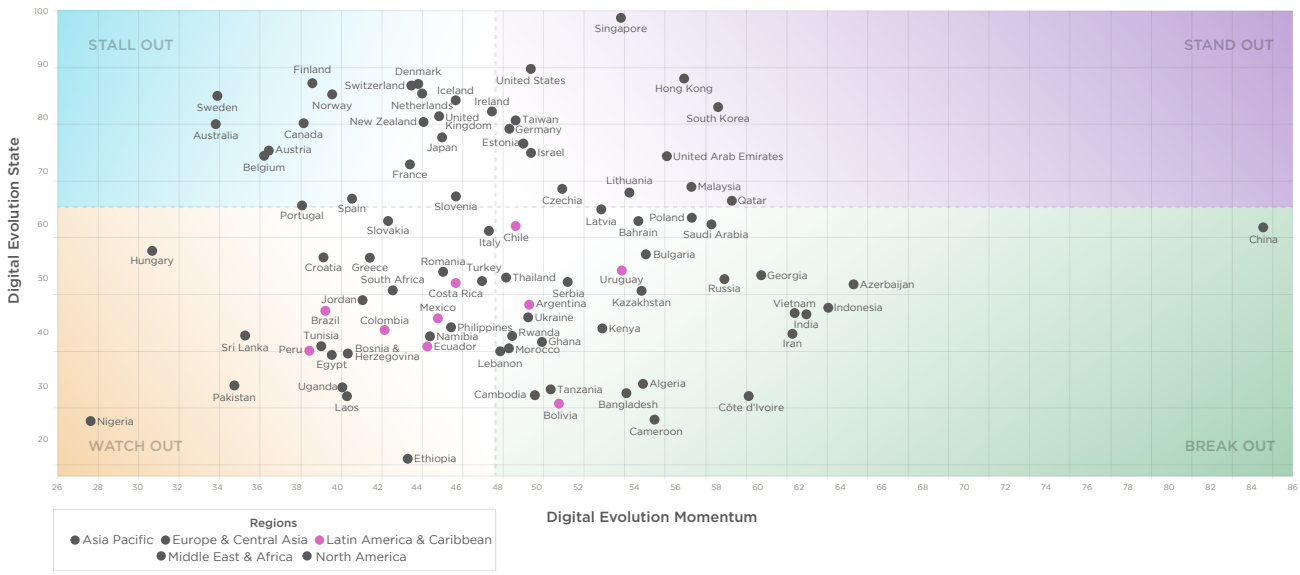
- European economies are among the most digitally inclusive (measure of gender, class, and geographic inclusion), with six (Norway, Belgium, Switzerland, Austria, Iceland, Poland) of the top 10 scorers on Digital Inclusion based in Europe.

Smart Digital Policy

- Forward-thinking policies define the region, with Estonia a leading example through innovative policies like the E-residency program and Digital Nomad visa initiative. Since the launch of the E-Residency initiative in 2015, associated businesses have generated over €1 billion in revenues.[86]
- European nations—perhaps due to strong performance on inclusion and innovative policymaking—enjoy some of the most optimistic attitudes around digitalization.

Figure 26

Noteworthy Patterns & Insights: Latin America and Caribbean



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Economies in the Latin America and Caribbean (LAC) region continue to make strides in reducing digital inequities and fostering broader technology adoption. As revealed by data from our Digital Trust scorecard, high levels of online engagement are a bright spot for the region. Moreover, Costa Rica and Argentina have made exceptional strides towards improving their Institutional Environment, joining the ranks of the region's historical top performers on Institutions: Uruguay and Chile (Figure 26). Still, LAC Watch Outs have not kept pace when it comes to investments in next-generation access infrastructure and into their innovation ecosystems.[87] This is holding these economies back from realizing the full potential of digitalization. Below is a brief summary of the bright spots in the region:

Digitally Friendly Institutions

- Ecuador, Mexico, Costa Rica, and Argentina all continue to make progress in optimizing their institutions, while Chile holds its position as the region's top scorer in Institutional Environment.
- Costa Rica, the second fastest-moving economy on Institutions, has been at the forefront of future-oriented digital policymaking, through expanding internet access and experimenting with new initiatives, such as the job-matching platform Bola de Cristal.[88]

