THE DIGITAL EVOLUTION INDEX 2017

THE FLETCHER SCHOOL
TUFTS UNIVERSITY

in partnership with

mastercard

Introducing the 2017 edition of the Digital Evolution Index

Mapping global digital evolution reveals current digital leaders and opportunities for growth

Every day, billions of people around the world use the internet to share ideas, trade with one another and keep in touch with family, friends and colleagues. With worldwide internet penetration at nearly 50 percent[1], the global digital economy has become a space of immense opportunity.

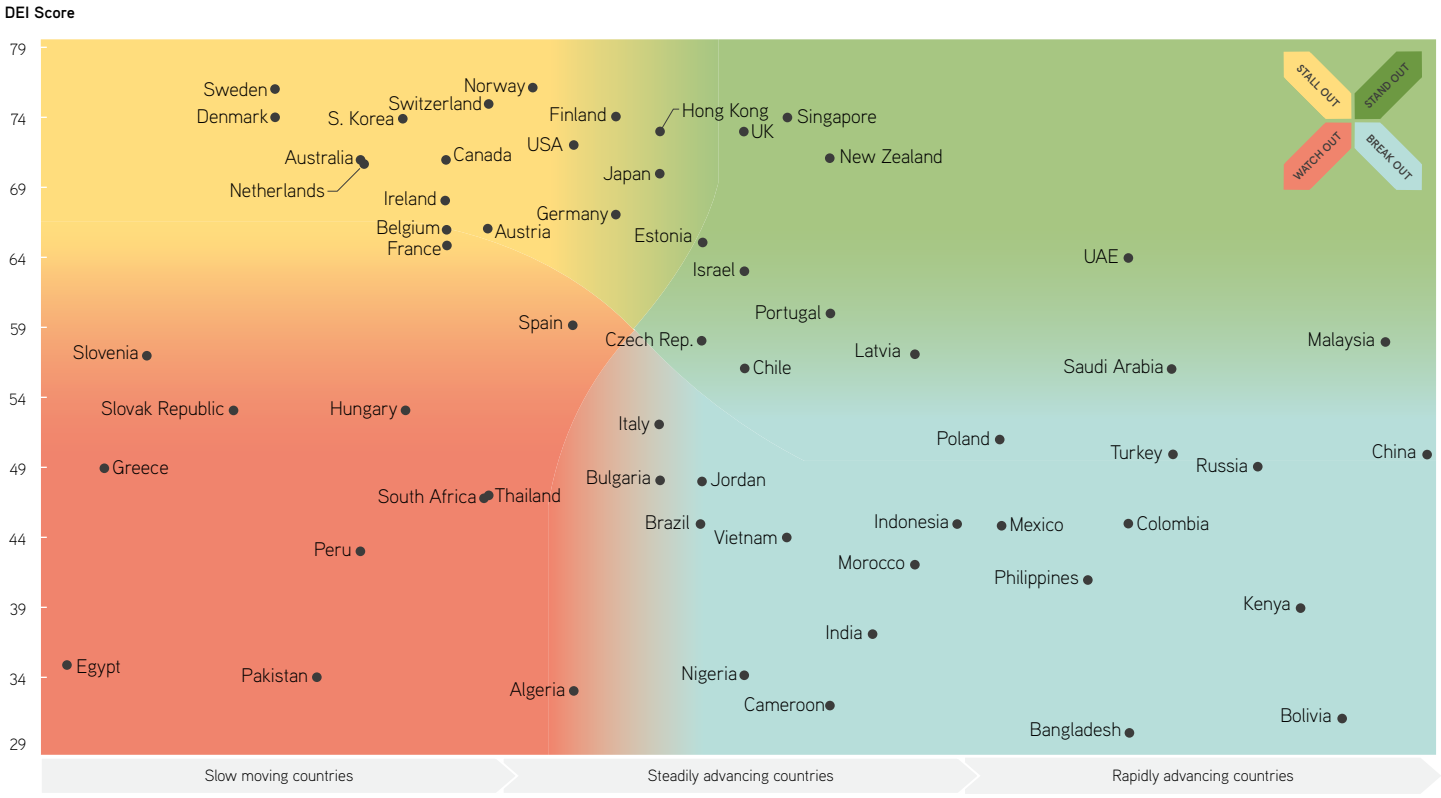
Similarly, it's clear that both business and consumer transactions and interactions are becoming heavily reliant on us being connected. Digital flows are now responsible, according to the McKinsey Global Institute[2], for more GDP growth globally than trade in traditional goods. Digitalization is now driving globalization.

As such, achieving a competitive advantage in the global digital arena has become a key priority for governments, businesses and citizens who strive for inclusion and relevance in this global marketplace. It is also clear that momentum, innovation and trust all have a critical role to play when countries look to improve their digital development.

It is in this context that **The Fletcher School at Tufts University**, in partnership with **Mastercard**, present the 2017 edition of the **Digital Evolution Index (DEI 17)**.

The DEI 17 is a data-led evaluation of digital development across 60 countries rooted in four key drivers: Supply Conditions; Demand Conditions; Institutional Environment; and Innovation and Change. 170 indicators across these drivers are applied to create a robust framework for understanding digital evolution, providing each country with a DEI score.

This framework is combined with insights from academics and experts at Fletcher and input from business leaders driving digital change across the globe. Together, they help to paint a picture not just of what the digital landscape looks like today, but also how it stands to change in the future. The framework also provides policymakers and business leaders across countries with an understanding of how they can accelerate digital evolution locally to achieve a greater global impact.



Digital evolution explained

The DEI 17 includes analysis of each country's DEI score and digital momentum – the rate at which countries have been developing their digital economies since 2008. To investors and businesses, momentum is indicative of market attractiveness and potential; to policymakers, it is a proxy for competitiveness. It illustrates the pace of progress.

A high digital momentum score signals opportunity and, typically, improvements in access (more people coming online). It also reflects a society where people are finding increasing value and utility in the digital space.

The scores for digital evolution (the latest year, 2015, y-axis) and digital momentum (change over time, 2008–15, x-axis) are plotted together to provide a graphical representation of each country's standing according to both measures. On this landscape, countries fall into one of four quadrants of development:

Stand Out nations can be considered the digital elite; they are both highly digitally evolved and advancing quickly.

Stall Out nations have reached a high level of digital evolution, but risk falling behind due to a slower pace of progress and would benefit from a heightened focus on innovation.

Watch Out countries have low rankings for both measures. They have a lot of work to do, both in terms of infrastructure development and innovation.

Break Out countries score relatively low for overall digital evolution, but are evolving quickly enough to suggest they have the potential to become strong digital economies. While there are a wide variety of reasons for countries to be in the Break Out zone, they are generally making gains in the innovation space or in consumer demand. However, many of them are held back by weak infrastructure and institutions.

The DEI 17 reveals how a country measures up and also how it might take inspiration from techniques and initiatives that have proved successful elsewhere. This is essential knowledge, not just for businesses and institutions looking for opportunities in the changing digital landscape, but also for governments and policymakers overseeing the evolution of the digital environment and digital capability.

The digital trust environment

Central to digital evolution is digital trust. The idea of trust has been important throughout the history of commercial transactions. As interactions are increasingly conducted digitally and affect more and more aspects of people's lives, digital trust continues to grow in importance. The challenge thus far is that trust has proven difficult to understand: what creates it, what its benefits are, and how one might hope to instill it in customers.

