
THE DIGITAL SPRINTERS

How to unlock a
\$3.4 trillion opportunity

Prepared by AlphaBeta
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Important Notice on Contents

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THE DIGITAL SPRINTERS:

HOW TO UNLOCK A \$3.4 TRILLION OPPORTUNITY

THE CHALLENGES OF TRANSITIONING DIGITAL CONNECTIVITY INTO ECONOMIC GROWTH

Economic growth has not kept pace with digital penetration. The Digital Sprinters represent approximately

19% OF INTERNET USER GROWTH BUT ONLY 7% OF GLOBAL REAL GDP GROWTH

since 2013

For the Digital Sprinters, increased internet penetration has not led to dramatic productivity gains. For example,

INTERNET USER GROWTH HAS OUTPAID LABOR PRODUCTIVITY GROWTH BY 15 TIMES

since 2013

Digital adoption can vary by **MORE THAN 2X** across different sectors within one country



THE VALUE OF DIGITAL TECHNOLOGIES TO EMERGING ECONOMIES



Digital technologies could create an

ANNUAL POTENTIAL OPPORTUNITY OF UP TO USD3.4 TRILLION

in economic impact across 16 important emerging economies in Latin America, Eastern Europe, Africa & the Middle East – the “Digital Sprinters”, in 2030

Surprisingly,

47% OF POTENTIAL BENEFITS

of digital technologies accrue to sectors such as resources, infrastructure and agriculture – not services



12 POLICY LEVERS CAN UNLOCK THE DIGITAL OPPORTUNITY FOR ECONOMIC DEVELOPMENT

LEAD FROM THE TOP

1 Steer the direction

Drive change through the public sector

4 Create tipping points through government procurement

5 Go 100% digital on government services

6 Crowd source policy innovation

2 Coordinate across government

Equip the private sector with the digital essentials

7 Craft regulations for the digital, not analog era

8 Build future-proof digital infrastructure with interoperability and upgrading in mind

9 Equip MSMEs with the digital tools to support their growth

10 Use co-creation, the sharing economy and new digital incentives to stimulate innovation

3 Support global digital integration

Put citizens at the center of the digital economy

11 Support those who could be left behind by the digital transformation

12 Equip people with the right skills to access digital opportunities



EXECUTIVE SUMMARY

“ THIS WILL REQUIRE MORE SOPHISTICATED POLICIES AROUND UTILIZING TECHNOLOGIES DIFFERENTLY AND A SHIFT IN FOCUS FROM INCREASING THE NUMBER OF INTERNET USERS TO ENABLING AN ACTIVE DIGITAL ECONOMY WITH “DIGITAL WORKERS AND INNOVATORS, DIGITAL BUSINESSES AND DIGITAL GOVERNMENT.

”



Digital technologies can be a powerful catalyst for improving incomes, productivity and economic growth. There is much evidence on how developed countries have leveraged digital transformation in the way products and services are produced, distributed and consumed. From rolling out autonomous robots on factory floors, to purchasing groceries online, to consuming entertainment on mobile devices, this digital transformation has increased efficiency across the developed world. However, evidence suggests that simply focusing on generating access to digital technologies, such as driving internet penetration, is not sufficient to leverage their benefits.

Emerging economies will need to go beyond simple digital penetration to fully integrate and leverage available digital technologies to drive economic development. This will require more sophisticated policies around utilizing technologies differently and a shift in focus from increasing the number of internet users to enabling an active digital economy with “digital workers and innovators, digital businesses and digital government”. This report aims to understand the potential economic benefits of unleashing the full digital technology benefits in a number of important emerging markets and identify the policies to help realize that potential.

Internet penetration (as evidenced by rising internet use) has seen significant uptake globally. Yet, this increase in digital connectivity has not led to the transformation of productivity and economic growth, and improvements in livelihoods anticipated in academic literature. As Nobel laureate Robert Solow observed, “you can see the computer age everywhere but in the productivity statistics”. This became known as the “Solow Paradox”. More recently, some observers have argued that the same paradox exists with regard to digital technologies.¹ While digital technologies have penetrated most aspects of our lives, it is not yet clear how this translates into fundamental increases in productivity. From 2013-17, more than one billion people have started using the internet globally, reaching 4.1 billion users according to the International Telecommunication Union (ITU). There is strong evidence that internet penetration is closely linked with productivity, at least at the firm level.² Yet, over the last decade, economic productivity growth has been slower than over the previous decade. Global labor productivity grew at an average annual rate of 2.9 percent between 2000-07, compared to 2.3 percent between 2010-17. Many factors may have contributed to this, in particular the aftershocks of 2008’s global financial crisis resulting in persistently weak demand and uncertainty. It is definitely arguable that the penetration of digital technologies may have helped the world economy recover faster. However, the expected drastic transition of digital connectivity into productivity and economic growth has not occurred.

This poses a particular challenge for emerging economies. Productivity is a crucial driver of long term economic development³ and many emerging economies have focused on boosting broadband penetration, anticipating spillovers into economic development. Despite having made significant progress in internet penetration, these countries’ share of global growth is lagging behind their share of global internet user growth. Evidently, driving penetration is not sufficient to boost economic development if unsupported by policy that enables full utilization of digital technologies. Following the adverse impacts of COVID-19, capturing this potential digital dividend becomes ever more crucial.

The aim of this report is to understand how emerging economies can fully leverage digital technologies for economic development. This report focuses on 16 important emerging economies (which we dub the “Digital Sprinters”). These are Argentina, Brazil, Chile, Colombia, Egypt, Israel, Kenya, Mexico, Nigeria, Peru, Russia, Saudi Arabia, South Africa, Turkey, the United Arab Emirates and Ukraine. They include six of the ten largest economies in both the Latin America and Middle East & Africa regions, as well as three of the five largest non-high-income economies in Europe. Together, these “Digital Sprinters” account for 13 percent of GDP, 16 percent of population and 19 percent of internet users globally.

The report identifies the following key messages:

1 In the Digital Sprinters, fast growth in internet penetration has not translated into faster economic growth.

Historically, economic growth in the Digital Sprinters has not kept pace with internet adoption. Together, the Digital Sprinters represent approximately 19 percent of internet user growth but only 7 percent of global real GDP growth since 2013. In absolute terms, the number of internet users in the 16 economies from 2013-18 has grown annually more than 15 times faster than average labor productivity. Despite internet user growth of 9.2 percent in these markets, labor productivity increased only minimally at 0.6 percent and GDP per capita by only 0.1 percent. There are also large variations in digital technology adoption rates between sectors (even within the same economy).

2 If the transition from digital penetration to economic growth could be fully leveraged, digital technologies could transform economic development in these emerging markets.

Across the 16 economies, the annual economic impact of selected key technology applications in ten sectors could reach up to **USD 3.4 trillion by 2030** (equivalent to about 26 percent of the estimated combined GDP of these economies in 2030). Surprisingly, 47 percent of the total potential opportunity estimated in this report in 2030 is in industrial sectors and agriculture, not services. In particular, the resources sector is forecast to account for only 12 percent of the total GDP of the Digital Sprinters in 2030; however, it could drive 26 percent of the digital opportunity. These sectors are also those where there is often limited adoption of digital technologies to date. Closing this gap in digitalization between sectors is crucial to realizing the economic development benefits of these technologies.

1. There are a number of explanations and theories, for this paradox, also referred to as the “productivity puzzle”, which have been discussed at length in the literature: i) mismeasurement of outputs and inputs; ii) lags due to learning and adjustment, adoption barriers, and transition costs; iii) redistribution and dissipation of profits, i.e. cannibalization of incumbent revenues; and iv) Mismanagement of information and technology (i.e. inability to harness the digital benefits). For more detailed expositions of the re-emergence of the paradox in the digital age see McKinsey & Company (2018), “Is the Solow Paradox back?”, McKinsey Quarterly. Available here: <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/is-the-solow-paradox-back#> and McKinsey Global Institute (2018) Solving the productivity puzzle: The role of demand and the promise of digitization. Available here: <https://www.mckinsey.com/featured-insights/regions-in-focus/solving-the-productivity-puzzle>

2. World Bank (2016), World Development Report 2016: Digital Dividends and sources within. Available at: <https://www.worldbank.org/en/publication/wdr2016>

3. McKinsey Global Institute (2018) Solving the productivity puzzle: The role of demand and the promise of digitization.

Available at: <https://www.mckinsey.com/featured-insights/regions-in-focus/solving-the-productivity-puzzle>

3 12 policy levers linked to four strategic imperatives are crucial to go beyond digital penetration and capture the digital benefits linked to economic development.

A thorough review of impactful, innovative and practical digital policies identified a number of important levers for capturing the digital-led economic development opportunity:

STRATEGIC IMPERATIVE 1:

LEAD FROM THE TOP

These policy levers are concerned with setting the right direction for the digital transformation of the economy. They entail elevating digitization to be a top national agenda item, developing concrete sector-level plans to guide progress, and improving coordination. As a result, different to the other three imperatives, these levers tend to be cross-cutting across several sectors. Specific policy levers include:

1. **Steer the direction.** From the outset, governments should create a clear plan, roadmap or national strategy for digitization with accountability residing at senior levels of government.
2. **Coordinate across government.** Create government mechanisms to coordinate digital policies across sectors with strong public and private sector champions.
3. **Support global digital integration.** Engage in active knowledge sharing and setting of standards and effective digital trade rules to enable growth in sectors.

STRATEGIC IMPERATIVE 2:

DRIVE CHANGE THROUGH THE PUBLIC SECTOR

These levers leverage the position of government to directly drive the adoption of technology in the public sector as well as establishing public sector provisions that facilitate digital transformation for the private sector and citizens. Specific policy levers include:

1. **Create tipping points through government procurement.** Use government procurement to scale promising digital technologies to drive them down the cost curve.
2. **Go 100% digital on government services.** Digitize relevant government services (e.g. going "cloud native") and support digital interactions with citizens for services in that sector (e.g. digitizing tax filings or utility bill payments).
3. **Crowd source policy innovation.** Encourage sharing of government data and establish collaborative platforms to spur innovation on public policy.



STRATEGIC IMPERATIVE 3:

EQUIP THE PRIVATE SECTOR WITH THE DIGITAL ESSENTIALS

Having established a clear direction for leveraging digital for economic development, these policy levers are focused at enabling the private sector to obtain the maximum benefits from digital technologies. Specific policy levers include:

1. **Craft regulations for the digital, not analog era.** Go beyond adjusting regulations for a digital economy in an ad-hoc manner to actively experimenting with new regulatory approaches (e.g. regulatory sandboxes) enabling firms to explore new digital products and services.
2. **Build future-proof digital infrastructure with interoperability and upgrading in mind.** Going beyond universal broadband access to support investment in critical infrastructure (including 5G networks) requires new approaches, with a strong focus on developing mechanisms to create shared and interoperable infrastructure.
3. **Equip MSMEs with the digital tools to support their growth.** Work with MSMEs to help them understand the benefits of adoption and tackle specific barriers through model learning factories and socialization programs.
4. **Use co-creation, the sharing economy and new digital incentives to stimulate innovation.** Co-create products and services with the private sector; develop regulatory models to support sharing economy models, and rethink R&D incentives for a digital era.

STRATEGIC IMPERATIVE 4:

PUT CITIZENS AT THE CENTER OF THE DIGITAL ECONOMY

Preparing individuals for this digital era requires going beyond just providing broadband access, but instead focusing on innovative ways to provide individuals with the necessary skills and also to support behavior change. Specific policy levers include:

1. **Support those who could be left behind by the digital transformation.** Rethink social protection mechanisms so that they protect workers and not jobs, repurpose existing infrastructure to support digital access, and go beyond simple information campaigns to use behavioral science to spur greater adoption of digital technologies and change usage patterns.
2. **Equip people with the right skills to access digital opportunities.** Enhance the responsiveness of the curriculum, target talent in the diaspora, embed technology in the classroom, and introduce digital bootcamps (short-term, focused education courses, which are run by employers can be crucial to fill in necessary skill gaps).