A Broadening, Increasingly Inclusive Market

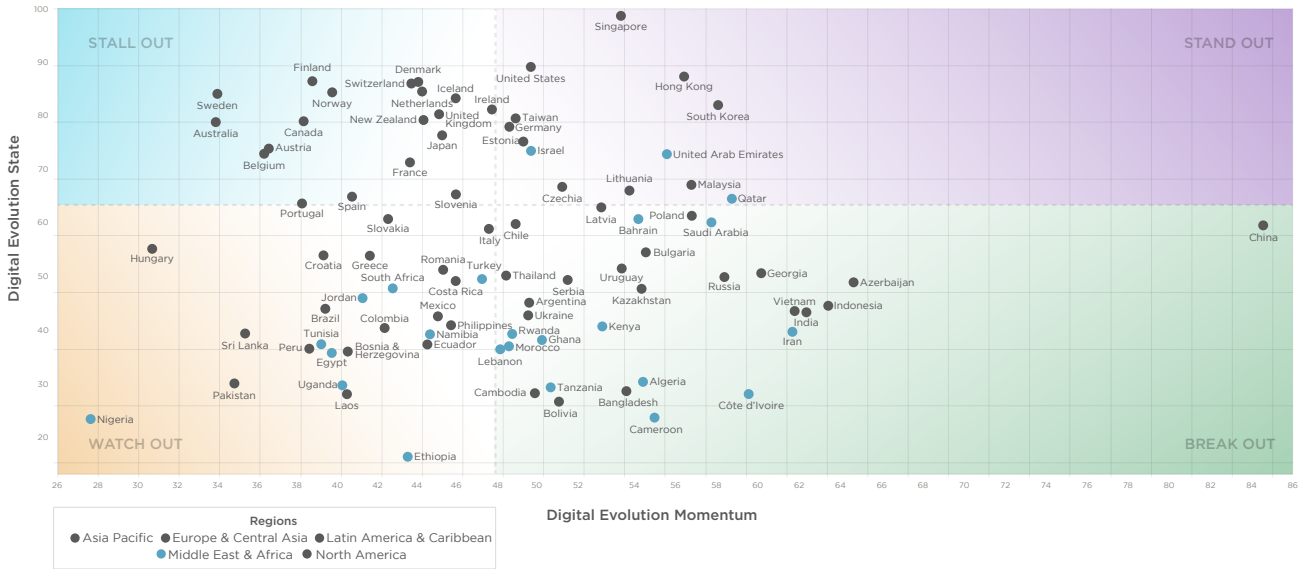
- While Latin America and the Caribbean as a region face a significant digital inclusion gap, governments are working at a rapid pace to close it. Peru, Mexico, and Bolivia are bringing more rural citizens online,[89] while Uruguay, Chile, and Colombia are reducing digital disparities among their poorest citizens.[90]
- The proliferation of digital devices and online connections in LAC outpaces much of the world. Among the LAC economies in the Digital Evolution scorecard, the average share of the population using the internet nearly tripled between 2008 and 2019 (from 23% to 65%).[91]

Strong Online Engagement

- While lagging on overall momentum, LAC showed high levels of digital engagement through the Behavior measure of the Digital Trust: the users who are online are highly engaged.
- On average, Brazilians spend close to four hours daily on social media platforms, nearly double the average American,[92] while nearly three times as many Colombians (28.4%) as Britons say "likes" on social media inform their shopping decisions.[93]
- High Demand and engagement reflect an opportunity for policymakers and businesses to seize in the region.

Figure 27

Noteworthy Patterns & Insights: Middle East & Africa



Digital Intelligence Index is a collaborative research initiative of The Fletcher School at Tufts University and Mastercard.

In a region with vast and varied geopolitics, demographics, and geography, equally varied strides are being made on pathways to digitalization. A common emerging thread is robust demand-driven growth with economies such as Israel, UAE, and Qatar leading the region overall (Figure 27). Further, a surge in mobile payment adoption in Sub-Saharan Africa has contributed to significant albeit uneven digital growth in this sub-region. Iran, a new addition to our study, demonstrates impressive momentum comparable to that of its neighbors further to the east: Vietnam and India. The following regional and sub-regional trends deserve mention:

Developing Digital Authorities

- The Arabian Peninsula economies—Saudi Arabia, the UAE, Qatar, and Bahrain—have all created digital authorities[94] tasked with putting long-term, strategic plans into place to develop their digital economies.[95]
- With relatively high levels of education, young populations, and access to expatriate talent, these countries are well positioned to carry out their ambitious digital visions.[96]