The DEI 17 incorporates a newly devised framework for digital trust that takes into account:

- The trustworthiness of the digital environment for each country
- The quality of users' experience
- Attitudes towards key institutions and organizations
- People's behavior when they interact with the digital world

Digital trust is rooted in relationships. The guarantors of digital trust form one axis: the institutions, businesses, individuals and governments that are responsible for creating and fostering a trustworthy digital environment and experience.

The givers of trust represent the other side of this relationship: the consumers, who through their behavior and attitudes reflect and reveal their preferences and sentiments. Analysis of trust data relating to givers of trust shows that what people say is not always a reliable predictor of how they behave.

An important aspect of digital trust is friction: the frustrating aspects of interactions that slow users down when they attempt to complete a transaction. Friction can be found in many places, including in slow page-load times, prompts to re-fill information already submitted, annoying adverts, necessary security measures and unreliable technology. While some sources of friction are necessary to ensure security and privacy, many others are unnecessary – and needlessly frustrate users.

Tolerance for friction in digital interactions varies from place to place. Countries with fast momentum seem to demonstrate more patient and engaged behavior. Digitally advanced countries are more sensitive to friction.

The DEI 17 reveals these and other crucial insights that can help senior decision-makers across industries, including government, identify how they can help take their country's digital economy to the next level.

"Digital trust is rooted in relationships"

1 Meeker, Mary. *Internet Trends 2017 – Code Conference.* Kleiner Perkins. May 31st 2017. kpcb.com/internet-trends
2 McKinsey Global Institute. *Digital globalization: The new era of global flows*, February 2016

How Stand Out nations outperform their rivals

Top performers lead the way in digital sophistication and pace of change through first-class innovation

Government and industry leaders around the world dream of guiding their nation into the Goldilocks zone where prosperity and an intense spirit to innovate coexist. These countries are digital leaders with the resources and hunger to stay at the top for years to come.

The DEI 17 reveals the identities of the digital elites operating at this level. As a group, they are split in two. First, there are the international trade hubs of Hong Kong*, Singapore and the UAE. Geographically small, they have long histories as crossroads of trade and regional hubs for capital. These entrepôts are now as comfortable with digital businesses and data flows as they are with finance and commerce. And second, there are the nation states of the UK, Estonia, Israel and New Zealand. These four countries are powering ahead of their rivals thanks to a complex formula of infrastructure, incubating start-ups, a cultural commitment to innovation, and government support.

> "If needed to, Estonians could all move to a new continent, boot up, and reconstitute Estonia exactly as it is"

This last ingredient – government – is a crucial element. While some may believe true innovation happens when government "gets out of the way," the Stand Out countries of the DEI suggest there is, in fact, a significant role for the state to play in facilitating and fostering the digital economy.

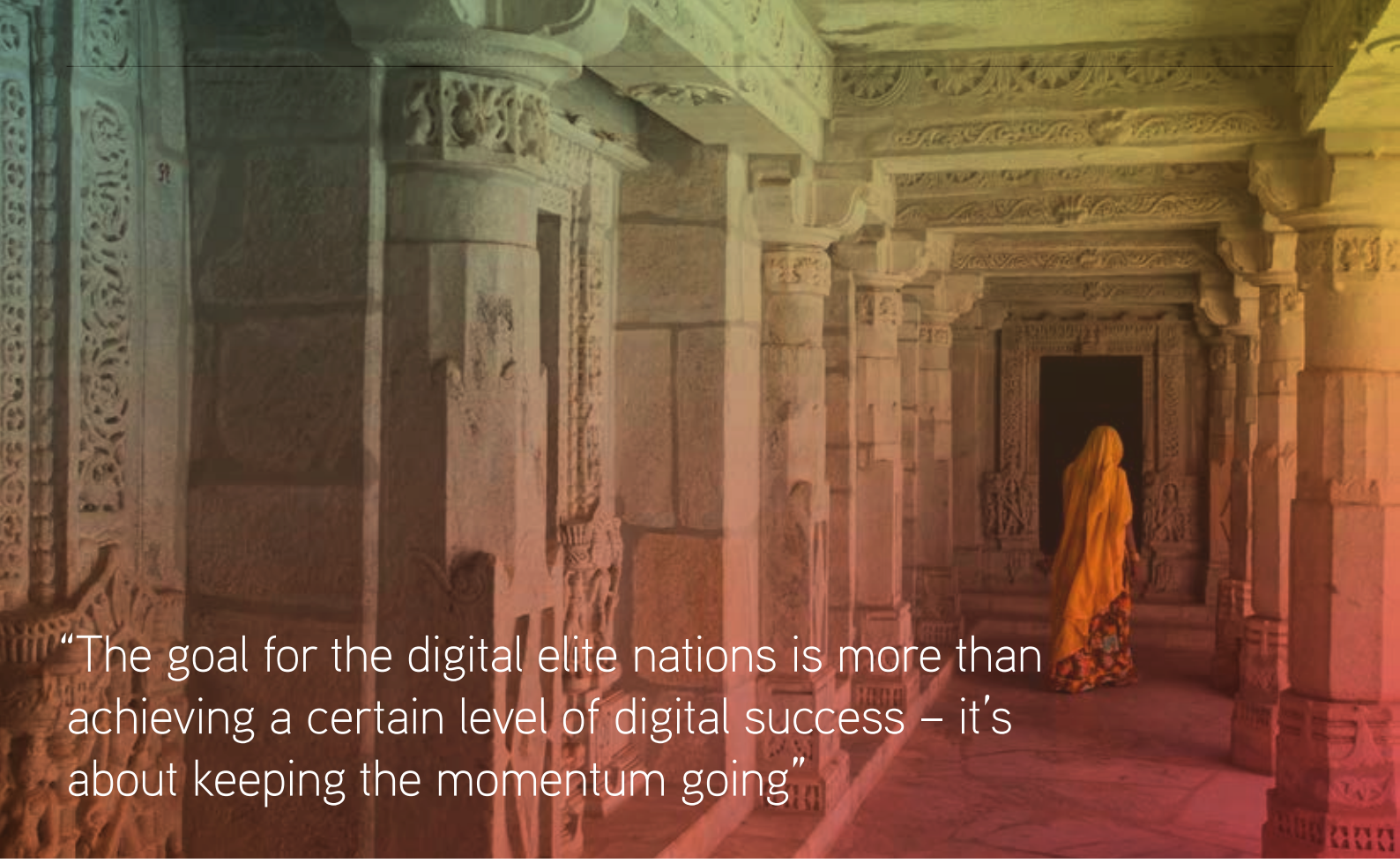
Estonia is an outstanding example. At the turn of the millennium, it embarked on a national project to become a leader in technology. It has succeeded beyond expectations. Today, *Wired* magazine calls it "E-stonia, the world's most digitally advanced society." Government officials list their email and cellphone numbers online[3]. Paying for car parking by text was common 15 years ago. First-grade children learn to code. Governance is entirely paperless. All documents are online, and everything is backed up in the cloud. If needed to, Estonians could all move to a new continent, boot up, and reconstitute Estonia exactly as it is.

An eye-catching service is Estonia's "e-residency" program. Foreign nationals can become an Estonian digital citizen, able to register a company, file taxes and use all digital services available to citizens – only without the passport. According to Taavi Kotka who designed the system during his time as the country's CIO, "The beauty of the whole program is that it costs zero to us. It's the same processes and the same functions that Estonians use[4]."