1. FACING THE CHALLENGE

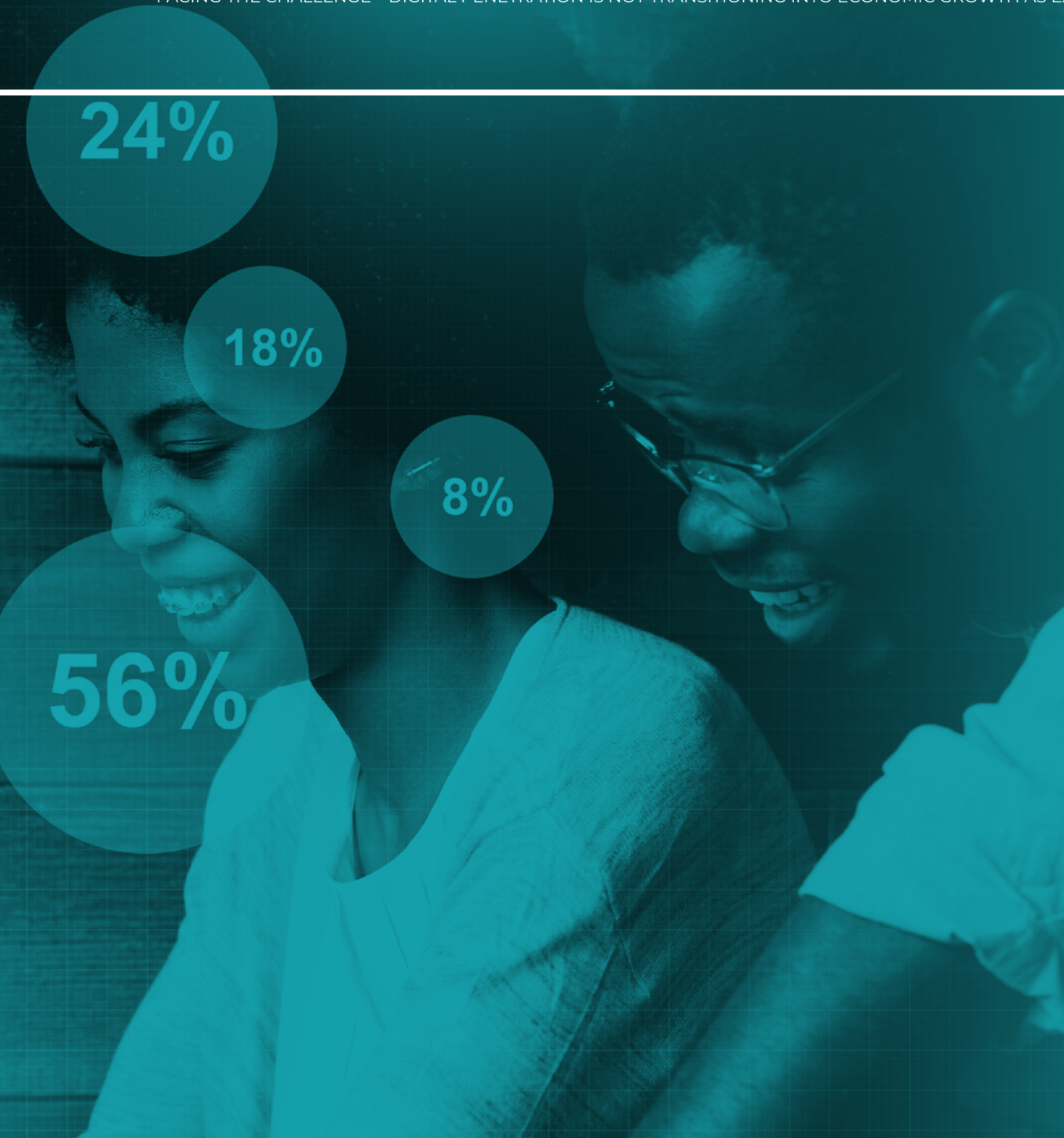
DIGITAL PENETRATION IS NOT TRANSITIONING INTO ECONOMIC GROWTH AS EXPECTED

1.1 DIGITAL CONNECTIVITY IN THE DIGITAL SPRINTERS HAS NOT YET TRANSLATED INTO THE EXPECTED INCREASES IN ECONOMIC GROWTH

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1.2 VARYING DEGREES OF DIGITALIZATION BY SECTOR ARE ONE REASON FOR LIMITED TRANSITION OF DIGITAL CONNECTIVITY TO ECONOMIC GROWTH

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Across 16 important emerging economies in Latin America, Eastern Europe, Africa and the Middle East (the “Digital Sprinters”), economic development has lagged increasing internet penetration. The Digital Sprinters account for 19 percent of global internet user growth but only 7 percent of economic growth. Further, the number of internet users in the 16 economies

from 2013-18 has grown more than 15 times faster annually than average labor productivity. At the heart of the challenge are the uneven rates of technology adoption by sectors – the variation in adoption rates between sectors in the same country can be just as large as the variations in adoption between countries.

From 2013-17, more than one billion additional people have started using the internet globally. This growth has the potential to fuel a range of business, consumer, and societal benefits. There is little doubt that internet connectivity correlates strongly with economic growth, in particular in emerging economies.⁴ At the firm level, research shows that more productive firms are more likely to have access to broadband and operate websites.⁵ Going beyond internet access, today, there exists a vast array of digital technologies that could transform the way we live, work and interact. For example, Industry 4.0 or the “Fourth Industrial Revolution” refers to technologies applied across all sectors that combine the physical, digital and biological worlds.⁶ These technologies include (among others) cyber-physical systems, the Internet of Things (IoT), Artificial Intelligence (AI), cloud computing and cognitive computing. If these digital technologies are fully leveraged, they could be a major driver of future economic growth. Research by the World Economic Forum has shown how digitalization has immense potential to generate value for society including lives saved from improved safety, savings for customers and reduced carbon emissions.⁷

Many emerging economies have focused considerable resources and effort into driving digital access for their populations and businesses in the hope of capturing the predicted economic growth impacts. However, the data shows that this transition from digital penetration to economic growth and improved livelihoods is not straightforward. For example, in many emerging economies the growth in internet users has vastly outpaced economic growth. The implication is that digital access alone is not a remedy for sluggish economic or productivity growth. Emerging economies will need to go beyond simple digital connectivity to fully integrate and leverage available digital technologies to drive economic development. This research aims to address the question of how countries may do this in practice based on the existing evidence of successful digital public policy, both in the developed as well as the emerging world. This analysis focuses on 16 emerging economies, henceforth referred to the “Digital Sprinters”, where rapid growth in internet adoption has not yet fully translated into economic growth and which are at important junctures of their economic development process: Argentina, Brazil, Chile, Colombia, Egypt, Israel, Kenya, Mexico, Nigeria, Peru, Saudi



Arabia, South Africa, Russia, Turkey, the United Arab Emirates (UAE) and Ukraine. These include six of the 10 largest economies in the Latin America and Middle East & Africa regions respectively, as well as three of the five largest non-high-income economies in Europe. They also represent a range of different geographies and stages of economic development (as proxied by average incomes) – four countries are in the World Bank’s “lower middle-income” bracket (Egypt, Kenya, Nigeria, Ukraine); eight countries are in the ‘upper middle-income’ bracket (Argentina, Brazil, Colombia, Mexico, Peru, Russia, South Africa, Turkey); and four countries are in the “high-income” bracket (Chile, Israel, Saudi Arabia, UAE).⁸ Together, the Digital Sprinters account for 13 percent of GDP, 16 percent of population and 19 percent of internet users globally, indicating that these countries are relatively better digitally connected, i.e. more internet users per capita, than what their global GDP and population shares would suggest (EXHIBIT 1).

4. Koutrompis (2009), “The economic impact of broadband on growth: A simultaneous approach”, *Telecommunications Policy*. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0308596109000767>; Minges (2015), “Exploring the Relationship Between Broadband and Economic Growth”, *World Development Report 2016 Background Paper*. Available at: <https://openknowledge.worldbank.org/handle/10986/23638> and Amiri and Woodside (2017), “Emerging markets: the impact of ICT on the economy and society” *Digital Policy, Regulation and Governance*. Available at: <https://www.emerald.com/insight/content/doi/10.1108/DPRG-04-2017-0013/full/html>

5. Cardona et al. (2013), “ICT and productivity: conclusions from the empirical literature”, *Information Economics and Policy*. Available here: <https://www.sciencedirect.com/science/article/pii/S0167624513000036>; Bartelsman et al. (2013), “Cross-country analysis of ICT impact using firm-level data: The micro moments database and research infrastructure”, Eurostat. Available at: http://www.law.northwestern.edu/research-faculty/clbe/events/roundtable/documents/Bartelsman_esslaii_mmd_final.pdf and Bartelsman et al. (2019), “Productivity, technological innovations and broadband connectivity: firm-level evidence for ten European countries”, *Eurasian Business Review*. Available at: <https://link.springer.com/article/10.1007/s40821-018-0113-0>

6. Klaus Schwab (2017), *The Fourth Industrial Revolution*.

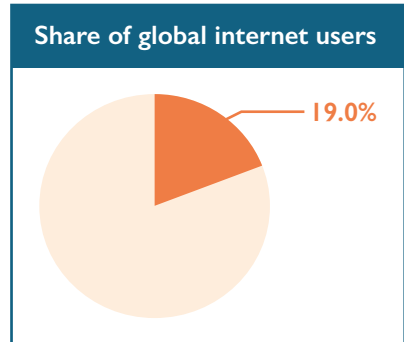
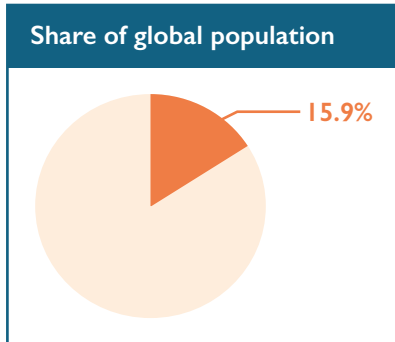
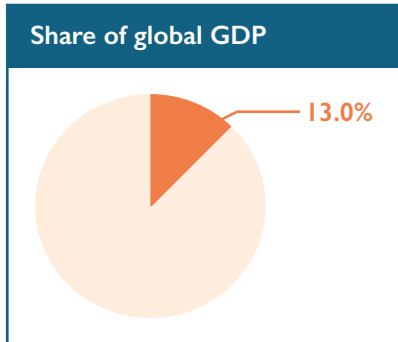
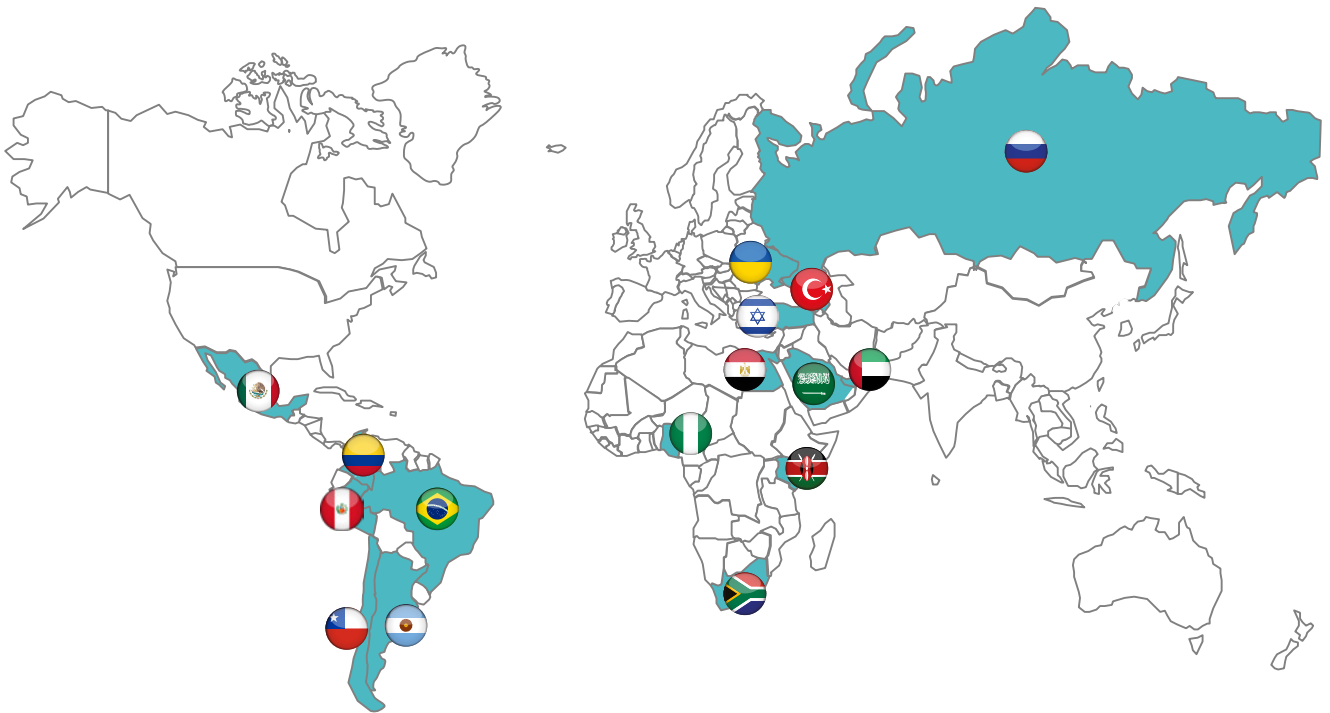
7. World Economic Forum (2016), “Unlocking Digital Value to Society: building a digital future to serve us all”. Available at: <https://reports.weforum.org/digital-transformation/unlocking-digital-value-to-society-building-a-digital-future-to-serve-us-all/>

8. For 2020 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of \$1,025 or less in 2018; lower middle-income economies are those with a GNI per capita between \$1,026 and \$3,995; upper middle-income economies are those with a GNI per capita between \$3,996 and \$12,375; high-income economies are those with a GNI per capita of \$12,376 or more. Information available at: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

Exhibit 1:

THE “DIGITAL SPRINTERS” ACCOUNT FOR 13% OF GDP, 16% OF POPULATION AND 19% OF INTERNET USERS GLOBALLY

REAL GDP POPULATION AND INTERNET USERS, % OF GLOBAL¹



1. Real GDP is measured in constant 2010 USD. Based on latest available data, i.e. 2017 or 2018. The “Digital Sprinters” economies are Argentina, Brazil, Chile, Colombia, Egypt, Israel, Kenya, Mexico, Nigeria, Peru, Saudi Arabia, South Africa, Russia, Turkey, United Arab Emirates, Ukraine.