Expanding Mobile Access in SSA

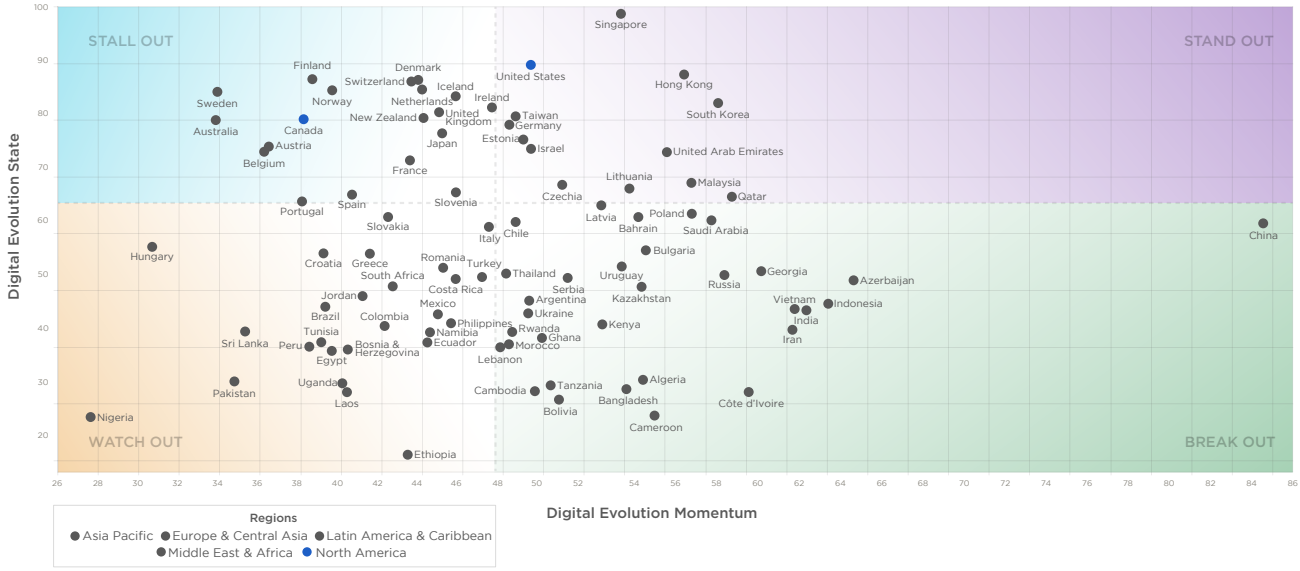
- The economies of Sub-Saharan Africa are amid a mobile revolution: mobile connections and mobile payments have surged across the continent. Over 135 million mobile money accounts were opened by Sub-Saharan African consumers between 2010 and 2018 alone, and the region accounts for more than a third of global mobile payments.[97]
- Modest improvements in cost and access infrastructure have enabled the expansion of mobile adoption—85% of the sub-continent's population is covered by at least a 3G mobile network[98]—but further improvements are needed to maintain this pace of progress.

Reducing Digital Inequities

- Middle Eastern and North African economies have made impressive progress in reducing digital inequities, bringing millions more online and empowering the previously digitally disenfranchised to partake in the digital economy.
- Some improvements are being made in reducing geographic and gender disparities, with more women and rural citizens online than ever before, but large gender-inclusion gaps remain.

Figure 28

Noteworthy Patterns & Insights: North America (Canada and the United States of America)



Digital Intelligence Index is a collaborative research initiative of The Fletcher School at Tufts University and Mastercard.

United States: The United States, #2 overall on digital evolution in our index, exhibits strength in the Innovation and Supply drivers. The rapid momentum in the US was due primarily to its strong showing in Innovation: scoring the 3rd highest overall, with the 15th fastest momentum of the 90 economies analyzed. Financing, Talent Availability, R&D, and Value Creation all contribute to the US's leading score and momentum in Innovation (Figure 28).

Canada: Canada, while a Stall Out, continues to outperform on Institutional Environment and does well on Innovation. Canada outscores the US on digital inclusion across many dimensions: gender, geography, race, and class.

Dynamic Digital Ecosystems

- Both American and Canadian universities continue to produce breakthrough technologies and top talent.[99]
- A tech-obsessed venture capital ecosystem has proved decisive in driving American innovation.[100] The US leads the world in tech investment in this edition of Digital Evolution.

Moving Towards Affordable, Accessible, and Inclusive Internet

- Canada outperforms the US on all three measures of digital inclusion—one potential reason why Canadians show more optimistic attitudes around digitalization.
- Both countries have provided relatively affordable internet access[101] with expansive fixed and mobile broadband infrastructure.[102] However, due to geographic size of both countries, there is still much room for improvement, particularly in more rural areas.