In Singapore, the government is pushing the smart-city agenda to new levels by harnessing all public data to create a "Virtual Singapore," a genuine "Smart Nation." This online platform will map out the performance of the city state in real time. It will be possible to look at how diseases might spread in an epidemic, or how traffic will react to roadworks.

In a similar fashion, the UAE is enjoying explosive digital growth. Again, the government is at the heart of it. In the

* Hong Kong is a Special Administrative Region of China



"The goal for the digital elite nations is more than achieving a certain level of digital success – it's about keeping the momentum going"

emirate of Dubai, a state body called Smart Dubai is executing a plan to transform services and society, just as the Estonians have. The national government's UAE Vision 2021 is a national innovation strategy targeting core sectors. These are 3D printing, nanotechnology, semiconductors, artificial intelligence, software and smart cities.

The UAE also illustrates the power of digital technologies to make life better. According to the World Happiness Report, the country ranks 21st out of 155 countries[5] – ahead of France, Spain and Singapore – making it the happiest Arab nation. This sort of metric is taken seriously: in February, the UAE hosted the World Happiness meeting, part of the World Government Summit.

Naturally, the goal for the digital elite nations is about more than achieving a certain level of digital success. It's about keeping the momentum going. A lesson highlighted throughout the DEI report is just how difficult this is. "The top five scoring countries in the DEI 17 – Norway, Sweden, Switzerland, Denmark and Finland – are all Stall Out countries, reflecting the challenges of sustaining fast upward momentum," says Dr Bhaskar Chakravorti, senior associate dean of International Business and Finance at The Fletcher School at Tufts University. "Investing in innovation capacities and attracting talent are crucial to jumpstarting momentum."

One nation that offers tantalizing clues as to how permanent change can be achieved is Israel. Michael Dell, founder of Dell Technologies, marvels at the country's achievements: "Israel's performance has inspired the entire world… Technology here improves by about ten times every five years[6]."

The Israeli formula is to be strong across all aspects of digital innovation. Israel spends more on research and development as a percentage of GDP than any other nation, at 4.25 percent compared to 1.95 percent in the EU and 2.79 percent in the US[7]. Israel has a culture of innovation, with infrastructure to match. The universities are powerhouses of research, and armed with technology transfer units to take concepts from the lab to the boardroom. The start-up scene, nicknamed Silicon Wadi, is arguably the second most productive in the world, although some way behind Silicon Valley.

A thread running through all the DEI elite is an openness to global trade. The UK is the example *par excellence*. London is known for the "Wimbledon Effect," in which the city plays host to an international cast of stars, rather than relying on homegrown talent. The idea

"The benefits of harnessing human creativity in the digital realm are huge"

was coined by the Japanese, marveling at the success of the City of London's finance sector. Now, London is home to Europe's tech stars. The fusion of tech and finance – fintech – has led to creative new business models in finance and is the hottest area right now. It makes sense, as the existing banks are on hand to offer expertise and backing to fintech start-ups. In the first quarter of 2017, peer-to-peer lender Funding Circle won £82 million from investors, while challenger bank Monzo and FX start-up Currencycloud both got more than £20 million. Since the Brexit referendum, the London tech sector has passed £1 billion in investment, making it the tech capital of Europe.

The jewel in the UK's crown is arguably DeepMind, creator of the artificial intelligence engine AlphaGo, which learned to play the Chinese board game Go better than any human. DeepMind founder Demis Hassabis is emblematic of the city: he has a Greek Cypriot father and Chinese Singaporean mother, and grew up in North London. He insists DeepMind plays games under the Union Jack flag.

Having now retired AlphaGo, DeepMind has turned its resources to teaching computers relational reasoning – the cognitive capability that enables humans to understand the relationships between different concepts and objects.

The benefits of harnessing human creativity in the digital realm are huge. New Zealand has worked hard to foster an entrepreneurial culture. It's got a thriving movie post-production industry (accelerated by *The Lord of the Rings* trilogy) and has spawned companies such as accounting software giant Xero. But the New Zealand government says the contribution of digital to the economy could be tripled if more firms were digitally engaged. At first glance, it would be easy to overlook New Zealand if evaluating global importance through the traditional lens of "trade route" mapping. Yet, in a digital world the winning currency is the ability to play globally, a mantel the nation has clearly embraced.

Countries need to look closely at how the DEI elite performers got where they are. The basic ingredients are clear: openness to talent; access to finance; advanced infrastructure; and a government with the ambition to harness digital innovation for social change. These are the elements that pave the way to excellence in tech – now and in the future.

3 Hammersley, Ben. *Concerned about Brexit? Why not become an e-resident of Estonia.* Wired. March 27th 2017
4 Orton-Jones, Charles. *Estonia – Saving UK businesses from Brexit doom.* Raconteur. November 15th 2016
5 Sustainable Development Solutions Network. *World Happiness Report 2017.* March 20th 2017
6 Levy, Guy. *Israel is the center of the digital future.* Ynetnews.com. May 22nd 2016
7 Cocco, Federica. *How Israel is leading the world in R&D.* Financial Times. February 8th 2017

Nordic nations ride high, but risk stalling

Despite a history of strong digital evolution, the Nordic nations are at risk of losing relevance in the global digital economy

Achieving the continuous innovation we see in Stand Out nations is an ongoing challenge. The 2017 edition of the Digital Evolution Index identifies a growth paradox where many of the most digitally evolved countries struggle to maintain a fast pace of growth and instead reach a digital plateau. These nations fall into the Stall Out category.

The DEI 17 demonstrates clearly the strength of Nordic innovation in the early phases of digitalization. Four Nordic nations feature in the top five by DEI score: Norway, Denmark, Sweden and Finland. Indeed, these countries have an impressive history of producing global brands and innovative start-ups, despite their relatively small populations.

However, past digitalization is not translating into future momentum. While Nordic governments were early investors in digitalization, they have suffered from a combination of demand saturation and clogged innovation engines.

> "It's essential that business executives and directors put digitalization goggles on from the very beginning"

Denmark, for instance, was a leader of early digital transformation in the workplace. But the nation has since struggled to maintain this momentum when it comes to the development of products and services for the digital consumer.

"We have always been proud of being very IT-ready in Denmark, but we've never actually been very good at converting that IT-readiness into a competitive advantage for Danish businesses," says Janus Sandsgaard, head of digital policy at the Confederation of Danish Enterprise[7]. "It's essential that business executives and directors put digitalization goggles on from the very beginning, when a business strategy is being drawn up."

The country proving itself most able to overcome this plateau is Finland. Like other Nordic nations, Finland has a long history of producing successful, innovative, high-tech companies. However, its recent history has been turbulent. Its most notable company, Nokia – once a global giant – has undergone mass lay-offs in recent years.

To prevent significant fall-out from Nokia's decline, the Finnish government responded by

encouraging collaboration between universities, start-ups and big business. It created incentives for businesses to invest, provided grants for start-ups and new job training, and enabled former Nokia employees to use the company's unwanted intellectual property free of charge.

Mikko Kesti, founder and CEO of Helsinki-based start-up Loupedeck, was one of the entrepreneurs able to take advantage of the abundance of talent suddenly available post-Nokia. "For us, it was a blessing that Nokia collapsed. I had spent 24 months looking for people to help me build my product, but I couldn't find them."