SOURCE: World Bank, World Development Indicators

1.1 DIGITAL CONNECTIVITY IN THE DIGITAL SPRINTERS HAS NOT YET TRANSLATED INTO THE EXPECTED INCREASES IN ECONOMIC GROWTH



Despite the impressive range of benefits digital technologies offer (discussed in detail in Chapter 2), the translation of digital connectivity into economic development is far from seamless. This is by no means a phenomenon exhibited only in emerging economies. For example, global labor productivity growth has slowed from an average annual rate of 2.9 percent

between 2000-2007 to 2.3 percent between 2010-2017.⁹ The economist Robert Solow famously said in 1987 that the computer age was everywhere except for the productivity statistics. This phenomenon, which became known as the Solow Paradox, was eventually addressed in the 1990s as sectors such as technology, retail and wholesale trade eventually saw significant productivity improvements after the widespread diffusion of related computer technologies.¹⁰

Digital connectivity has grown strongly in the Digital Sprinters in recent years. From 2013-17, in these 16 economies, more than 200 million additional people started using the internet. In fact, the average internet penetration – in terms of internet users as a share of population – amongst these 16 economies is approximately 10 percentage points higher than the global average. However, despite this growth in internet adoption, economic growth in the region is lacking. In absolute terms the Digital Sprinters represent approximately 19 percent of total global internet user growth however, they only account for 7 percent of all global real GDP growth since 2013 (EXHIBIT 2).¹¹ Similarly, despite internet user growth rates in the Digital Sprinters being slightly higher than the global average, economic growth has been only half that of the global average (EXHIBIT 3).

One of the likely drivers of this is that increased digital penetration has not been translated into increased productivity which is a crucial driver of long term economic development.¹² In absolute terms, the number of internet users in the 16 economies from 2013-18 has grown annually more than 15 times faster than average labor productivity (EXHIBIT 4). In fact, labor productivity growth in the Digital Sprinters during that period has actually been less than half the labor productivity growth experienced in the prior five years (2008-13). This implies that digital productivity has not transitioned into the productivity gains anticipated.

9. The Conference Board (2019), *Global Economic Outlook*. Available at: <https://www.conference-board.org/data/globaloutlook/>

10. McKinsey & Company (2018), "Is the Solow Paradox back?."

Available at: <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/is-the-solow-paradox-back>

11. World Bank, *World Development Indicators Database*. Available at: <https://databank.worldbank.org/>

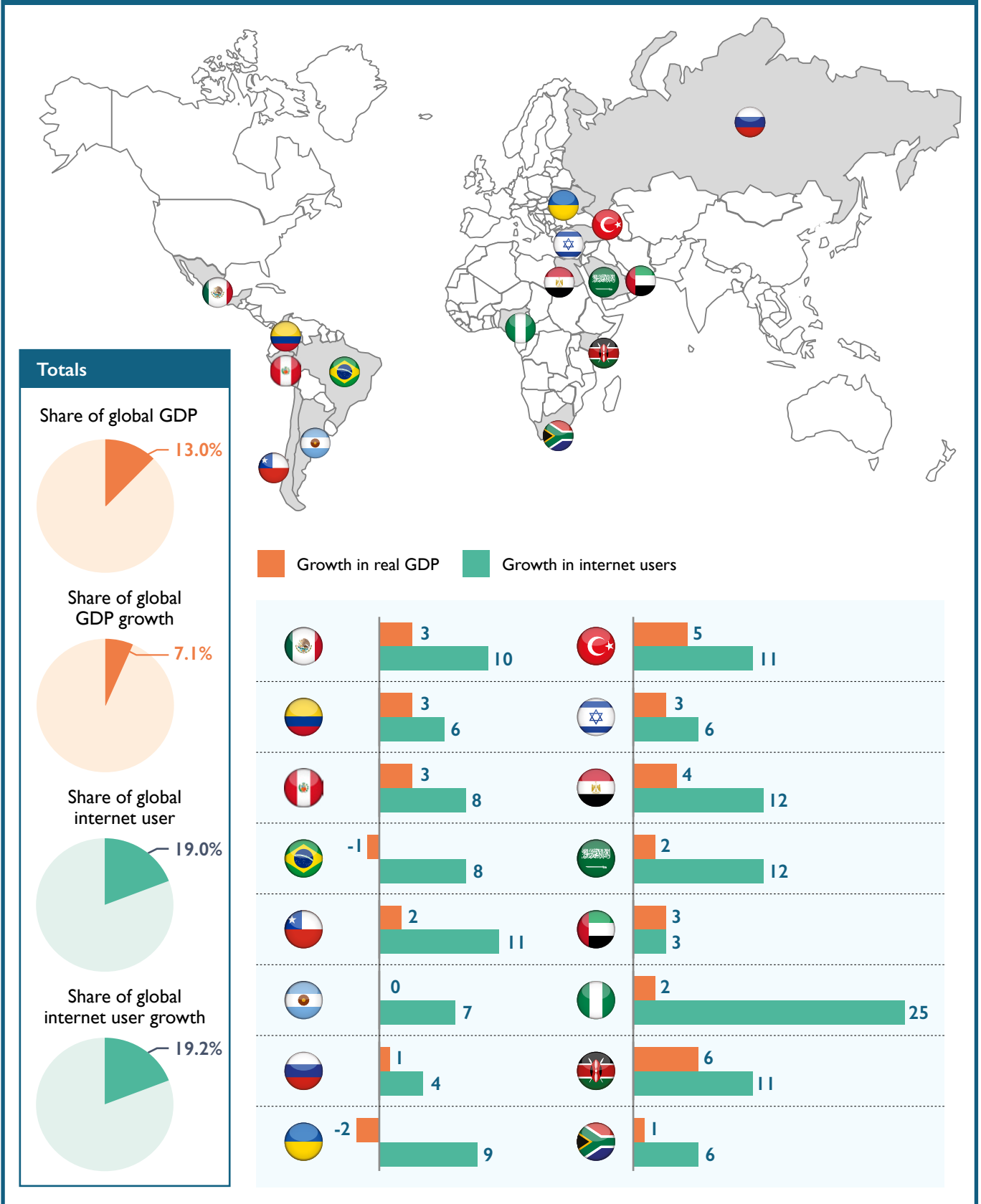
12. McKinsey Global Institute (2018) *Solving the productivity puzzle: The role of demand and the promise of digitization*.

Available at: <https://www.mckinsey.com/featured-insights/regions-in-focus/solving-the-productivity-puzzle>

Exhibit 2:

THE DIGITAL SPRINTERS ECONOMIES ACCOUNT FOR OVER 19% OF INTERNET USER GROWTH SINCE 2013, BUT ONLY 7.1% OF ECONOMIC GROWTH

ANNUAL GROWTH IN REAL GDP AND INTERNET USERS; PERCENT, 2013-18¹

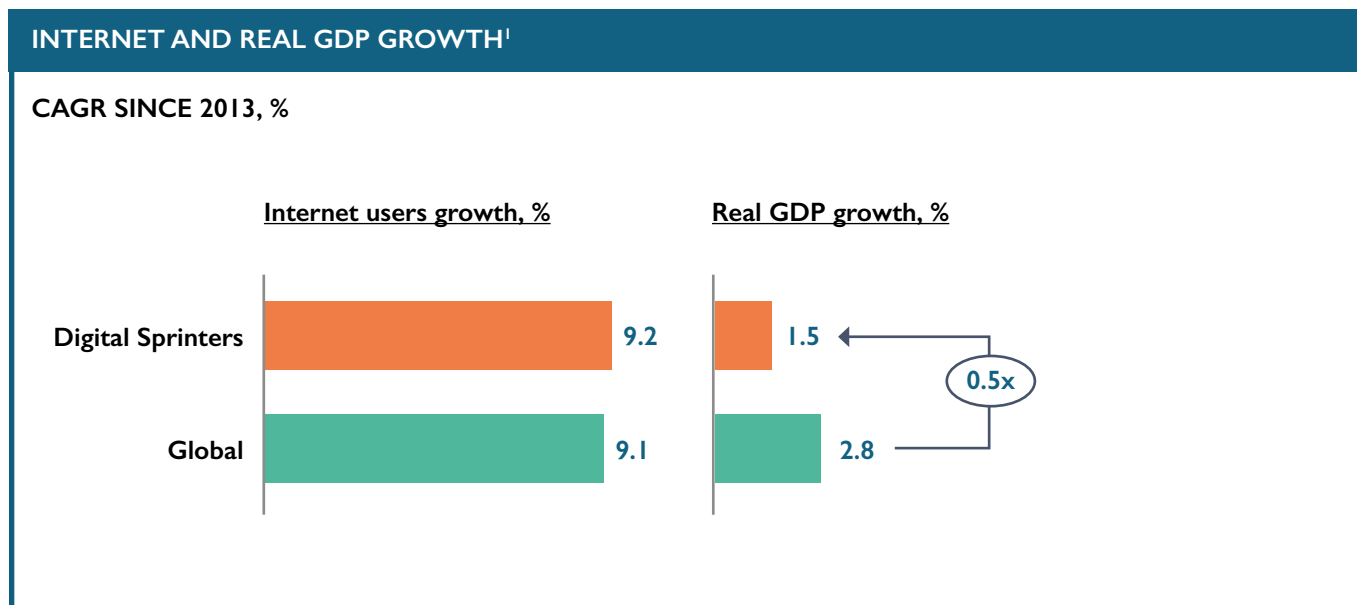


1. Real GDP is measured in constant 2010 USD. Growth is measured as CAGR since 2013 until latest available data, i.e. 2017 or 2018. The "Digital Sprinters" economies are Argentina, Brazil, Chile, Colombia, Egypt, Israel, Kenya, Mexico, Nigeria, Peru, Saudi Arabia, South Africa, Russia, Turkey, United Arab Emirates, Ukraine.

SOURCE: World Bank, World Development Indicators

Exhibit 3:

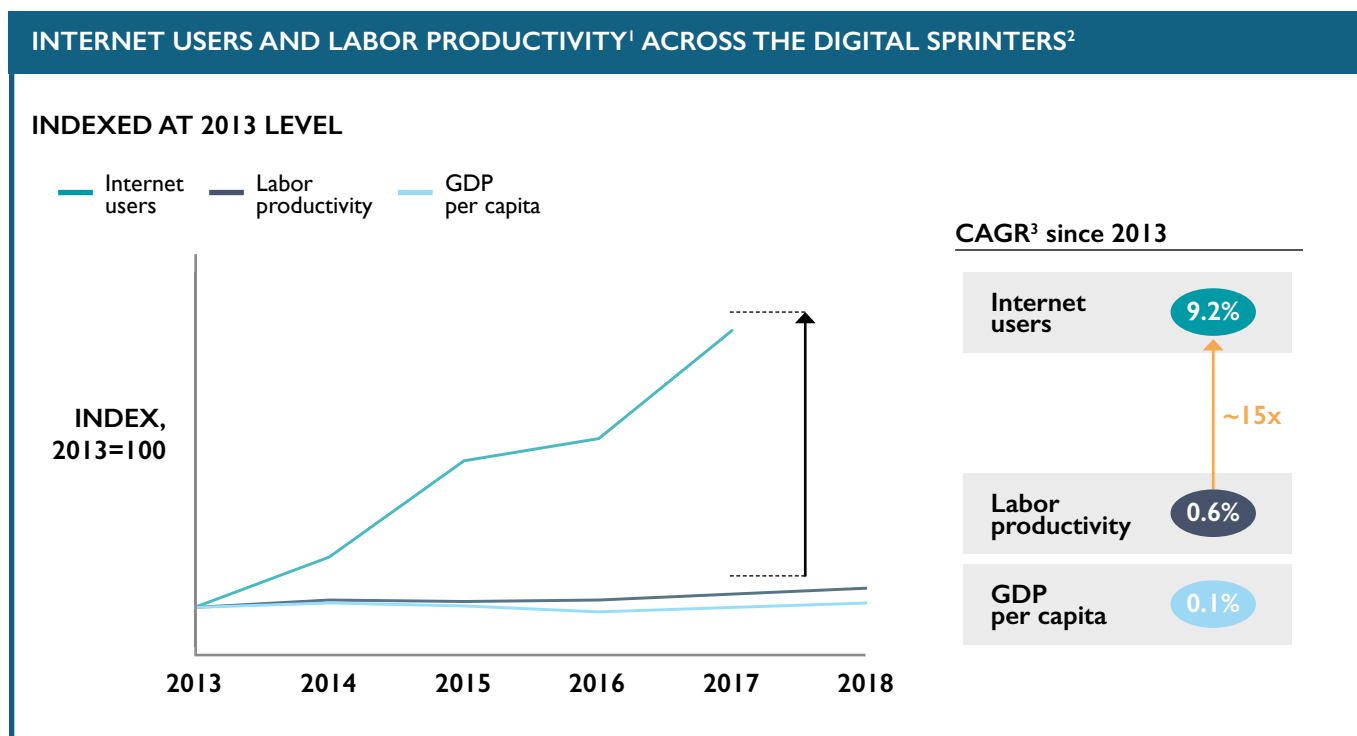
DESPITE SIMILAR GROWTH IN INTERNET USERS, THE DIGITAL SPRINTERS HAVE ONLY ACHIEVED HALF OF THE GLOBAL AVERAGE ECONOMIC GROWTH