Sophisticated Digital Consumers

- Consumers in both countries are more likely than those in other most Western economies to use digital payments,[103] shop online,[104] use social media,[105] and stream digital content.[106]
- Highly device affluent in both countries, with high rates of smartphone, laptop, and tablet ownership.[107]

Methodology

The Digital Intelligence Index (DII) uses a total of 160 indicators in the Digital Evolution scorecard to measure the state and quality of digitalization in an economy. It uses 198 indicators in the Digital Trust scorecard to measure the level of digital trust in 42 economies. Both the Digital Evolution and Digital Trust scorecards are structured at four levels: indicators, clusters, components, and drivers. Indicators are data points that answer a specific question. Clusters consist of aggregated groupings of normalized, standardized, and weighted indicators for the purposes of analysis and comparison; they combine and capture information from several indicators to illuminate a particular aspect that impacts digitalization as defined above. Combinations of clusters roll up to form components. Components are built to provide a comprehensive understanding of factors, which in turn shape and define index drivers.

The central hypothesis of the Digital Evolution scorecard is that digitalization of an economy is governed by four drivers of equal importance: Supply Conditions, Demand Conditions, Institutional Environment, and Innovation and Change. Our model, therefore, accords equal weights to all four drivers. In the Digital Trust scorecard, four factors are considered: Environment, Experience, Behavior, and Attitudes. Unlike the Digital Evolution scorecard, these are considered separately and not aggregated into a total Digital Trust score.

For both scorecards, indicator, cluster, and component weights are determined according to three factors:

- Data quality: Indicators that required more estimations, owing to patchy coverage across countries or years or both, were weighted lower than those with fewer estimations.
- The strength of the data collection methods: Since we only use secondary data, we studied the data gathering processes deployed by the sources of said data. We assigned greater weights to indicators that had more robust processes of data collection. Similarly, we assigned greater weights to observational data over survey data.
- Centrality: The importance of the indicator within its parent cluster/component/driver. Foundational measures, on which many other measures are dependent, were weighted more highly than those that had fewer multiplicative effects.

After indicators have been aggregated up into clusters, components, drivers, and ultimately final scores, final scores are rescaled to fit a 0 to 100 range.

Digital Evolution Momentum

Momentum scores are generated using the compound annual growth rate formula (CAGR). The CAGR method, by smoothing out changes in the growth rates over the years, allows us to describe the rate at which the index score is changing for a particular economy over time. We like this method because it is a well-tested and robust approach that stakeholders in business and public policy can easily understand and utilize. After calculating index growth rates for each economy, we rescale economy CAGRs on a similar 0 to 100 scale as final scores. Momentum scores, like the final index scores, are relative.

Estimation of Missing Data Points

Given the index's reliance on secondary data to build the Digital Evolution and Digital Trust scorecards, estimations were required to compensate for missing and incomplete data. We created a logic and a systematic process for estimating missing data points:

1. Where any observations exist for a given economy and indicator, DII relies first on Stineman interpolation to fill in missingness between observed datapoints. Next, NOCB (next observation carried backward) and LOCF (last observation carried forward) treatments are applied to fill in missingness outside observed data range.

2. Where no observations exist for a given economy and indicator, DII relies on recursive rounds of targeted mean imputation to fill in missing values, whereby missing values are estimated as the average of the sample observations of the most characteristically similar economies for the same year as the missing datapoint. Estimated data points are then given similar interpolation, NOCB, and LOCF treatments.

Quality Assurance

Throughout the imputation, weighting, standardizing, and aggregation processes, we adopted several quality assurance measures to ensure the validity and robustness of the index. By deploying different statistical tools throughout the process, including data cleaning, variance analysis, regression analysis, and simulations, we stress-tested the index scores at multiple levels to produce the most comprehensive and robust numbers possible.

Any economy's scores that jumped out as outliers in the index in the QA process were rigorously checked to make sure that the data in that economy are accurate and robust. This mitigates the chances of systematic errors in the process.

Economy Selection Criteria

While we would have liked for our study to cover every economy in the world, the two greatest limiting factors are data availability and data quality. Despite the constraints, we have been successful in expanding our economy coverage on the Digital Evolution scorecard by 30 economies over our previous edition—from 60 to 90. This group of 90 economies represents a wide range between developed and emerging economies and together represent over 90% of the global population. In our Digital Trust model, we covered 42 economies.