Kesti's business has created a photo-editing console – effectively, a mixing desk that enables photographers to alter images with the turn of a knob. Loupedeck developed the product in collaboration with UnSeen, a company of ex-Nokia engineers based in Tampere, Finland. Kesti says collaboration between companies in Finland is commonplace.

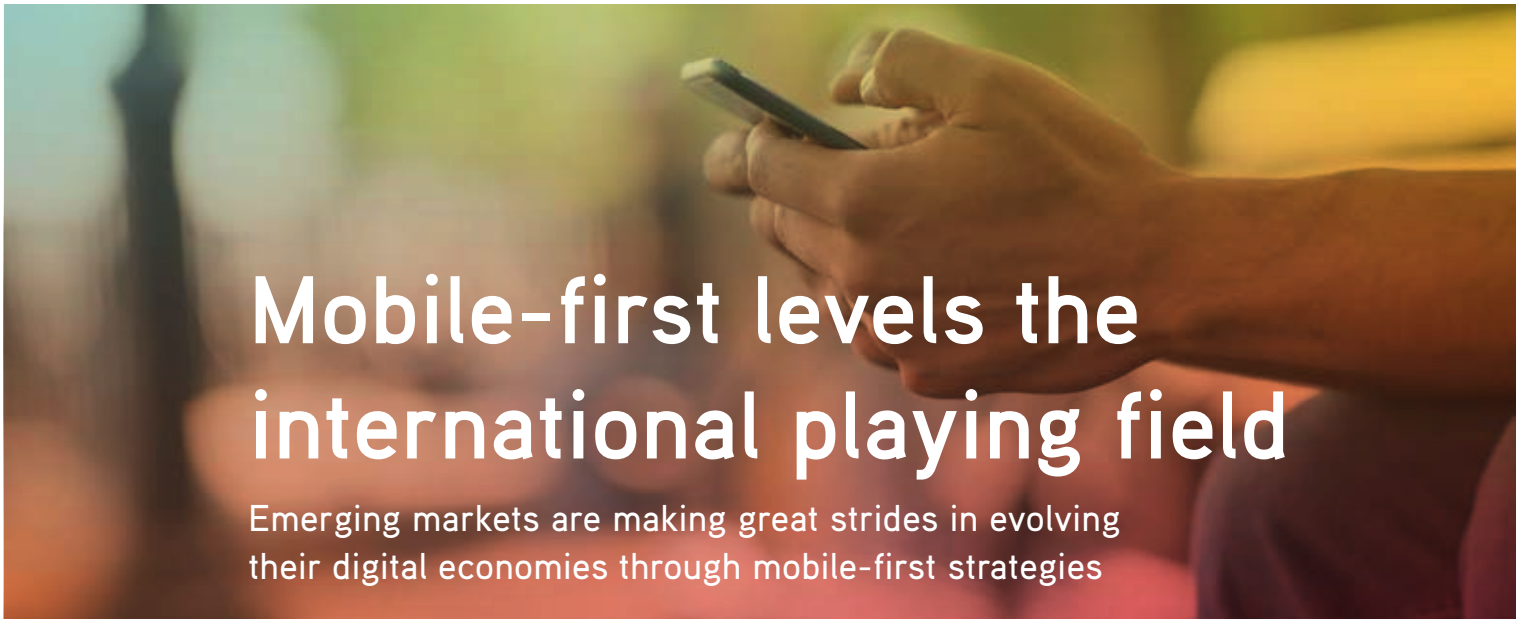
"They had the skills and we had the idea. We both want the same things – to innovate and to create a global product. It makes us both agile and flexible. We are forecasting sales of €5–8 million this year," he says.

Researching, developing and launching new products in the digital age is complex and expensive. So it is increasingly being done as a collaboration between different parties, including universities, big businesses, start-ups and government. This is one of the themes of *The Smartest Places on Earth*, a book by Antoine Van Agtmael and Fred Bakker[8]. They argue that "glorious isolation" is no longer an option for innovative businesses and stress the need for collaborative efforts. The book also tracks clusters of so-called "brainbelts" across Europe and the US. These typically contain one or more large employers, strong universities and a buoyant start-up scene.

Whether the Nordic nations can regain the momentum the DEI 17 suggests they have lost will surely depend upon the actions of key players in business, academia and government. Most crucial will be the extent to which these players are able to collaborate. The Finnish example is key and doubtless will be looked at by policymakers in Nordic countries and beyond.

7 Lund, Jakob. ***Ønskes: Digital vækstkultur***. Alt om data. August 17th 2015

8 Agtmael , Antoine Van and Fred Bakker. ***The Smartest Places On Earth***. PublicAffairs. May 9th 2017, Canada



Mobile-first levels the international playing field

Emerging markets are making great strides in evolving their digital economies through mobile-first strategies

More than 25 years ago, the world embarked on a drive to connect consumers with digital resources. The internet equips users with fast access to information, commerce and communications. But the speed of uptake has varied greatly from country to country.

There are plenty of reasons for this disparity. These include the unequal buying power of consumers and the availability of appropriate infrastructure, and differing social, political and economic environments.

Developed nations with mature economies surged ahead in the early years of the global dotcom boom. Some developing nations have since caught up and, on a few measures, are inching ahead of established digital markets such as the US, Canada and the UK.

One important indicator of a country's digital potential is its uptake of mobile internet via tablets and smartphones. Countries in the English-speaking world reached this stage through iterations of services originally aimed at desktops and laptops.

"Investments in mobile internet infrastructure are being rewarded with fast growth of digital services"

Others, however, have taken a more direct route, with a singular focus on internet access via cellphones. This could be a game changer for developing economies who adopt a mobile-first strategy, says Ajay Bhalla, president of Global Enterprise Risk and Security at Mastercard.

"The implications for these countries, if they get it right, is the potential for rapid development," says Bhalla, "The more people have access to the internet, the more opportunities there are for growth in so many sectors. Consider payments for all types of services – from travel to retail and even government services."