1. The “Digital Sprinters” economies are Argentina, Brazil, Chile, Colombia, Egypt, Israel, Kenya, Mexico, Nigeria, Peru, Saudi Arabia, South Africa, Russia, Turkey, Ukraine, United Arab Emirates.
 2. Real GDP is measured in constant 2010 USD. Growth is measured as CAGR since 2013 until latest available data, i.e 2017 or 2018. Weighted averages were used both globally and across the Digital Sprinters.
 SOURCE: World Bank, World Development Indicators

Exhibit 4:

SINCE 2013, GROWTH OF INTERNET USERS HAS BEEN OUTPACING LABOR PRODUCTIVITY GROWTH BY 15X ACROSS THE 16 EMERGING ECONOMIES STUDIED



1. Labor productivity is measured in GDP per worker at constant 2010 USD and a weighted average based on GDP and employed population across the Digital Sprinters was used.
 2. The “Digital Sprinters” economies are Argentina, Brazil, Chile, Colombia, Egypt, Israel, Kenya, Mexico, Nigeria, Peru, Saudi Arabia, South Africa, Russia, Turkey, Ukraine, United Arab Emirates.
 3. Growth is measured as CAGR since 2013 until latest available data, i.e 2017 or 2018.
 SOURCE: World Bank, World Development Indicators

1.2 VARYING DEGREES OF DIGITALIZATION BY SECTOR ARE ONE REASON FOR LIMITED TRANSITION OF DIGITAL CONNECTIVITY TO ECONOMIC GROWTH

While the Digital Sprinters have higher numbers of internet connectivity than the global average, there are still significant differences in digital connectivity and digital technology adoption across the 16 economies. For example, in Kenya in 2017, only 17.8 percent of the population used the internet while 94.8 percent did so in the UAE. Further, according to the World Bank Digital Adoption Index, there is a 2x difference in digital adoption between the leading country, the UAE, and the country with the lowest digital adoption, Nigeria (EXHIBIT 5). However, what is perhaps even more insightful is that the sector variations within countries can be just as

large or larger than these country differences. For example, in Turkey, digitalization in the financial services sector is twice that of the construction sector, according to Accenture's Digitalization Index. This suggests that while connectivity may be high, digital adoption is not occurring in the sectors where it could have significant impact. This also suggests that there is much to be learnt by "unpicking" aggregate performance to examine variations in sector-level adoption of digital technologies.

Turkey is not the exception. Among the Digital Sprinters, there is a large degree of variation in the degree of digitalization (or digital maturity) of sectors. Based on past literature, available digital adoption data and expert interviews, sectors can be classified as "Digital Novices" (where adoption is limited), "Digital Followers" (where adoption is increasing, but with large variations between firms in the sector), and "Digital Leaders" (where technology adoption is generally high across the sector).¹³ While the mobility and financial services sectors already have a very high degree of digitalization, several other sectors (such as infrastructure and government) have catching up to do (EXHIBIT 6).

Given that digital connectivity has not translated seamlessly into rapid economic growth, the question that policy makers need to consider is what policy interventions are needed to move beyond simple digital connectivity to fully leverage digital technologies in their economic development? To provide insights into this question, Chapter 2 identifies a set of digital technologies with large potential to drive economic development. It then presents a thought experiment to quantify the economic opportunity from digital technologies for the Digital Sprinters if their potential was fully exploited. Chapter 3 then addresses the question of how emerging economy governments might be able to unlock this opportunity using innovative policy approaches.

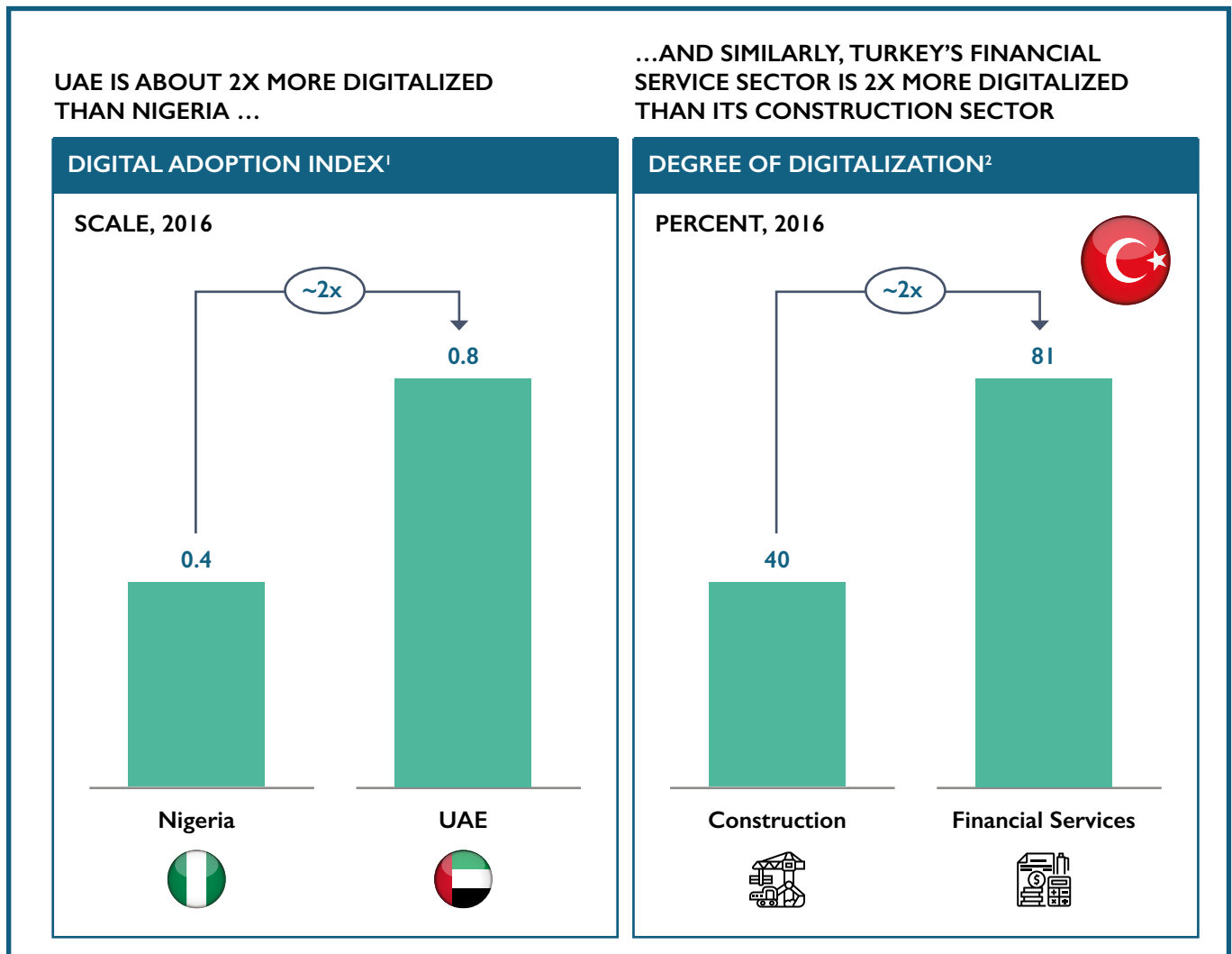


13. See Appendix A3 for more details.



Exhibit 5:

WHILE THERE IS LARGE VARIATION, UP TO 2X, IN DIGITAL ADOPTION BETWEEN COUNTRIES, INTRA-COUNTRY VARIATION BETWEEN SECTORS CAN BE JUST AS LARGE



1. The Digital Adoption Index (DAI) is a worldwide index that measures countries' digital adoption across three dimensions of the economy: people, government, and business. The index covers 180 countries on a 0–1 scale.

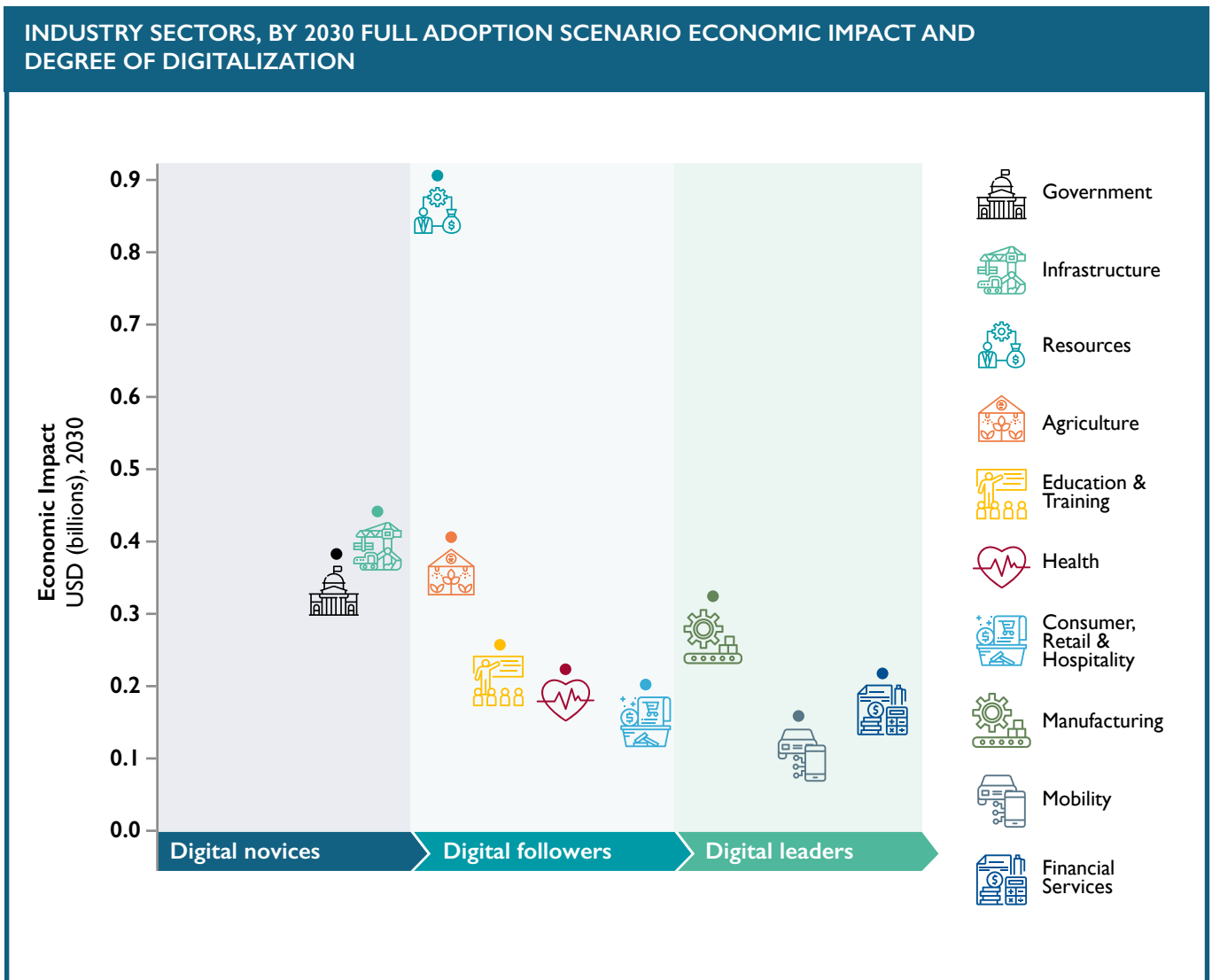
2. Companies participated in the Accenture Digitization Index study and were grouped into industry clusters. Participating companies were evaluated across 18 industry clusters.

SOURCE: World Bank; Accenture



Exhibit 6:

THE “DIGITAL SPRINTERS” COULD IMPROVE DIGITAL TECHNOLOGY ADOPTION SIGNIFICANTLY ACROSS MOST INDUSTRY SECTOR



SOURCE: AlphaBeta analysis, McKinsey, Accenture



2. SIZING THE PRIZE

LEVERAGING DIGITAL TECHNOLOGIES FOR ECONOMIC DEVELOPMENT

2.1 DIGITAL TECHNOLOGIES FOR ECONOMIC DEVELOPMENT

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2.2 IF THE DIGITAL SPRINTERS COULD FULLY LEVERAGE DIGITAL TECHNOLOGIES AVAILABLE TODAY, THIS COULD SUPPORT UP TO USD3.4 TRILLION OF ECONOMIC IMPACT BY 2030

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Past academic literature has identified eight groups of digital technologies with significant potential to enhance productivity and economic development. In order to measure this impact, it is crucial to understand how these technologies are driving economic benefits in different sectors with significant implications for economic development. Using a thought experiment, it is shown that these digital technologies, if fully leveraged, could unlock a large untapped potential for economic

development. In a hypothetical scenario where 39 applications based on the eight digital technologies in 10 sectors are fully adopted, the combined annual economic impact across the Digital Sprinters could reach up to USD3.4 trillion by 2030, which is about 26 percent of these countries' estimated combined GDP in 2030. A surprising share of the total opportunity, 47 percent, is in industrial sectors and agriculture.