Our selection methodology for both the Digital Evolution and the Digital Trust models was guided by three factors weighted equally: size of economy, size of population, and data availability. We aimed to include only economies where observed values would account for no less than 50% of total indicator data, limiting estimations and ensuring the most accurate possible picture of global digital evolution.

The unfortunate reality is that data availability and quality are the lowest among countries where the need for digital inclusion is the highest. Many economies, especially in Africa and in parts of Asia and Latin America, suffer from significant data gaps across drivers, making comparisons difficult. The added complexity that the digital economies of "mobile first" countries are evolving differently from each other and from those of developed economies poses a great challenge for making any intelligent estimations of missing data. By contrast, we found that it is much easier to add countries with stronger economies, despite their smaller sizes of population, given their better data quality and availability. Further, estimating missing data for these countries is less onerous given an element of comparability with their peers.

Limitations and Future Endeavors

As with any indexing exercise, we have made a range of assumptions and simplifications in the creation of these models. We have sought to build models that are wide ranging and comprehensive. However, we would like to add the caveats that their use should be guided with the understanding that models inherently simplify what they measure, they are dependent on the quality and accuracy of the data that are fed into them, and the assumptions we built into them are subject to biases and errors despite our best efforts. Despite our numerous stages of quality assurance, human error may have crept in. We invite anyone who spots an error to kindly contact us directly.

In our eighth year of studying the phenomenon of digitalization around the world, our greatest limitations have been the availability and quality of data. Despite these limitations, we have made every effort to be broad and inclusive in our data capture and to evolve our methodology in a manner that is respectful of and relevant to the evolutionary phenomenon we are trying to measure. We recognize in all humility, however, that there are many facets to and outcomes of digitalization writ large that we are yet to record and many more that the world is yet to discover. We hope to capture at least some of them, as better data become available, in our next edition.

The Drivers of Digital Evolution

The Digital Evolution scorecard analyzes the underlying drivers that govern an economy's digitalization: Supply Conditions, Demand Conditions, Institutional Environment, and Innovation and Change. To gain a comprehensive view of digital readiness and competitiveness of countries, we further divided these drivers into 13 components measured using a total of 160 indicators.

Digitalization is the outcome of the complex interplay of the four drivers and related factors often taking place in different combinations in different countries. No single trend or data related to consumer demand, government actions and policies, investments, innovation, or infrastructure can offer a measure or a complete picture of the myriad ways the internet and digital platforms are integrating into the lives of billions around the world. Insights into the drivers of digitalization help us move beyond a static snapshot and appreciate the systemic nature of forces at play. Such insights help us understand why some countries are experiencing greater momentum than others. They also outline the contributions that specific actors in the private and public space can make to unclog bottlenecks and to get innovation moving. Finding these key leverage points could propagate changes through the entire system. This systemic approach also helps explain why change may be slower than expected: The interlocking nature of these indicators could keep the status quo frozen until certain essential barriers are overcome.

Supply Conditions: How developed is the infrastructure to facilitate digital interactions and transactions? This driver measures the quality and readiness of digital and physical infrastructure such as bandwidth availability and quality of roads. Developing countries with fledgling infrastructure comprise the low end of the scores on the Supply driver.

Demand Conditions: Are consumers willing and able to engage in the digital ecosystem? The indicators underpinning Demand Conditions help address additional questions, such as:

- Do consumers have the means and instruments necessary to plug into the digital economy?
- Do consumers have the willingness and continued interest to remain actively engaged in the digital economy?

While high demand is always a welcome sign, low demand scores can be interpreted as an indication of untapped market potential that investors and businesses can take advantage of in an enabling institutional environment; stagnant demand over time, particularly in advanced markets, can be a sign of market saturation pointing to a need for innovation that can help restart the engines of demand.

Institutional Environment: In addition to directly investing in infrastructure and establishing laws and regulations, government actions and policies play an essential role in either supporting or hindering the business engine that creates and distributes digital technologies. At the same time, governments are key to determining the climate for investment and innovation in digital technologies and their applications. By providing a stable environment that encourages investment and protects consumers, governments create enabling conditions or even the technologies themselves that foster digitalization. The indicators underpinning the Institutional Environment driver also help address questions, such as: Are governments taking deliberate steps towards advancing and adopting digitalization? Do they have policies and regulations in place to foster digital ecosystems?