New digital ecosystem

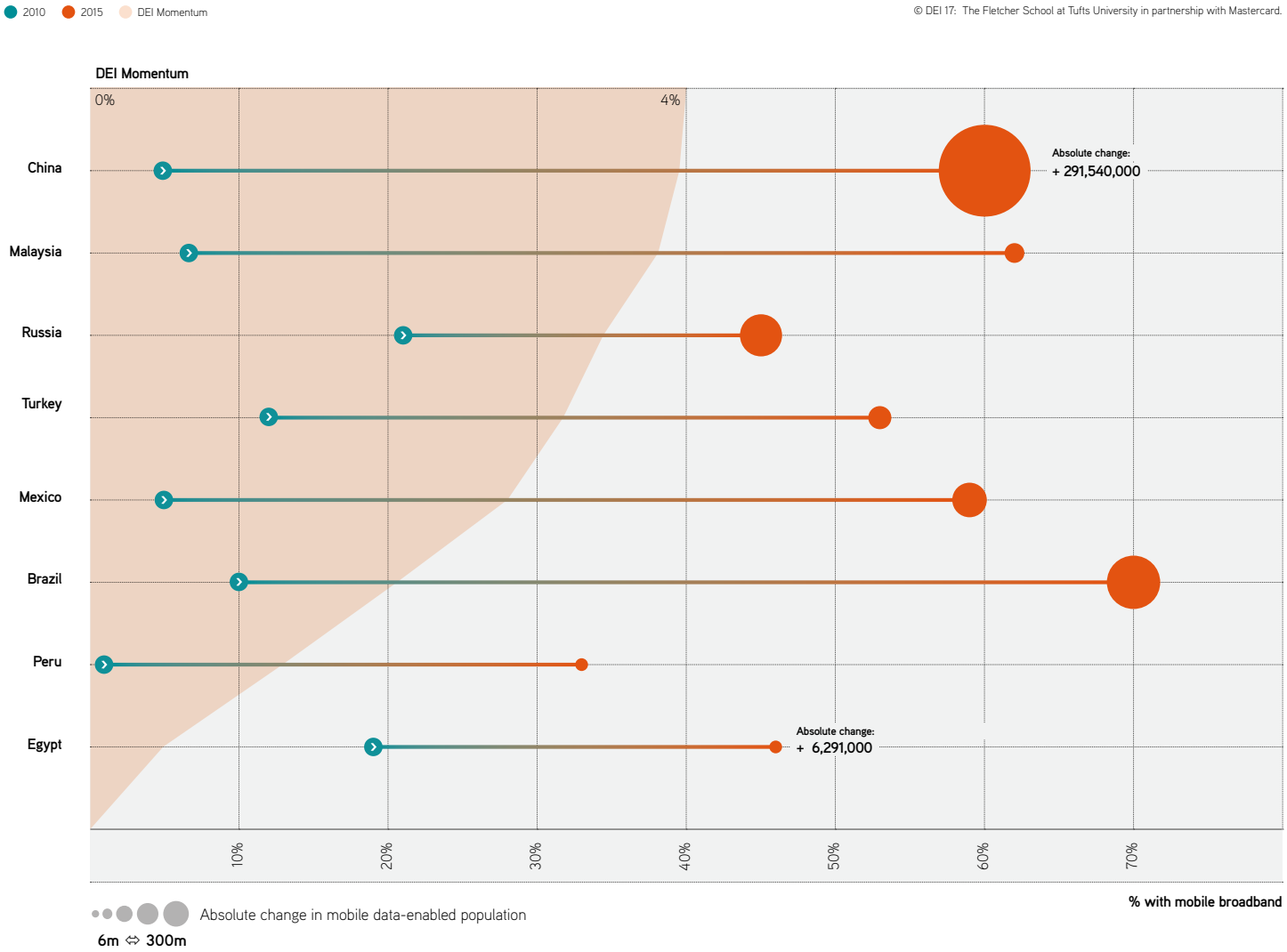
Desktop PCs still account for more web traffic than smartphones in the UK and US, but in China the reverse is true, and elsewhere smartphones are a clear winner. The effect is a global surge in mobile internet traffic. According to research by StatCounter[9], world mobile internet usage outstripped desktops for the first time in 2016.

"The US and UK were introduced to the internet through desktops and laptops, but the 1.5 billion new internet users added in the past five years had their first brush with the internet on a mobile device," explains Dr Bhaskar Chakravorti, senior associate dean of International Business and Finance at The Fletcher School at Tufts University.

"This has created a new ecosystem, where part of the world is sitting on legacy systems that were set up for a desktop-centric population, but another part is starting with a full-blown mobile-centric approach."

Chakravorti points to the example of M-Pesa, a money-transfer service that launched in Kenya in 2007, but which has since spread across Africa,

Mobile Internet Gap



India and parts of Eastern Europe. The business rose from the constraints of a market in which few had access to a bank account.

Customers can deposit money, transfer amounts via secure SMS messages and redeem deposits – all via a regular cellphone. M-Pesa is popular in countries where institutions are weak but cellphone adoption is high.

The explosion of smartphone use in the developing world has moved this narrative forward. Developing countries that have invested in mobile internet infrastructure are being rewarded with the fast growth of digital services.

Nowhere is this more pronounced than in China, where smartphone adoption has rocketed since 2010. Today, more than half the population have access to mobile internet and 95 per cent of cellphone users have a browser on their handset.

This compares favorably with India, a fellow fast-growth BRIC country with a giant population. While cellphone uptake in India has been strong of late, only roughly a quarter of the population can access digital services via a smartphone. That said, the popularity of services like M-Pesa, rooted in older technology, demonstrate the potential for growth through data-enabled mobile solutions in India as well as across Africa.

Which came first?

"Constraint is the mother of innovation," says Bhalla. "In China's case, constraints – particularly around affordability of access devices among its rising middle class – have forced businesses to innovate around phones. The giants of China's internet economy – Tencent, Alibaba and Baidu – were all built around a mobile device.

"Contrast that with the giants of the western world, who would all love to break into China, such as Amazon, Google and Facebook. They were all created for the desktop era and eventually adapted to mobile."

But in mobile-first environments, the context is completely different. In China, businesses are focused on how they can make money from smartphones – the primary access device for many. In this respect, the Chinese are surging ahead.

"In 2010, most digital commerce transactions were

cash on delivery; in other words, physical money was exchanged on the doorstep," Chakravorti continues. "By 2015, two-thirds of all transactions were made on a mobile phone, including those taking place in bricks-and-mortar shops."

India, in contrast, is making slow progress. While cellphone pick-up is strong, the gap between "smart" and "feature" phones in circulation is wider than ever before. India's stubborn cash economy meant it took demonetization by government decree to wean Indians away from notes and coins – an event that saw mobile wallet provider Paytm claim 170 million users in just a few months[10].

"India is an interesting example of a nation with a growing mobile internet gap. The country has been adding more mobile subscriptions and fewer mobile internet subscriptions," says Chakravorti. "Only 17 percent of the population owned a smartphone in early 2016.

"India has done a great job of adding more mobile users, but the country is tapering off its broadband, which presents a challenge. It's not a problem of availability – it's a vast country and the most vibrant telecom market in the world. But affordability remains an issue."

Power of the state

China's rapid rise in this area can be explained in part by its relatively high level of state control on the economy, unlike in western democracies. Chakravorti says western regulations create stable institutions but can slow progress compared to places where decisions are made centrally.

The World Bank's ease of doing business rankings[11] shows that the US and UK are better places to start and run a business, but that China has an advantage because the state can force through developments it deems to be a national priority.

"Contrast that with the UK's paralysis in deciding where to build new airport infrastructure – potentially with a third runway at Heathrow," Chakravorti points out.

"Institutions at their best are a huge help – and, at their worst, a hindrance. In China, pretty much every telecoms player has some level of state involvement. It is able to corral companies in [such] a way that they can get to the last mile faster than in the rest of the world. It can accelerate progress, where other countries rely more on demand, competition and market mechanisms."

Another factor influencing mobile internet is the rapid pace of urbanization in China, where the growth of the manufacturing industry precipitated an influx of workers into city centers from the countryside. This, in turn, led to a big expansion of middle-class consumers.

China has widespread digital infrastructure, affordable mobile hardware and network plans, as well as a proliferation of internet services – all of which make buying a smartphone worthwhile. In countries where digital mobile is weaker, one or more of these factors is lacking.

Without 3G or 4G coverage, people can't access the internet; without affordable handsets they can't buy the means to get online; and in the absence of localized and relevant digital services there is no reason to buy a phone. Countries such as India, where appetite for mobile telephony is established but where internet adoption is low, must address these factors if they want to catch up.