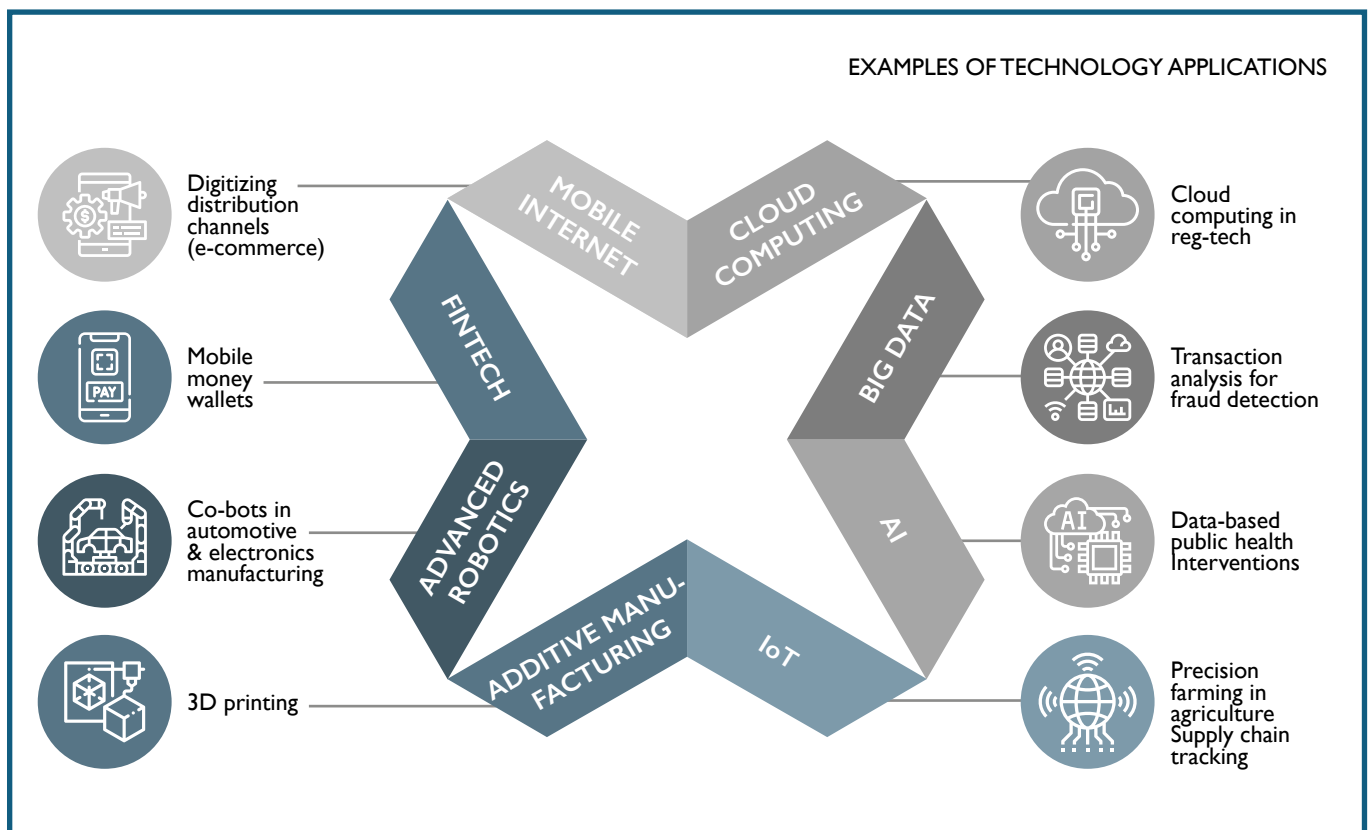
2.1 DIGITAL TECHNOLOGIES FOR ECONOMIC DEVELOPMENT

There is a large body of research by academics, development practitioners, non-for-profits as well as the private and public sector on the interaction between various technologies and economic development. In 2013, McKinsey Global Institute identified 12 disruptive technologies that would transform life, business and the global economy through significant productivity impact.¹⁴ Of these technologies, seven are considered digital in nature: mobile internet; automation of knowledge; IoT which is often combined with geospatial and satellite technology (e.g. remote sensing); cloud technology; advanced robotics; autonomous and near-autonomous vehicles; and additive manufacturing (more commonly known as 3D printing). Since 2013, several technologies have been added to this list due to their potential for transformational economic and social impact. For example, the UK-based international

development network, Bond, noted rapid changes in the technologies shaping international development between 2016-19.¹⁵ Emerging technologies included big data, financial technology (FinTech), machine learning and even blockchain. These technologies are by no way mutually exclusive and the line between what constitutes a different technology versus an application of a technology can be blurred. For example, Artificial Intelligence (AI) utilizes big data which often relies on cloud computing technology to provide the storage and computational horsepower to run machine learning algorithms and other analytics. Similarly, autonomous vehicles contain a multitude of sensors, many of which are internet enabled i.e. IoT. EXHIBIT 7 provides an overview of 8 key groups of digital technologies with significant implications for economic development.

Exhibit 7:

PREVIOUS LITERATURE HAS IDENTIFIED 8 TECHNOLOGIES WITH SIGNIFICANT IMPLICATIONS FOR ECONOMIC DEVELOPMENT



14. MGI (2013). *Disruptive technologies: Advances that will transform life, business, and the global economy*.

Available at: <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/disruptive-technologies>

15. Wilkinson (2019), "5 frontier technology trends shaping international development", Bond News.

Available at: <https://www.bond.org.uk/news/2019/06/5-frontier-technology-trends-shaping-international-development>

Each of these technologies could provide significant benefits to economic development:

- Mobile internet.** Smartphone penetration and the associated penetration of mobile internet has helped to accelerate the growth of internet users much faster than a simple reliance on broadband connectivity. In particular, many emerging economies are considered “mobile-first” or “mobile-only”, meaning a citizen’s first and often only exposure to the internet is through a smartphone or feature phone. For 11 out of the 16 focus countries, mobile broadband penetration exceeds fixed broadband penetration. Egypt, Kenya, Nigeria, Peru and South Africa, for example, had less than five fixed broadband subscriptions per 100 inhabitants in 2016.¹⁶ As a result, the internet is now available to 3.5 billion mobile internet subscribers globally, giving them access to information, e-commerce and digital products and services.¹⁷ Further, the rise of the mobile internet has given rise to and driven adoption of a variety of new business models such as the app economy, OTT services and m-commerce (which for many is the only form of e-commerce available to them).
- Cloud computing.** Cloud computing is the on-demand delivery of IT resources over the Internet with pay-as-you-go pricing. Instead of buying, owning, and maintaining physical data centers and servers, you can access technology services, such as computing power, storage, and databases, on an as-needed basis from a cloud provider. Public cloud hosting has the ability to boost internal productivity by making resources available on an on-demand basis, providing tailored productivity tools, and enabling improved security. Cloud computing has also become essential for leveraging technology and tools such as artificial intelligence and machine learning. The Boston Consulting Group estimates that public cloud use in both the public and private sector across six APAC economies could contribute to a total economic impact of about USD450 billion across between 2019-23, if growth in public cloud spending continues at its present compound annual growth rate (CAGR) of 25 percent.¹⁸ This opportunity has many policy implications and has
- driven countries around the world to re-examine digital regulation, such as data localization, which can have negative implications on countries being able to leverage cloud computing’s full value.¹⁹
- Big data.** Big data (or more appropriately Big data analytics) refers to the ability to analyze extremely large volumes of data, extract insights, and act on them closer to real time. Much of this has been facilitated by cloud computing which allows larger storage and faster computing power without the need for local physical hardware. Predictive analytics can help in analyzing customer preferences and increase customer satisfaction. With the information derived from analytics, businesses can also design targeted programs for customer engagement. Big data is also fundamental to advanced technologies such as AI and machine learning.
- Artificial Intelligence (AI).** AI refers to the ability of software or hardware to exhibit human-like intelligence. This entails a set of technologies that enable computers to perceive, learn, reason and assist in decision-making to solve problems in ways that are similar to what people do.²⁰ Examples of AI applications include virtual assistants, autonomous vehicles and speech recognition tools. The economic impact of AI has the potential of being transformative for emerging as well as developed economies alike. For example, in 2013, McKinsey Global Institute estimated a potential global economic impact of USD5-7 trillion from automation of knowledge by 2025.²¹ PwC estimates AI technologies could increase global GDP by USD15.7 trillion annually by 2030.
- Fintech.** Financial inclusion is a key driver of economic development.²² However, using traditional models of banking, in particular branch-based networks, has left 2.5 billion people²³, the majority of whom live in emerging economies, excluded from access to formal financial services. FinTech, often referred to as Digital Financial Services (DFS), has been successful at driving financial inclusion through facilitating deposits and payments as well as providing access to more advanced financial products

16. Based on data collected from the UN Population Division and the World Economic Forum’s (2016), *The Global Information Technology Report 2016*.

Available at: <https://www.weforum.org/reports/the-global-information-technology-report-2016>

17. GSMA (2019), *Mobile Internet Connectivity 2019 – Global Factsheet*.

Available here: <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/07/Mobile-Internet-Connectivity-Global-Factsheet.pdf>

18. BCG (2019), *Ascent to the cloud – How six key APAC economies can lift-off*. Available at: http://image-src.bcg.com/Images/Ascent_to_the_Cloud_Report_21Oct_tcm9-231826.pdf

19. See OECD (2016), *Economic and Social Benefits of Internet Openness – Background paper for Ministerial Panel 1.1*. Available at: [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP\(2015\)17/FINAL&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP(2015)17/FINAL&docLanguage=En) and Hinrich Foundation (2019), *Digital Trade Research*. Available at: <https://hinrichfoundation.com/trade-research/digital-trade-research/>

20. Microsoft (2018), *The future computed*. Available at: https://blogs.microsoft.com/wp-content/uploads/2018/02/The-Future-Computed_2.8.18.pdf

21. MGI (2013), *Disruptive technologies: Advances that will transform life, business, and the global economy*.

Available at: <https://www.mckinsey.com/business-functions/mckinsey-digital-four-insights/disruptive-technologies>

22. The causality between financial inclusion and economic growth (uni- as well as bi-directional) has been well documented in academic literature, including: Sarma and Pais (2011),

“Financial inclusion and development”, *Journal of international development*. Available at: <https://onlinelibrary.wiley.com/doi/abs/10.1002/jid.1698>; Sharma (2016), “Nexus between

financial inclusion and economic growth: Evidence from the emerging Indian economy”, *Journal of Financial Economic Policy*. Available at: <https://www.emerald.com/insight/content/doi/10.1108/JFEP-01-2015-0004/full/html?journalCode=jfep>. Sethi and Acharaya (2018), “Financial inclusion and economic growth linkage: some cross-country evidence”, *Journal of*

Financial Economic Policy. Available at: <https://www.emerald.com/insight/content/doi/10.1108/JFEP-11-2016-0073/full/html?fullSc=1>; Also see Bakar and Sulong (2018), “The Role of

Financial Inclusion on Economic Growth: Theoretical and Empirical Literature Review Analysis”, *Journal of Business & Financial Affairs, for a review of the literature*. Available at: <https://www.omicsonline.org/open-access/the-role-of-financial-inclusion-on-economic-growth-theoretical-and-empirical-literature-review-analysis-2167-0234-1000356-106285.html>

23. World Bank (2017), *Global Findex Database*. Available at: <https://globalfindex.worldbank.org/node>

such as loans, savings and investments which can drive economic growth. Cashless payments alone have been estimated to add about one percentage point to the annual GDP of mature economies and more than three percentage points to those of emerging economies.²⁴ While early digital payment methods such as card networks are well established in the developed world, many emerging economies are leap-frogging these, directly using different forms of closed loop stored value wallets (e.g. mobile money) or Real-time Payment (RTP) systems.²⁵

- IoT and remote sensing.** IoT are sensors and actuators connected by networks to computing systems, which can monitor or manage the health and actions of connected objects and machines.²⁶ Their positive economic impact can be very large. Solutions that already exist today based on this technology have the potential to boost the digital economy of Central and Eastern Europe by EUR 160 billion (~USD 174 billion), for example. IoT has a number of applications across sectors with significant economic development implications: wearable devices can help monitor and maintain health and wellbeing; energy consumption can be monitored and optimized in buildings; equipment use can be enhanced; and the health and safety performance of factories improved. One big area for the application of IoT are smart and sustainable cities. For instance, IoT sensors can be used in transport (for smart meters and demand management, distribution and substation automation, congestion lanes, smart parking meters, and centralized and adaptive traffic control) and in waste management (to optimize waste collection).
- Advanced robotics.** While simple robots have been a staple of factory floors in the developed world for decades, advanced robotics sets itself apart through the expanding range of tasks that robots can perform. Robots can now be used across the entire production cycle – from cutting metal housings to assembling miniature components on boards, applying sealants and adhesives, buffing and polishing surfaces, performing quality inspections, and packing and palletizing finished products.²⁷

Industrial robots can significantly improve productivity in manufacturing industries and there has been increased investment in robots globally in response to drivers such as wage costs, 24x7 production requirements, and high levels of staff turnover. Developments in sensors and power-force limiting technologies (that ensure the robots slow down or stop if they come into contact with workers) mean robots can now share workspaces with human employees. The electronics manufacturing industry is forecast to soon surpass the automotive industry as the most important source of demand for industry robots. In 2017, the share of supply to the automotive industry was only one percentage point more than the share of sales to electronics manufacturing firms. Based on current growth rates, by 2021, the sales of robots to the electronics manufacturing industry will be higher than the automotive industry.²⁸

- Additive manufacturing.** This describes the technologies that build 3D objects by adding layer-upon-layer of material. There are a range of potential benefits for electronic products, such as ability to handle complex, low-volume components where rapid turnaround is critical.²⁹

To understand the economic value of digital technologies by sector, a set of relevant applications (linked to these technologies) for different sectors were identified (EXHIBIT 8). This analysis looks at the economic impact of digital technologies across 10 sectors. The sectors are aggregations of a set of industries at the ISIC code one-digit-level selected due to i) their relevance for the 8 digital technologies above, and ii) their importance to Gross Domestic Product.³⁰ They were aggregated into 10 broader sectors due to cross-cutting technology applications and for ease of analysis. Together, these ten sectors account for 89 percent of the combined GDP of the Digital Sprinters economies.