Digital Intelligence Index

Innovation and Change: Innovation is the key to finding new solutions to global, national, and local challenges. Innovation and the resulting change push the boundaries of the digital ecosystem and what it can do; it is in equal parts the most impactful and challenging driver to jumpstart. By breaking down the systems of innovation into inputs, such as availability of talent and capital; processes, such as university and industry collaboration in R&D; and outputs, such as new digital products and services created, we measure the vitality of innovation in a country and identify opportunities for improvement. The indicators associated with this driver focus on the core issue: What is the extent of innovation taking place in the country's digital economy?

The Drivers of Digital Trust

The Digital Trust scorecard analyzes the underlying drivers that govern an economy's digital trust: Environment, Experience, Behavior, and Attitudes. To gain a comprehensive view of digital trust, we further divided these drivers into 14 components measured using a total of 198 indicators.

Environment: What are the mechanisms to build trust in the digital environment? How are guarantors of trust performing in ensuring a safe and secure online ecosystem? The Environment score includes three key components: accountability, privacy, and security.

Experience: Experience measures the quality of user experience in the digital trust environment. Experience looks at three major sources of friction: infrastructural, access, and interaction.

Behavior: How do users (givers of trust) react and interact with the digital environment and experience? We measure behavior through examining consumer use of technology, social media, e-commerce, and mobile payments. In addition, we look at media consumption patterns, payment sophistication, and tolerance for friction in the online experience. Through these various metrics, we can determine a level of engagement with the digitalizing world.

Attitudes: How are citizens (givers of trust) feeling about their experiences with digitalization? We examine survey data around trust in science and technology, concerns over new technologies and job prospects, sentiments around privacy, and trust in technology companies and leaders.

Glossary

Ability to Adopt: The extent to which people have the skills needed to engage online. A cluster under the component State of the Human Condition, under the driver Demand.

Ability to Demand: The extent to which people have the wherewithal to engage in consumption. A cluster under the component State of the Human Condition, under the driver Demand.

Access Affordability: The affordability of mobile devices and data plans. A cluster under the component Access Infrastructure, under the driver Supply.

Access Availability: The extent to which there is telecommunications infrastructure access. A cluster under the component Access Infrastructure, under the driver Supply.

Access Infrastructure: The extent and quality of telecommunications infrastructure needed to get connected. A component under the driver Supply.

Access to Financial Institutions: The extent to which people can access traditional financial institutions. A cluster under the component Transaction Infrastructure, under the driver Supply.

Accountability: A component under the driver of Environment. The extent to which institutions are capable, credible, and have the capacity to serve citizens.

Attitudes: One of the four drivers of Trust. The sentiments and confidence in guarantors expressed by givers of trust (users).

Behavior: One of the four drivers of Trust. The level of engagement among internet users in any given economy. Measured through use of technology, use of social media, use of e-commerce and mobile payments, tolerance of friction, payment sophistication, and digital media consumption.

Bureaucracy: The extent to which there exists government bureaucracy that may inhibit businesses and individuals from operating. A cluster under the component Institutions and the Business Environment, under the driver Institutional Environment.

Business Practices: The extent to which businesses actively engage in using innovative practices. A cluster under the component Process, under the driver Innovation and Change.

Class Digital Divide: The extent to which inequities in digital account ownership, online engagement, and digital payment uptake differs among the poorest 40% of the population as compared to the richest 60%. A cluster of Digital Inclusion, a component under Demand.

Cluster: A group of indicators answering a key question about digital evolution. Clusters form components, which form drivers.

Communications Infrastructure: The quality and state of physical and digital internet infrastructure. A cluster measure under the component Access Infrastructure, under the driver Supply.

Component: Groups of clusters answering a key question about digital evolution. Clusters form drivers.

Confidence in Guarantors: The trust users hold in institutions, businesses, and policymakers to protect online privacy, harness technology to create jobs, and advocate for consumers.

Consumer Spending: The extent to which people are actively participating in the wider retail economy, both online and offline. A cluster under the component State of the Human Condition, under the driver Demand.

Demand: Answers the question of whether consumers are willing to and able to transact in the digital environment. One of the four main drivers of digital evolution.

Device Affluence: The extent to which people have and are using new technologies. A component under the driver Demand.

Device Affluence: The extent to which people or households have digital devices, including laptops, desktop PCs, tablets, mobile phones, and/or smartphones. A cluster under the component Digital Uptake, under the driver Demand.