9 Statcounter.com, *Mobile and tablet internet use exceeds desktop for first time worldwide*. November 1st 2016

10 Sen, Sunny. *Mobile wallets see a soaring growth post-demonetisation*. Hindustantimes. January 1st 2017

11 The World Bank. *Economy Rankings*. Accessed June 28th 2017. doingbusiness.org/rankings

Measuring digital trust

To increase digital engagement and drive growth, businesses and institutions are tasked with increasing digital trust. First, they must understand it

As the digital world permeates more and more areas of our lives, the degree to which people trust digital devices, interactions, services and the organizations behind them becomes increasingly important.

When people make purchases online, or give up their data through browsing and social media use, they want to believe that they will receive the goods they paid for, and that their data will not be misused.

But while there can be no doubt that trust matters in these contexts, there has been a lack of clarity about just what trust is – as well as how it can be earned by would-be guarantors, or instilled in users.

For that reason, the DEI 17 includes a newly developed four-part digital trust framework that is designed to help distill just what constitutes digital trust and establish why it matters. The elements of the framework are made up of four drivers: environment, experience, attitudes and behavior.

The first two drivers are controlled by the guarantors of trust: businesses, institutions and government. Environment relates to security, systems of accountability and privacy. Experience is characterized by the amount of "friction" that users in a certain country have to put up with when they engage with the digital world.

The latter two drivers – attitudes and behavior – are controlled by consumers, the givers of trust. Attitude corresponds to users' self-reported levels of trust in large technology companies, online transactions, and the government's ability to keep their data safe. Behavior is a measure of how enthusiastically and patiently users engage with the digital world.

You might expect user behavior towards the digital world to correspond very closely to the reliability of their digital environment and the quality of their experience. But this isn't always the case.

In South Korea, for example, the digital environment and experience fostered by government and businesses is highly sophisticated. But consumer behavior here scores far lower than in top-scoring China, where the environment is significantly less advanced. And there are a number of other digitally advanced countries where the same pattern is true.

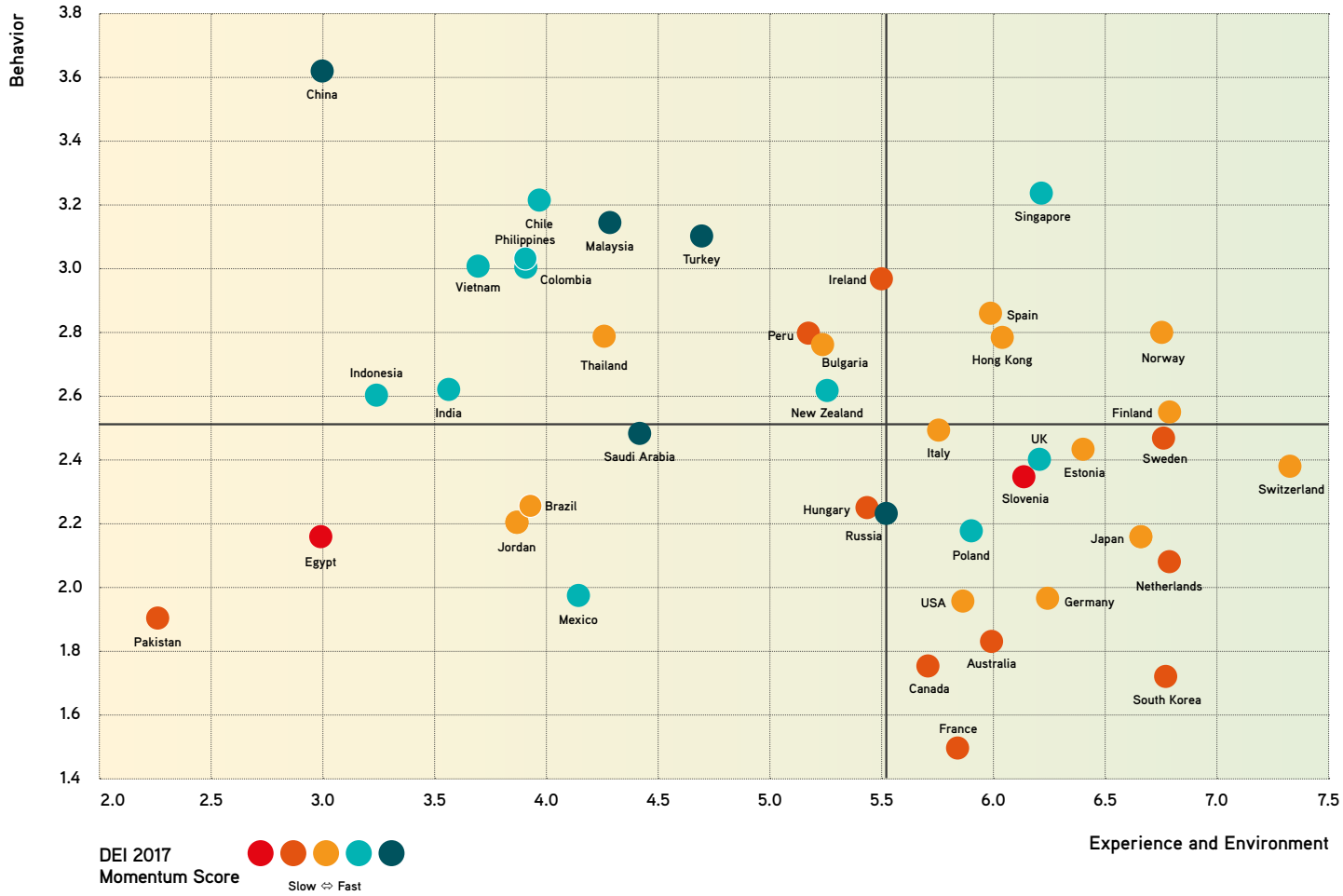
China's rocketing smartphone adoption rate and related high momentum score suggest exactly why this might be. When plotting behavior against experience and environment and overlaying momentum, as per the graph below, a pattern emerges.

Although the relationship isn't uniform, there is a clear correlation here: the higher a country's momentum score (blue), the more likely it is to score highly for behavior as well. In other words, it seems that the more quickly a country develops digitally, the more likely users are to exhibit more patience with friction, and increase their level of digital engagement.

These findings point to a responsibility across the external guarantors of trust – government and business leaders – to push for continued innovation in technology and the policies surrounding its wider implementation in society. In the short term, this push will increase countries' rate of evolution, and, in turn, inspire greater patience and engagement from users, as they realize greater value in new technologies and products.

Trust Index Landscape

Digital Evolution Index 2017



Friction and fervor in the digital experience

As billionaire investor Warren Buffet once famously said, "It takes 20 years to build a reputation and five minutes to ruin it." Trust is crucial to the economy, society and pretty much every part of our everyday lives, including our digital interactions.

The global financial crisis of 2008 has exacerbated the scarcity of trust.

Digital technology is dissolving national borders and making it easier than ever for us to communicate and do business instantly, in almost any place or at any time.

Rapid advances in digital technology in the past 20 years have created big benefits (convenience, speed, access to virtually all known information, new business opportunities) but also big problems (increasingly sophisticated cyberattacks and worries about data privacy).

Trust in a digital age

How is all this financial, technological and social upheaval affecting trust online? It's a simple question that has profound consequences, including for the global economy.