Relevant technology applications in the focus sectors and their sources of value (e.g. reduced wastage in production, enhanced consumer offerings) were identified based on a detailed review of the academic literature for each of the 8 focus technologies.

24. Boston Consulting Group (2019), *How Cashless Payments Help Economies Grow*.

25. Google (2019), *Real Time Payments Systems & Third Party Access – A perspective from Google Payments*.

Available at: https://static.googleusercontent.com/media/pay.google.com/en/about/business/static/data/GPay_RTP_2019.pdf

26. MGI (2019), *The rise of Digital Challengers – How digitization can become the next growth engine for Central and Eastern Europe*.

Available at: https://digitalchallengers.mckinsey.com/files/McKinsey%20CEE%20report_The%20Rise%20of%20Digital%20Challengers.pdf

27. International Federation of Robotics (2018), "Automation boom in electrical /electronics industry drives 30% increase in sales of industrial robots", IFR Secretariat Blog.

Available at: <https://ifr.org/post/automation-boom-in-electrical-electronics-industry-drives-30-increase-in-sa>

28. International Federation of Robotics (2018), "Automation boom in electrical /electronics industry drives 30% increase in sales of industrial robots", IFR Secretariat Blog.

Available at: <https://ifr.org/post/automation-boom-in-electrical-electronics-industry-drives-30-increase-in-sa>

29. Sharp (2019), "Is additive manufacturing the right choice for your electronic assembly?" JJS Manufacturing Blog.

Available at: <https://blog.jjsmanufacturing.com/additive-manufacturing-electronic-assembly>

30. A more detailed description of the methodology can be found in the Appendix A2.

Exhibit 8:

39 DIGITAL TECHNOLOGY APPLICATIONS ACROSS 10 INDUSTRIES WERE IDENTIFIED



1. These sectors uniquely match to the relevant International Standard Industrial Classification of All Economic Activities (ISIC) with the exception of "Consumer, retail & hospitality", combining ISIC Sector G: Wholesale and retail trade; repair of motor vehicles and motorcycles and Sector I: Accommodation and food service activities; "Infrastructure", which combines ISIC Sectors F: Construction and L: Real estate activities; and "Resources", combining the ISIC Sector B: Mining and quarrying; Sector D: Electricity; gas, steam and air conditioning supply and Sector E: Water supply, sewerage, waste management and remediation activities.

SOURCE: AlphaBeta analysis

2.2 IF THE DIGITAL SPRINTERS COULD FULLY LEVERAGE DIGITAL TECHNOLOGIES AVAILABLE TODAY, THIS COULD SUPPORT UP TO USD3.4 TRILLION OF ECONOMIC IMPACT BY 2030

Understanding current adoption of digital technologies can be difficult. Therefore, this report focuses on the potential opportunity that such technologies can offer for economic development. Based on the technology applications identified above, digital technologies could enable up to USD3.4 trillion of economic impact across 16 important emerging economies in Latin America, Eastern Europe, Africa and the Middle East by 2030, the Digital Sprinters (EXHIBIT 9). This impact is based on the potential economic impact if each of the 16 countries could fully adopt and leverage the 39 digital technology applications identified across the 10 sectors.³¹

Perhaps surprisingly, the potential benefits of digital technologies accrue predominantly to industry sectors such as resources, manufacturing and infrastructure, as well as agriculture – not necessarily service sectors – partially driven by lower current adoption of digital technologies (and hence larger potential incremental gains). These sectors account for 47 percent of the total opportunity in 2030. This is an important insight as conventional wisdom dictates that to achieve a successful digital transformation, countries should focus their efforts on building their “tech” or online economy i.e. supporting services such as e-commerce. For example, when measuring the impact of the digital economy, the emphasis is commonly placed on the volume of e-commerce transactions or the valuations of local tech start-ups. However, the results presented here may lead to a different conclusion. For example, the e-commerce opportunity is accounted for as part of the digital opportunity in the consumer, retail and hospitality sector. As the analysis shows, focusing on only these sections of the economy may only unlock a fraction

of the overall economic potential. Technology tends to be most impactful when it transforms traditional processes in established industries, i.e. technology is the means, not the end. Interestingly, some of the largest potential economic benefits from digitalization are in sectors with limited adoption today, such as resources and infrastructure (see chapter 1). Closing this gap in digitalization between sectors is crucial to realizing the economic development benefits of these technologies. Further, some sectors are punching well above their weight when it comes to the digital opportunity (EXHIBIT 10). For example, the resources sector accounts for only 12 percent of the total GDP of the Digital Sprinters economies today; however, it could drive 26 percent of the digital opportunity in 2030. In contrast, the consumer, retail & hospitality sector has a much lower share of digital economic opportunity in 2030 compared to its current share of the GDP in the Digital Sprinters economies.

Below are some examples of how digital technologies can support economic development in each of these sectors, leveraging examples from these 16 economies, but also other leading economies.

Some of the main opportunities and examples by sector include:³²

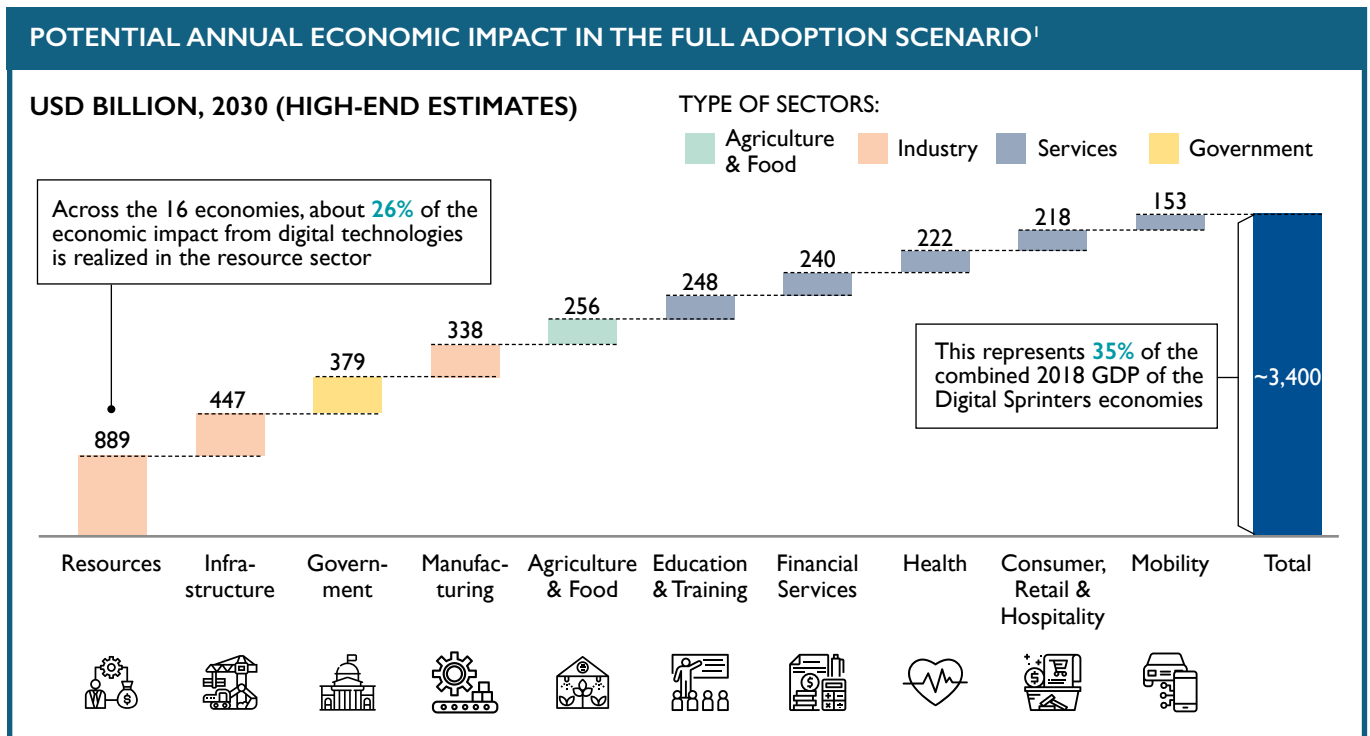
- **Resources.** Mining and Oil & Gas are some of the largest potential beneficiaries from digital technologies. For example, data collected from sensors fitted in trucks and drills can be aggregated and automatically processed to drive efficiency in mine operations. In Chile,

31. It is important to note that this economic impact is calculated as an aggregation of several metrics, including but not exclusively incremental GDP gains, and should not be taken as contribution to value added or GDP. Despite this comparison to GDP can be drawn upon for illustrative purposes. The metrics through which economic impact is calculated are GDP increments, productivity gains, cost savings, time savings, increased revenues, increased wages and increased tax collection.

32. The descriptions below only include a subset of the total technologies analyzed in this research.

Exhibit 9:

IN THE DIGITAL SPRINTERS, DIGITAL TECHNOLOGIES COULD SUPPORT UP TO USD3.4 TRILLION OF ECONOMIC IMPACT IN 2030

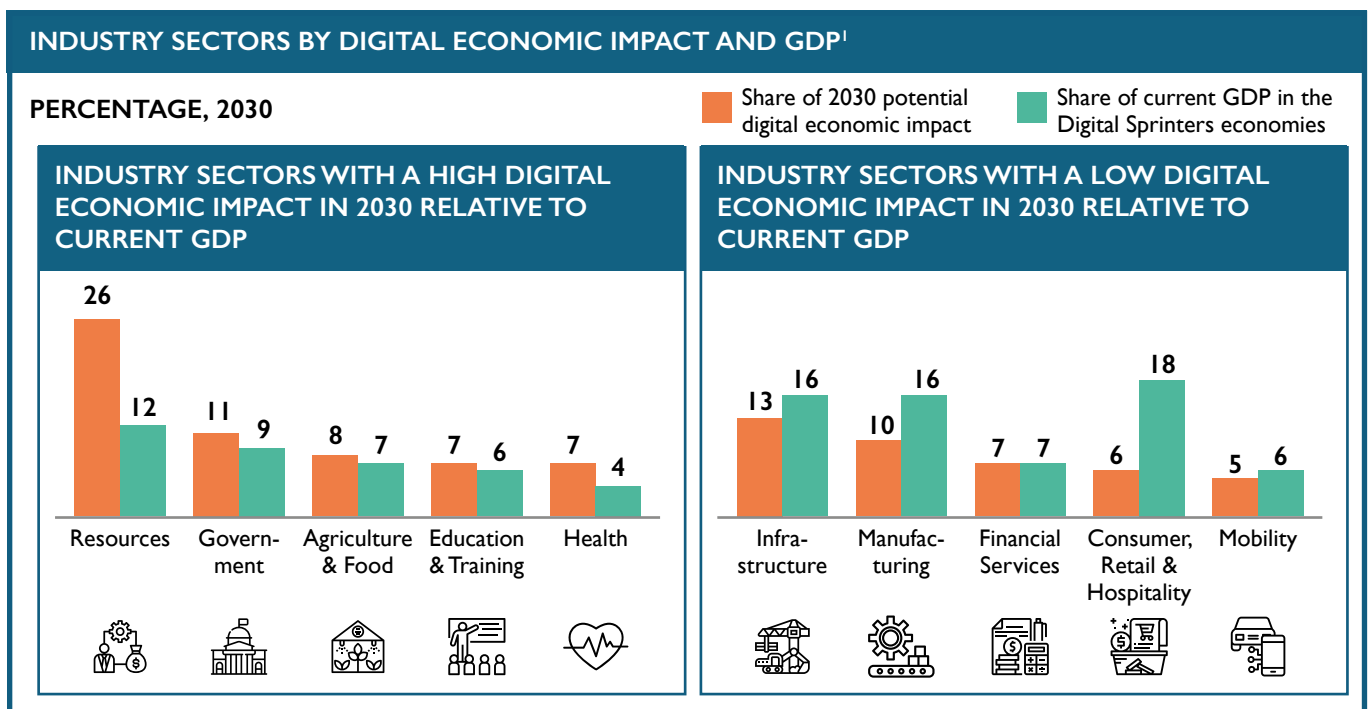


¹ These estimates do not represent GDP or market size (revenue), but rather economic impact, including GDP increments, productivity gains, cost savings, time savings, increased revenues, increased wages and increased tax collection. The “Digital Sprinters” economies are Argentina, Brazil, Chile, Colombia, Egypt, Israel, Kenya, Mexico, Nigeria, Peru, Saudi Arabia, South Africa, Russia, Turkey, United Arab Emirates, Ukraine. In this analysis, 39 technology applications are considered.