Device and Broadband Uptake: The extent to which people and households are connected to the internet and own digital devices. A cluster measure under the component Digital Uptake, under the driver Demand.

Digital Inclusion: The extent to which inequities in digital account ownership, online engagement, and digital payment uptake exists across gender, class, and geography. A component under Demand.

Digital Payment Uptake: The extent to which people have access to, and use, digital payment technologies, such as cards, or payments via mobile phone. A component under the driver Demand.

Digitalization: A process where every-day human interactions and transactions—with the government, businesses, and fellow humans—and consumption of goods, services, information, and ideas are primarily conducted through the use of the internet and internet-based technologies and services.

Digitization: The process of converting a good or a product (example: money, music, photographs) from its physical form to digital form.

Driver: A main factor in Digital Evolution and Digital Trust. In the Digital Evolution scorecard, there are four drivers: Supply, Demand, Institutional Environment, and Innovation and Change. Together, these encompass the main factors behind and resulting from digital evolution. The Digital Trust scorecard is composed of four drivers: Attitudes, Behavior, Experience, and Environment.

Effectiveness of Institutions: How effective institutions are at delivering services, and maintaining security, and upholding the rule of law. A cluster under the component Institutional Effectiveness and Trust, under the driver Institutional Environment.

Electricity: The quality and availability of the electricity supply for businesses and consumers. A cluster under Access Infrastructure, under the driver Supply.

E**lectronic Payments:** Measures the proliferation of physical support infrastructure for digital payments, including ATMs and POS terminals. A cluster under the component Transaction Infrastructure, under the driver Supply.

Environment: One of the four drivers of Trust. The security, privacy, and accountability measures fostered by the guarantors of trust (institutions and businesses). The digital trust environment is the context in which trust interactions occur. Like Experience, it is shaped by institutions and businesses, which act as the guarantors of trust.

Experience: One of the four drivers of Trust. The reliability and speed of user encounters and transactions, measured through interaction, infrastructural, and access friction.

Financial Inclusion: The extent to which people have access to, and are actively part of, formal financial institutions. A cluster under the component Digital Payment Uptake, under the driver Demand.

Financing: The extent to which money is available for new ventures, particularly those which focus on technology. A cluster under the component Input, under the driver Innovation and Change.

Fixed Broadband Uptake: The extent to which businesses and consumers have wired broadband connections at home and at the workplace. A cluster of the component Device and Broadband Uptake, under the driver Demand.

Friction: Anything that hinders the seamless completion of transactions or interactions online. This can range from slow loading speeds, unnecessary pages, or password re-entry. Online experience will never be frictionless, and some forms of friction are necessary for security: it's all about finding the right balance.

Fulfillment Infrastructure: The extent to which consumers and businesses can reliably and affordably order and deliver goods. A component under the driver Supply.

Gender Digital Divide: The gap between men and women's internet usage. Historically, men are more likely to get online than women. Particularly in emerging economies, women are less likely to go online and less likely to engage extensively online. A cluster under the component Digital Inclusion, under the driver Demand.

Government Digital Uptake: The extent to which governments use technology. A cluster under Institutions and the Digital Ecosystem, under the driver Institutional Environment.

Government Facilitation of ICT: The extent to which governments prioritize technology and telecommunications and implement policy around it. A cluster under Institutions and the Digital Ecosystem, under the driver Institutional Environment.

ICT Regulatory Environment: The extent to which institutions facilitate telecom competition, set and enforce clear technology best practices and regulations, and ensure equal access. A cluster under Institutions and the Digital Ecosystem, under the driver Institutional Environment.

Indicator: The base level of measure in the Digital Evolution scorecard. Measures a specific aspect related to the digital world, examples including the percentage of people in a country with a smartphone, or R&D investment as a percentage of GDP. Groups of indicators form clusters.

Innovation and Change: Answers the question of to what extent new ideas and ventures are being created and adopted in digital commerce. One of the four main drivers of digital evolution.

Inputs: Inputs encompass elements needed to drive innovation and change, such as creating the right talent pool, having sufficient investment, and the creation of new ventures. A component under the driver Innovation and Change.

Institutional Effectiveness and Trust: The extent to which institutions create an environment which enables trust. A component under the driver Institutional Environment (in the DEI).

Institutional Environment: Answers the question as to whether government policies and regulations are facilitating the creation of digital ecosystems. One of the four main drivers of digital evolution.

Institutions and The Business Environment: The extent to which institutions enable business through appropriate legal protections, as well as minimizing unnecessary bureaucracy. A component under the driver Institutional Environment.