Trust is becoming increasingly important to online transactions. But this isn't universal. The DEI 17 found major differences in the level of digital trust in different countries.

In those nations undergoing rapid advances in digital technology – such as China, Malaysia, Bolivia, Kenya and Russia – individuals are more tolerant of slow and unreliable online technology, compared to users in countries where technology is more advanced.

The need for speed

"Momentum – the pace at which a country is digitalizing – correlates positively with high tolerance," says Dr Bhaskar Chakravorti, senior associate dean of International Business and Finance at The Fletcher School at Tufts University.

"China has by far the most tolerant population when it comes to the digital experience and environment," he continues. "The trust indicated by this level of citizens' patience with sometimes erratic technology can be connected back to the momentum with which China has evolved, digitally, since 2008 – the highest among all the

"If the first step to increasing digital trust is understanding it, the second step is aiming to be more trustworthy"

countries featured in the DEI."

So, although Chinese citizens may have to put up with digital technology that's generally inferior to that found in South Korea, for example, China's technology has still improved enough over two or three years to make its inhabitants more patient with its current state – which is in fact far better than in the recent past.

Countries where the digital experience and infrastructure are better tend to have more advanced digital economies and display a higher reliance on technology.

Over time, the level of consumer expectation in these countries has grown higher. Consequently, even minor digital disruptions can cause major frustrations.

Digital honeymoon

"Consumers in 'high momentum' countries may be having a honeymoon period in their attitudes towards technology," says Chakravorti. He adds that in developing countries, consumers' tolerance for patchy broadband and unwieldy interfaces may decline as their expectations rise.

A common question is: "How can countries (both developed and developing) increase trust in digital technology?"

If the first step to increasing digital trust is understanding it, then the second step is aiming to be more trustworthy.

"Increasing trust" is an overly simplistic goal in the digital world – phishing scams, fake online news, hoaxes and identity theft all speak to the necessity of some level of skepticism. Guarantors should work towards intelligent trust, by first aiming to be trustworthy.

In the same manner that Stand Out countries maintain their digital elite status through innovation and government support, guarantors should consider using practices and policies that increase transparency, accountability and security – while reducing unnecessary friction.

Once again, Estonia provides a good case study. With their e-IDs, Estonian citizens can complete just about any state or municipal service online, and in minutes. Citizens can also log into their state portal accounts to see not just who can access their information, but also who has accessed it – providing a high level of transparency.

"Digital guarantors should increase transparency, accountability and security while reducing unnecessary friction"

There are calls for innovation in the policy space – re-thinking existing laws and protections to catch up with the digital age.

One example of this is the regulation of algorithms – mathematical formulas used to decide what news to show Facebook users, or which areas to deliver services to. Algorithms play important roles in some of the world's most popular online products and services.

In the past year, there has been growing concern that technology companies have been using algorithms to manipulate public opinion, increase inequality and even discriminate against people based on their ethnicity[12].

New technologies such as artificial intelligence and the Internet of Things (sensors connected to the internet through everyday household items, from coffee makers to cars) are set to make algorithms even more entrenched in our everyday lives.

Some have even suggested that there should be a national algorithm safety board[13] to ensure that algorithms are used responsibly, for the greater public good.

"Today, it's a bit like the Wild West," says Chakravorti. "Every company creates algorithms in their own way.

"Businesses, governments and civil society will need to collaborate to develop rules and principles for safeguarding trust in the digital economy."

Countering cyber threats

The proliferation of cyber security threats is another major impediment to digital trust, particularly in developed economies.

Simple precautions such as two-factor authentication (signing in to a website with your password and a code that is sent to your phone) and the use of biometrics may help protect us from hackers - yet they also create more friction.

Increasing trust online or offline can be tricky, and requires balance. Digital trust is influenced by a handful of factors, including culture, the pace of technological change and the ease with which people can communicate and do business online.

As more of our world is digitized, trust online will soon become as, if not more, important than trust in the physical world. We need to invest more time, thought and resources in nurturing it.

12 Chakravorti, Bhaskar. *10 Questions To Ask Before Trusting The Nabobs Of The Net.* Forbes, May 19th 2016

13 Macaulay, Thomas. *Pioneering computer scientist calls for National Algorithm Safety Board.* Techworld. May 31st 2017

Watch what they do, not just what they say

To truly understand the level of trust consumers have in their country's digital environment, consider their behavior, not just their attitudes

Sit in any airport lounge, coffee shop or park in any developed country – and, indeed, in many developing countries – and you will see people who only have eyes for their smartphones. Our love affair with technology is very public. So why do so many of us profess to be skeptical about it?

"Our smartphones are inexhaustible sources of communication, connectivity, and learning," says Elizabeth Filippouli, founder and CEO of the Global Thinkers Forum. "At the same time, technology can be intimidating. It takes energy, understanding and dedication to learn its uses. There are also people who think that innovations may ultimately be harmful, because they breed a culture of isolationism and crypto anarchy."

The DEI 17 highlights these complex views on technology, revealed by the difference between the research findings on each country's attitude towards digital and its behavior.

Research into trust typically involves surveying people on how much they feel they trust technology – as well as institutions, processes and other people. Surveys, however, are not always a reliable barometer since they have three main flaws:

"People can be skeptical about technology and still elect to use it"

First, consumers are not always candid – they may want to please the researcher or convey positive social values. Second, the surveys themselves may not be specific enough about whom we are trusting to do what. We may trust our neighbor to walk our dog, for example, but would we trust them to run the country? Finally, there is a misguided notion that more trust is always better – in fact, having too much trust in the wrong device, institution or politician is not a good thing. For these reasons, while survey-based measures of trust are included in the attitudes pillar of the digital trust model, it is just as important for us to look at people's behavior as a proxy for trust.

Behavior provides a different lens than attitudes for measuring trust in technology. The behavior pillar reflects how individuals spend two of their most valuable assets: time and money. Through contrasting and comparing the behavior and attitudes pillars, several interesting insights emerge.

For instance, in some cases, countries have large numbers of people who claim to lack trust in technology, but in practice they are very patient with it, tolerating "friction" such as password prompts and service disruptions and showing an eagerness to buy goods online. This does not necessarily mean that people are not honest or candid in stating their attitudes, but it shows that oftentimes negative attitudes do not necessarily result in a drastic change in behavior, particularly in the short term. People can be skeptical about technology and still elect to use it.