SOURCE: AlphaBeta analysis

Exhibit 10:

IN THE DIGITAL SPRINTERS ECONOMIES, 5 INDUSTRY SECTORS HAVE A HIGH DIGITAL ECONOMIC IMPACT RELATIVE TO THEIR GDP CONTRIBUTION



¹ The digital economic impact refers to the 2030 “full adoption” scenario of relevant digital technologies. These estimates do not represent GDP or market size (revenue), but rather economic impact. The “emerging 16” economies are Argentina, Brazil, Chile, Colombia, Egypt, Israel, Kenya, Mexico, Nigeria, Peru, Saudi Arabia, South Africa, Russia, Turkey, United Arab Emirates, Ukraine. In this analysis, 39 technology applications are considered.

SOURCE: AlphaBeta analysis



Timeing helps mining companies develop “digital twins” of their mining operations, using sensors, enabling these companies to conduct predictive safety and maintenance programs.³³ Cloud computing can also support more efficient exploration. For example, Sean Salter, Vice President of Technology for Woodside Energy, states that “Modern geophysical technologies place a huge demand on supercomputing resources. Woodside utilizes Google Cloud as an on-demand solution for our large computing requirements. This has allowed us to push technological boundaries and dramatically reduce turnaround time.”³⁴

- Infrastructure.** Digital technologies can not only enhance the efficiency in construction of new infrastructure, but also improve the utilization and maintenance of existing infrastructure. For example, within 10 years, full-scale digitization could help the construction industry save an estimated 12-20 percent, equal to between USD1-1.7 trillion annually.³⁵ The operating efficiency of infrastructure assets could also be enhanced through digital technologies. For example, RFID-based automation systems, which monitor RFID-tagged vehicles and equipment as well as cargo, can be used to plan the flow of cargo, assets, and vehicles across terminals in real time. In Saudi Arabia, the first smart building, the headquarters of the Ministry of

Higher Education in Riyadh, was completed in 2010.³⁶ With integrated technologies, operations and systems, the smart building will contribute to increased employee productivity, ease of operation and lower total cost of ownership. Saudi Arabia has committed to further develop smart buildings as part of their 2030 Vision.³⁷

- Agriculture & food.** Digital technologies can transform the entire food value chain. Precision agriculture can optimize crop yields through fitting tractors with global positioning systems (GPS) and multispectral sensors (to allow precise application of fertilizer), farm-management software, drone technology and advanced robotics.³⁸ Large-scale farms could potentially increase their yields by 40 percent over the next 20 years by deploying such technologies.³⁹ Brazil is at the forefront of many of these agriculture technologies. The Brazilian Agricultural Research Corporation, known as Embrapa, has pioneered more than 9,000 technology projects to develop Brazilian agriculture.⁴⁰ Precision farming in particular can lead to drastic yield improvements. Israel's ag-tech sector is world leading, comprising more than 450 companies. Some examples are CropTimal, a company whose real-time tests of plant tissue, soil and water in the field, dramatically helps reduce the standard analysis procedure from 10 days to

33. Austmine (2019), “AI in the Chilean Mining Industry” Available at: <http://www.austmine.com.au/News/ai-in-the-chilean-mining-industry>

34. Information retrieved from <https://cloud.google.com/about/locations/sydney/>

35. Boston Consulting Group (2016), *The Transformative Power of Building Information Modeling Digital in Engineering and Construction*.

Available at: <https://www.bcg.com/en-ch/publications/2016/engineered-products-infrastructure-digital-transformative-power-building-information-modeling.aspx>

36. Construction Week (2011), “First Smart Building for Saudi government finished”

Available at: <https://www.constructionweekonline.com/article-10624-first-smart-building-for-saudi-government-finished>

37. Middle East Architect (2017), “Experts say Saudi Arabia is reinforcing smart building technology”

Available at: <https://www.middleeastarchitect.com/thoughts/saudi-arabia-is-reinforcing-smart-building-technology>

38. The Economist (June 2, 2016), “The future of agriculture”.

39. McKinsey Global Institute (2011). *Resource Revolution: Meeting the world's energy, materials, food, and water needs*.

Available at: <https://www.mckinsey.com/business-functions/sustainability/our-insights/resource-revolution>

40. Elcio Perpétuo Guimarães et al. (2004), *Agropastoral systems for the tropical savannas of Latin America*, International Center for Tropical Agriculture and Brazilian Agricultural Research Corporation, 2004.

41. Leichman (2019), “The top 12 ways Israel is feeding the world”, Israel 21c. Available at: <https://www.israel21c.org/the-top-12-ways-israel-feeds-the-world/>



less than an hour.⁴¹ Another example, Israeli firm Netafim, a pioneer in drip irrigation, uses a range of IoT sensors and big data analytics in its smart irrigation solutions. The company is exporting their irrigation solutions into many emerging markets globally. About 19,000 farmers across eight countries including Argentina, Brazil, Israel, Russia and Ukraine are also using the imaging and analysis platform of Taranis, another Israeli startup. Combining sensors and high-resolution aerial and satellite imaging, the platform helps farmers prevent disease and pest infestation.⁴² The firm has the world's largest dataset of agricultural symptoms. Urban farmers are increasingly using sensors to run indoor vertical vegetable farms in stacked layers. For example, Moscow-based iFarm project has developed their own multi-layered horizontal shelf system alongside a digital database of parameters to enable a fully automated microclimate.⁴³ Digital technologies can also tackle some of the estimated USD 1 trillion of food wasted annually.⁴⁴ One food waste tracking software provider is Winnow, a London-based start-up (with operations globally) that uses smart meters to track everything thrown away (detailing where it comes from, food type, and the specific product) and allows staff to alter the meals based on data. Users of Winnow have experienced up to a 50 percent reduction in food waste.⁴⁵

- Government.** There are a range of digital technologies that could increase the cost efficiency and effectiveness of government services. Some governments have already launched significant efforts to bringing all public services online. Russia's portal "Gosuslugi.ru" provides a whole range of public services online and was ranked fourth top government website worldwide by SimilarWeb.⁴⁶ In 2019, the portal had 103 million users (approximately 88 percent of Russia's potential user base) and processed over 1.8 billion applications. A review by the US's Congressional Research Service concluded that cloud computing in particular could save federal agencies approximately up to 50 percent of IT budgets.⁴⁷ Cloud computing has several applications with economic development implications in government. One major area of opportunity is the detection of tax fraud and evasion. For example, Brazil's use of big data analysis to audit corporate tax declarations has helped identify fraudulent business networks and led to a 12.5 percent increase in the country's federal tax collection since 2010.⁴⁸ Mandatory e-invoicing for businesses helped authorities in Mexico combat false invoicing and unrecorded transactions, leading to significant increases in tax revenue.⁴⁹ Russia digitally transformed its tax authority which enabled a two fold increase in tax collection through an automated tax collection platform,

42. Leichman (2019), "The Israeli tech helping farmers worldwide improve their crops", Israel 21c.

Available at: <https://www.israel21c.org/the-israeli-tech-helping-farmers-worldwide-improve-their-crops/>

43. TechEU (2019), "Russia-based iFarm secures \$1 million to take its urban farming solutions to the next level".

Available at: <https://tech.eu/brief/russia-based-ifarm-secures-1-million-to-take-its-urban-farming-solutions-to-the-next-level/>

44. FAO (2011), Seeking an end to loss and waste of food. Available at: <http://www.fao.org/in-action/seeking-end-to-loss-and-waste-of-food-along-production-chain/en/>

45. The Guardian (2016), "The smart tech startup helping restaurants cut food waste by 50%". Available at: <https://www.theguardian.com/sustainable-business/2016/may/27/startup-smart-tech-cut-food-waste-winnow-awards-winner> and Compass UK (2017), "Leading the fight against food waste". Available at: <https://www.compass-group.co.uk/medialblog/leading-the-fight-against-food-waste/>

46. Similarweb (2020), Top Websites Ranking. Accessed August 2020. Available at: <https://www.similarweb.com/top-websites/category/law-and-government/government/>

47. Congressional Research Service (2015), Overview and Issues for Implementation of the Federal Cloud Computing Initiative: Implications for Federal Information Technology Reform Management. Available at: <https://fas.org/sgp/crs/misc/R42887.pdf>

48. Ernst and Young (2016), Tax administration is going digital: Understanding the challenges and opportunities.

Available at: [http://www.ey.com/Publication/vwLUAssets/EY-tax-administration-is-going-digital/\\$FILE/EY-tax-administration-is-going-digital.pdf](http://www.ey.com/Publication/vwLUAssets/EY-tax-administration-is-going-digital/$FILE/EY-tax-administration-is-going-digital.pdf)

49. OECD (2017), Technology tools to tackle tax evasion and tax fraud.

Available at: <https://www.oecd.org/tax/crime/technology-tools-to-tackle-tax-evasion-and-tax-fraud.pdf>

obligatory online cash registers and real-time tracking of transactions.⁵⁰ These efforts have contributed to a decrease in Russia collection gap of Value-Added-Tax (VAT), from 20 percent to 1 percent. Digital technologies can also help to transform the efficiency of government delivery of services and spending. In Kenya, the World Food Program found that the use of electronic transfers, rather than in-kind payments, to support food insecure households lowered delivery costs by 15 percent.⁵¹ Nigeria has saved USD 1 billion over the last decade after switching to an Integrated Personnel & Payroll Information System.⁵²

- Manufacturing.** Embracing the Fourth Industrial Revolution, many countries are taking steps towards the digitalization of their manufacturing sectors to improve labor productivity and stay globally competitive. The use of big data and the Internet of Things can improve demand forecasting and production planning to improve customer service levels, while real-time data on inventory levels and shipments in transit can allow manufacturing businesses to optimize their supply chains. Industrial automation and robotics also demonstrate significant potential in addressing a shrinking and ageing workforce by driving productivity in repetitive and labor-intensive manufacturing tasks. In Turkey, there are about 200 robots per 10,000 employees in the automotive sector.⁵³ This is being driven by a combination of factors, including advancements in robotic functions, the need for 24x7 production systems, and rising wages. Additive manufacturing is also being increasingly used in manufacturing, which are technologies that build 3D objects by adding layer-upon-layer of material. Additive manufacturing allows for the creation of bespoke parts with complex geometries and little wastage. Additive manufacturing is particularly valuable in manufacturing sectors due to faster development cycles, part consolidation, light-weighting, and new and custom geometries.⁵⁴
- Education & training.** Digital technologies hold the promise of enhancing the quality of instruction, improving the productivity of teaching and support staff, and enhancing the matching of labor demand and supply. For example, the African School for Excellence (ASE),

an affordable private secondary school in South Africa, deploys an innovative rotational classroom model in which students rotate between teacher-facilitated lessons, small-group peer-learning activities and individual work on computers supervised by trainee teachers. Deploying online courses from free products such as Khan Academy, this blended learning approach innovatively reduces costs through its reliance on a smaller number of highly trained teachers, while enhancing education outcomes with its emphasis on personalized learning and small class sizes. Students in the ASE have been found to outperform the wealthiest students in the country by 2.3 times in mathematics and 1.4 times in English.⁵⁵ At the same time, the per-student cost of USD800 a year is low when compared with South African average student costs that are in the range of USD1,400 to USD16,500 per year.⁵⁶ Online job platforms could also potentially boost global GDP by USD2.7 trillion through encouraging workforce participation and increasing the speed and efficiency of job matching.⁵⁷

- Financial services.** Mobile money services can be instrumental in increasing financial inclusion. Besides their e-wallet feature which allows users to securely store and use money, these services further improve the degree of financial integration for the unbanked by partnering with utility companies, the government and international money transfer services to allow customers to pay for their bills, participate in conditional cash transfer programs, as well as send and receive remittances. Many emerging services even grant their financially-excluded customers access to loans, insurance, and investment through automated features that create “trust scores” based on individuals’ credit histories. Blockchain technology is finding early application in this sector, facilitating cross-border digital wallet remittance service, offering overseas workers a secure, low-cost and convenient way to send families back home money online in seconds. Digital financial inclusion can drive a number of economic benefits. For Nigeria, it is estimated that further adoption of digital financial services could increase Nigeria’s GDP by as much as 12.4 percent by 2025 through increases in productivity, investment, and labor supply.⁵⁸

50. Financial Times (2019), “Russia’s role in producing the taxman of the future”. Available at: <https://www.ft.com/content/38967766-aec8-11e9-8030-530adfa879c2>

51. CGAP (2013). World Food Programme’s exploration of the in-kind to e-payments shift for food assistance in Kenya.

52. Effective Institutions Platform (2015). A study of peer learning in public sector reforms.

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Available at: <https://www.brookings.edu/wp-content/uploads/2019/09/Learning-to-Leapfrog-InnovativePedagogiestoTransformEducation-Web.pdf>

56. David Istance and Alejandro Paniagua (2019), Learning to leapfrog: innovative pedagogies to transform education. Center for Universal Education at Brookings Institution.