Institutions and The Digital Ecosystem: The extent to which institutions enable the use of, and themselves use, digital technologies. A component under the driver Institutional Environment.

Internet Speed: Upload and download speeds for mobile and fixed broadband. A cluster under the component Access Infrastructure, under the driver Supply.

Legal Environment for Businesses: The extent to which institutions enable business through the rule of law, anti-corruption efforts, and appropriate legal protections. A cluster under the component Institutions and the Business Environment, under the driver Institutional Environment.

Legal Protections: The extent to which there are there legal protections for consumers in the event of a digital security incident. A cluster under the component Privacy, under the driver Environment (in Digital Trust).

Mobile Broadband Uptake: The extent to which people connect via mobile internet, in particular through mobile broadband technologies such as 3G and 4G. A cluster under the component Digital Uptake, under the driver Demand.

Mobile Internet Gap: The mobile internet gap is the difference between the number of mobile broadband internet subscriptions and the number of mobile cellular subscriptions. In the most developed digital economies, those who have a mobile cellular plan have a mobile broadband data plan to go with it. In such a case, there is no gap. But even in some developed economies and emerging economies, not every mobile cellular subscription may have a corresponding mobile broadband subscription. For example, one may have a smartphone but because of cost or preference might not have mobile broadband data access on that phone. Similarly, one may have access to mobile internet data but be unable to get a device that can use it. Any number of reasons can exist for this gap: however, there is a marked difference in how this gap is closing across emerging economies.

Momentum: The rate at which a country's digital environment is changing over time. The DEI uses a compound annual growth metric based on an averaged base year of 2008/2009.

Outputs: The extent to which new ideas, products, and systems are created, adopted, and exported. A component under the driver Innovation and Change.

Postal Delivery: The availability of postal services, including at-home mail delivery. A cluster of Fulfillment Infrastructure, under the driver Supply.

Privacy: The extent to which there are protections for user privacy and anonymity. Privacy is the ability to control how much any other person or entity can see your actions or statements, whether or not those actions or statements are connected to a user's identity. Anonymity is the protection of individual identity, although actions may still be visible to others. Privacy is a component under Environment.

Processes: The extent to which there are systems in place which can facilitate the development of innovative ideas and practices. A component under the driver Innovation and Change.

Research and Development: The extent to which governments, businesses, and universities engage in research and development. A cluster under the component Process, under the driver Innovation and Change.

Rural Digital Divide: The extent to which inequities in digital account ownership, online engagement, and digital payment uptake differs between rural and urban consumers. A cluster of Digital Inclusion, a component under Demand.

Security: The extent to which users are affected by fraud or have recourse mechanisms in case something goes wrong and for which institutions and businesses are developing new mechanisms to meet emerging threats. Forms part of the driver Environment, along with Privacy and Accountability.

Sentiments: The level of generalized social trust and trust in science and technology in any given economy.

Startup Capacity: The extent to which there are bureaucratic hurdles in creating a new start-up. A cluster under the component Input, under the driver Innovation and Change.

State of the Human Condition: The extent to which people have the means, skills, and willingness to engage online. A component under the Demand driver.

Supply: Answers the question of how developed digital and business infrastructure is. One of the four main drivers of digital evolution.

Talent Availability: The extent to which the right talent pool is being developed, attracted, and retained. A cluster under the component Input, under the driver Innovation and Change.

Traditional Transport: The quality of air transport, port, rail, and road infrastructure operations and logistic performance. A cluster under the component Fulfillment Infrastructure, under the driver Supply.

Transaction Infrastructure: The extent and quality of financial transaction means within a country. A component under Supply.

Transparency: The extent to which governments and institutions allow people and companies to express themselves freely and provide enough visibility of internal operations to limit corruption. A cluster under the component Institutional Effectiveness and Trust, under the driver Institutional Environment.

Use of Digital Money: The extent to which people use electronic payments, including card payments, to make transactions. A cluster under component Digital Payment Uptake, under the driver of Demand.

Use of Mobile Digital Money: The extent to which people use mobile electronic payments, including mobile wallets, to make transactions. A cluster under component Digital Payment Uptake, under the driver of Demand.

Value Capture: The extent to which innovative technologies are producing value across global digital markets. A cluster under the component Output, under the driver Innovation and Change.

Value Creation: The extent to which innovative technologies are being developed domestically. A cluster under the component Output, under the driver Innovation and Change.

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About

Digital Planet

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