"Humans are very social and we have a constant fear of missing out," explains Andrew Nicholson, co-founder and CMO of marketing automation company Kulea MA. "That beep on

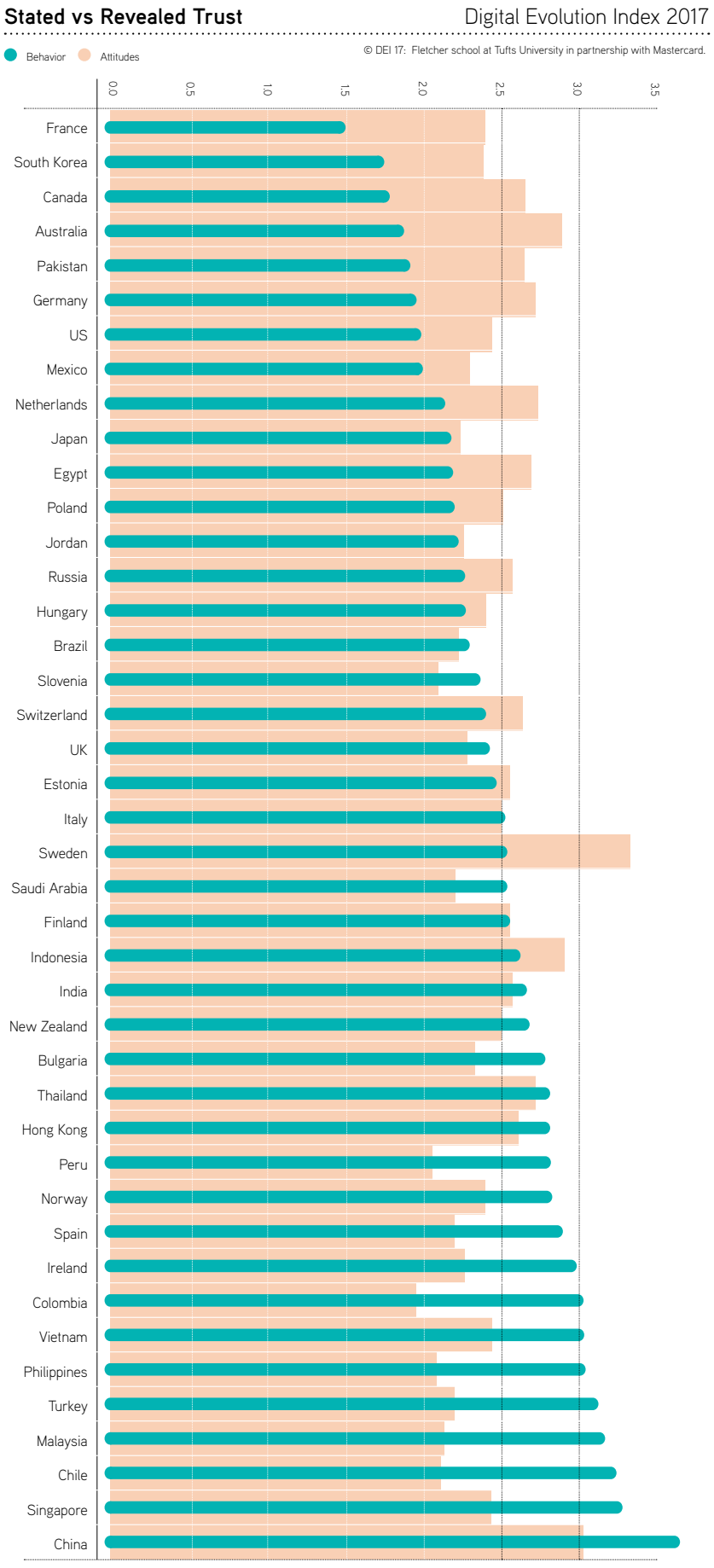
"If relevant technologies and digital services are regularly introduced, consumers are more tolerant of friction and interruptions"

our phone conveys a nugget of information that our brain is hardwired to accept and respond to. Since our phones are constantly on, we are overwhelmed by endorphin-releasing nuggets." Like any addiction, it seems that the more that people use technology, the more they want to use it – especially if they are rewarded for doing so.

"Our research shows that users' reaction to their digital environment depends on the rate of change they experience," says Dr Bhaskar Chakravorti, senior associate dean of International Business and Finance at The Fletcher School at Tufts University. "If relevant technologies and digital services are regularly introduced, consumers are more tolerant of friction and interruptions."

Of course, the gap between attitudes and behavior varies according to country. In emerging markets, for example, people are more likely to put up with unreliable technologies and slow loading times than their peers are in more digitally developed countries. This is because the rate of improvement they have experienced puts these frictions in context; a slow smartphone is better than no smartphone.

In reality, momentum plays a crucial role in changing attitudes across all markets, according to Ajay Bhalla, president of Global Enterprise Risk and Security at Mastercard, which sponsors the Fletcher report. He says: "The study shows that improving momentum and reducing friction are key. Momentum is like a tailwind, while friction is a headwind on the path to digital trust."



The road ahead for the global digital economy

The future is bright, but governments and businesses must act now to bolster their digital economy and help it to evolve

The DEI 17 shows that the international pecking order is changing. The nations with the highest scores for digital momentum – such as China, Malaysia, Bolivia and Kenya – have high economic potential and are likely to pique the interest of global investors, especially if their stock continues to rise.

As we've seen, it takes a complex combination of factors to improve the digital environment in a given country, but the evidence shows that governments have a significant role to play. For policymakers and politicians, the initiatives that have proven successful for Stand Out and Break Out nations should provide food for thought. It seems as though the ability to think globally and act locally – to create collaborative connections and conditions for them to thrive – is a crucial determinant of success on the journey to world-leading digital sophistication.

"The DEI 17's findings signal how digital trust is becoming front and center"

However, some countries are at risk of "stalling out" and being left behind. For digitally advanced nations whose momentum has slowed, a lack of innovation is often the most important challenge. But their citizens also tend to exhibit a lack of trust, which may stymie digital evolution further. This may be because the "digital honeymoon" is over for them, and the benefits of digital evolution are now expected to come as standard, with advances only seen as being incremental.

A lack of trust doesn't tend to impede Break Out nations nearly so much. Citizens in China and other upwardly mobile countries have higher levels of trust in their dealings with the digital world. That's likely because they see the scale of the opportunity on offer and so are more prepared to put up with the friction that comes along with it.

The DEI 17's findings signal how digital trust is becoming front and center. The rise of fake news, dissatisfaction with the way disingenuous brands and individuals portray themselves online, as well as serious disruption to crucial institutions as a result of hacking and other breaches in cyber security are all cases in point.

In this report, we've seen how trust in digital institutions and processes might be increased. Security, accountability and transparency are all key factors in improving trust. Policies and practices should work to balance these principles, while working to reduce friction.

Looking ahead, the prospects for a more connected, global digital future look bright – with Stand Out and Break Out nations playing an increasingly prominent role. Take the decision of the founders of Instiglio,

a social impact bond start-up, which came from the Harvard i3 innovation competition. It chose to base the company in Bogotá, rather than Boston or San Francisco. Consider the Estonian government's e-residency initiative, which *Wired* magazine suggested could "fundamentally change what it means to be a country," and which has led to the prime minister of Japan taking up e-residency of the tiny former Soviet country[14]. It's also interesting to note the work done by Chinese e-commerce giant Alibaba in an attempt to instigate a new era of frontier-free global trade. Founder Jack Ma first announced his plans for the electronic world trade platform (eWTP) at the G20 summit in Hangzhou last year[15]. He hopes it will eradicate many barriers to e-commerce and will encourage small and medium-sized businesses to trade across borders.

These are the sorts of innovations and forward-thinking initiatives that give other countries and companies inspiration for what they will have to do to keep up – or to maybe even get ahead of the curve.

By the time the next DEI comes around, we will know just how well they fared, as well as how insights gleaned from the DE1 2017 helped them to navigate a path forward.

14 Hammersley, Ben. *Concerned about Brexit? Why not become an e-resident of Estonia.* Wired. March 27th 2017

15 CNBC Exclusive Interview. *CNBC Transcript: Jack Ma, Executive Chairman and Founder of Alibaba Group.* September 2nd 2016