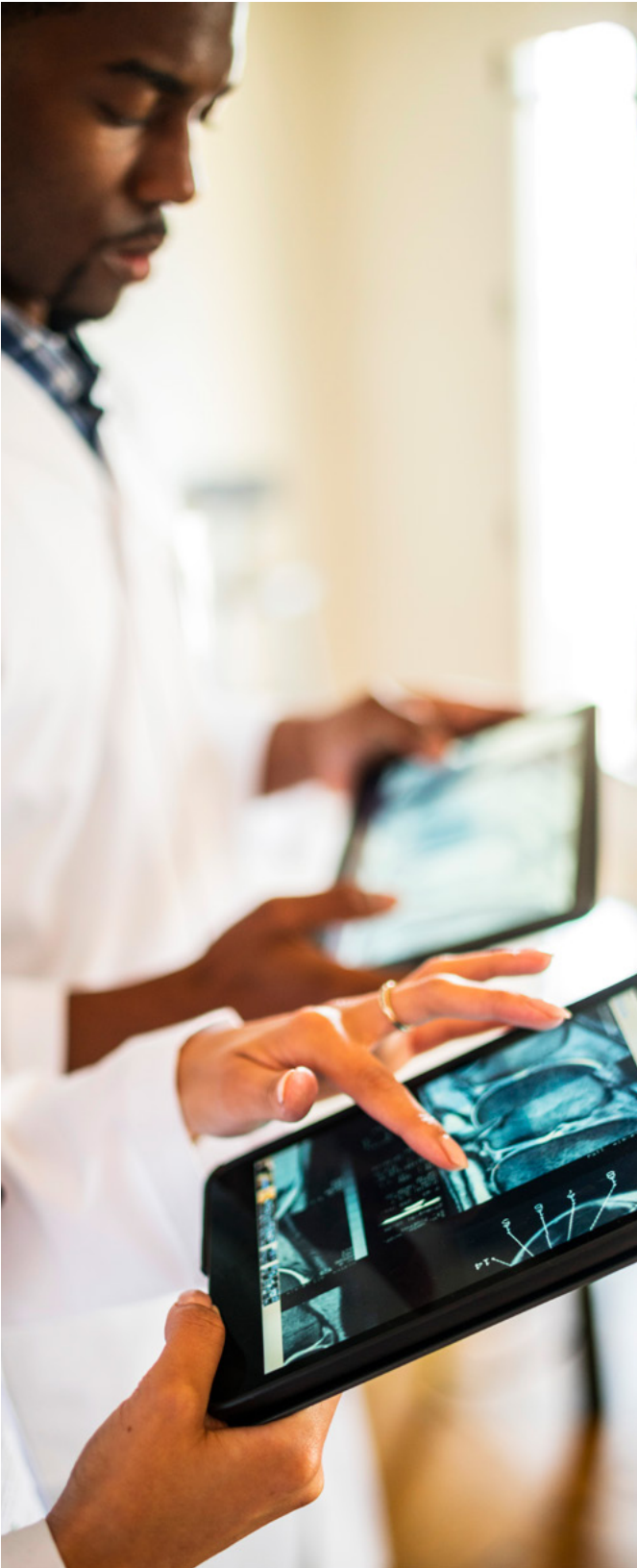
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Available at: <https://www.mckinsey.com/featured-insights/employment-and-growth/connecting-talent-with-opportunity-in-the-digital-age>

58. USAID (2018). The Digital Financial Services Landscape in Nigeria: Enabling Market Conditions for Pay-As-You-Go Solar.

Available at: https://www.usaid.gov/sites/default/files/documents/1860/Enabling_Market_Conditions_for_Pay-As-You-Go_Solar_Executive_Summary.pdf



- Health.** There is ample scope for digital technologies to reduce projected rising healthcare costs worldwide due to ageing populations and the rise of non-communicable diseases. For example, remote monitoring systems can reduce unnecessary hospitalization and make preventative care more effective. Using sensors that read the vital signs of patients at home, nurses and doctors can be alerted to problems before they worsen. Emerging technologies include wearable patches that can diagnose heart conditions, sensors that monitor asthma medication intake and detect poor air quality, and glucose monitors that send diabetics' data straight to their smartphones.⁵⁹ In recent years, there have been increasing digital health innovations in Israel. For instance, Sweetech has a clinically proven, AI-powered platform which enables the personalized prediction and prevention of diabetes.⁶⁰ The app-based platform also delivers data-driven recommendations. The McKinsey Global Institute estimates that remote monitoring could reduce the cost of treating chronic diseases in health systems by 10–20 percent by lowering the frequency of emergency room visits and unnecessary hospitalization.⁶¹ Digital technologies can also expand access to medical care in underserved areas through telemedicine and support increases in quality of treatment through data-based public health interventions and deploying Internet of Things technology to detect counterfeit drugs.
- Consumer, retail & hospitality.** Significant gains in this sector will come from productivity improvements due to electronic retailing (e-tailing). Consumers benefit in the form of lower prices and better product selection, while retailers can improve inventory management by reducing stock-outs, due to better demand forecasting enabled by big data and IoT technologies. The supply chain can also be transformed through digital technologies. Radio frequency identification (RFID) tags on containers can track products as they move from the factory to stores, allowing companies to avoid stock-outs and losses. Singapore's YCH Group reduced stock turnaround time by 20 percent in a 220,000-square-foot warehouse of close to 3,000 stock-keeping units by using RFID systems for more accurate pallet sorting.⁶² In Egypt, AvidBeam has developed video analytics products to provide in-store analytics for shopping malls and retail shops.⁶³ These products track consumer behaviors (e.g. age and gender recognition) and help to improve operational efficiency.

59. Goldman Sachs (2015), *IoT: Digital Revolution comes to US healthcare*.

60. Israel Ministry of Economy and Industry (2019), "How Israel Became the Beating Pulse of Digital Health Innovation" Available at: <https://itrade.gov.il/south-africa/2019/01/02/how-israel-became-the-beating-pulse-of-digital-health-innovation/> and No Camels (2018), "How Israeli Digital Health Technologies Are Revolutionizing Healthcare and Reshaping Privacy Concerns" Available at: <https://nocamels.com/2018/01/israeli-tech-revolutionizing-healthcare/>

61. McKinsey Global Institute (May 2013), *Disruptive technologies: Advances that will transform life, business, and the global economy*.

62. Honeywell case studies (2010), "YCH Group selects Intermec fixed vehicle computer to improve supply chain management".

63. Menabytes (2019), "Exclusive: Egypt Ventures invests in video big data analytics startup AvidBeam in a Series A round". Available at: <https://www.menabytes.com/avidbeam-series-a/> and AvidBeam (2020), "Shopping Malls & Retail Shops In-Store Analytics" Available at: <https://www.avidbeam.com/industries/retail/>



- Mobility.** Digital technologies can transform access to transport and the efficiency of transport flows. Consumers can already use apps on their electronic devices to find out about real-time traffic conditions and reroute journeys away from heavy traffic; access car sharing, e-hailing and on-demand private shuttles; find appropriate routes for cycling and walking; and enable public transit agencies to analyze and improve network performance.⁶⁴ Transport systems will increasingly become more multimodal, on-demand and shared, increasing consumer choice and convenience. Smart pricing for the use of road infrastructure can help manage traffic congestion in cities. The use of autonomous vehicles is expected to grow significantly over the next two decades, with some estimating that 12 million fully autonomous vehicles will be sold globally by 2035.⁶⁵ The benefits of autonomous vehicles include fewer road accidents, reduced need for parking spaces and less congestion in cities. By reducing the human error factor in driving, it is estimated that autonomous vehicles could cut accidents by as much as 90 percent.⁶⁶ In 2014, the Secretariat of Ports (SEP) of Brazil started to deploy Portolog, a smart port logistics system, in the Port of

Santos. This system aims to synchronize the arrival of ships and improve the efficiency of the port. The annual benefits of this smart port have been estimated to be about USD200 million, equivalent to a 10 percent reduction in the total transport cost.⁶⁷ Other emerging economies, such as Mexico, are also developing smart ports.⁶⁸

The total contribution to the digital opportunity by sector can vary significantly by country. EXHIBIT 11 highlights which sectors show the largest opportunity for economic impact by 2030 by country. For example, Turkey is the only country amongst the Digital Sprinters where the manufacturing sector offers the largest digital opportunity. Consumer, retail & hospitality is amongst the three sectors with the largest opportunities for the UAE and Egypt, only.

There is clearly a large potential economic prize from leveraging available digital technologies to support sector economic development. The question remains – can emerging economies unlock this potential? The next chapter explores policy ideas for how the Digital Sprinters can translate this potential into reality.

64. McKinsey & Company (2015), *Urban mobility at a tipping point*.

Available at: <https://www.mckinsey.com/business-functions/sustainability/our-insights/urban-mobility-at-a-tipping-point>

65. Boston Consulting Group (2015), *Autonomous Vehicle Adoption Study*.

66. McKinsey & Company (2015), *Urban mobility at a tipping point*.

Available at: <https://www.mckinsey.com/business-functions/sustainability/our-insights/urban-mobility-at-a-tipping-point>

67. PortEconomics EU (2016), "Using information and making more of existing infrastructure"

















Available at: <https://www.porteconomics.eu/2016/02/17/using-information-and-making-more-of-existing-infrastructure-lessons-from-the-ports-of-santos-and-hamburg/>

68. Mexico Industrial Maps (2018), "Guanajuato towards the development of smart parks and ports"

Available at: <https://mexicoindustrialmaps.com/en/article/guanajuato-towards-the-development-of-smart-parks-and-ports>

Exhibit 11:

THE INDUSTRIES HOLDING THE LARGEST DIGITAL OPPORTUNITY CAN VARY SIGNIFICANTLY ACROSS COUNTRIES

Country	Annual economic impact in 2030, USD billion	Share of 2030 GDP, Percent	Industries holding the largest absolute opportunity from digital in 2030		
			1	2	3
	617	25	Financial services	Infrastructure	Agriculture & food
	521	25	Resources	Infrastructure	Manufacturing
	318	31	Resources	Manufacturing	Education & training
	316	20	Resources	Infrastructure	Government
	286	52	Resources	Consumer, retail & hospitality	Government
	269	24	Manufacturing	Government	Infrastructure
	175	33	Infrastructure	Government	Agriculture & food
	149	23	Resources	Manufacturing	Infrastructure
	139	28	Infrastructure	Manufacturing	Consumer, retail & hospitality
	116	26	Resources	Infrastructure	Government
	114	22	Resources	Infrastructure	Education & training
	96	22	Resources	Government	Manufacturing
	76	22	Resources	Infrastructure	Manufacturing
	74	43	Financial services	Agriculture & food	Infrastructure
	71	13	Government	Manufacturing	Health
	52	27	Infrastructure	Government	Resources

SOURCE: AlphaBeta analysis



3. CAPTURING THE PRIZE

INNOVATIVE POLICIES FOR REALIZING THE DIGITAL OPPORTUNITY

3.1 FOUR STRATEGIC
IMPERATIVES CAN HELP THE
DIGITAL SPRINTERS CAPTURE
THE DIGITAL OPPORTUNITY

page 36

3.2 POLICY LEVERS
ARE IMPORTANT
WITHIN THESE FOUR
STRATEGIC IMPERATIVES

page 39

3.3 PUTTING IT
ALL TOGETHER

page 61



How can the Digital Sprinters capture the economic development opportunity highlighted in Chapter 2? Based on a review of innovative policies adopted globally (including within the Digital Sprinters) and interviews with digital policy experts, 12 policy levers emerged which have the potential to capture the economic impact from these digital technologies. These levers can be categorized into four strategic imperatives:

- 1. Lead from the top;*
- 2. Drive change through the public sector;*
- 3. Enable the private sector; and*
- 4. Provide individuals with the digital toolkit to succeed.*

It is important to understand the most impactful policies that are likely to yield the biggest impact and unlock the bulk of the digital opportunity explored in Chapter 2.

Further, it is crucial to understand how such policies can be integrated together to maximize their effectiveness. Rather than looking at policies that enable economies to simply become passive recipients of digital technologies (e.g. promotion of digital literacy, increasing broadband access), this research has examined policy levers that go further to enable countries to fully leverage digital technologies in their economic development.



3.1 FOUR STRATEGIC IMPERATIVES CAN HELP THE DIGITAL SPRINTERS CAPTURE THE DIGITAL OPPORTUNITY

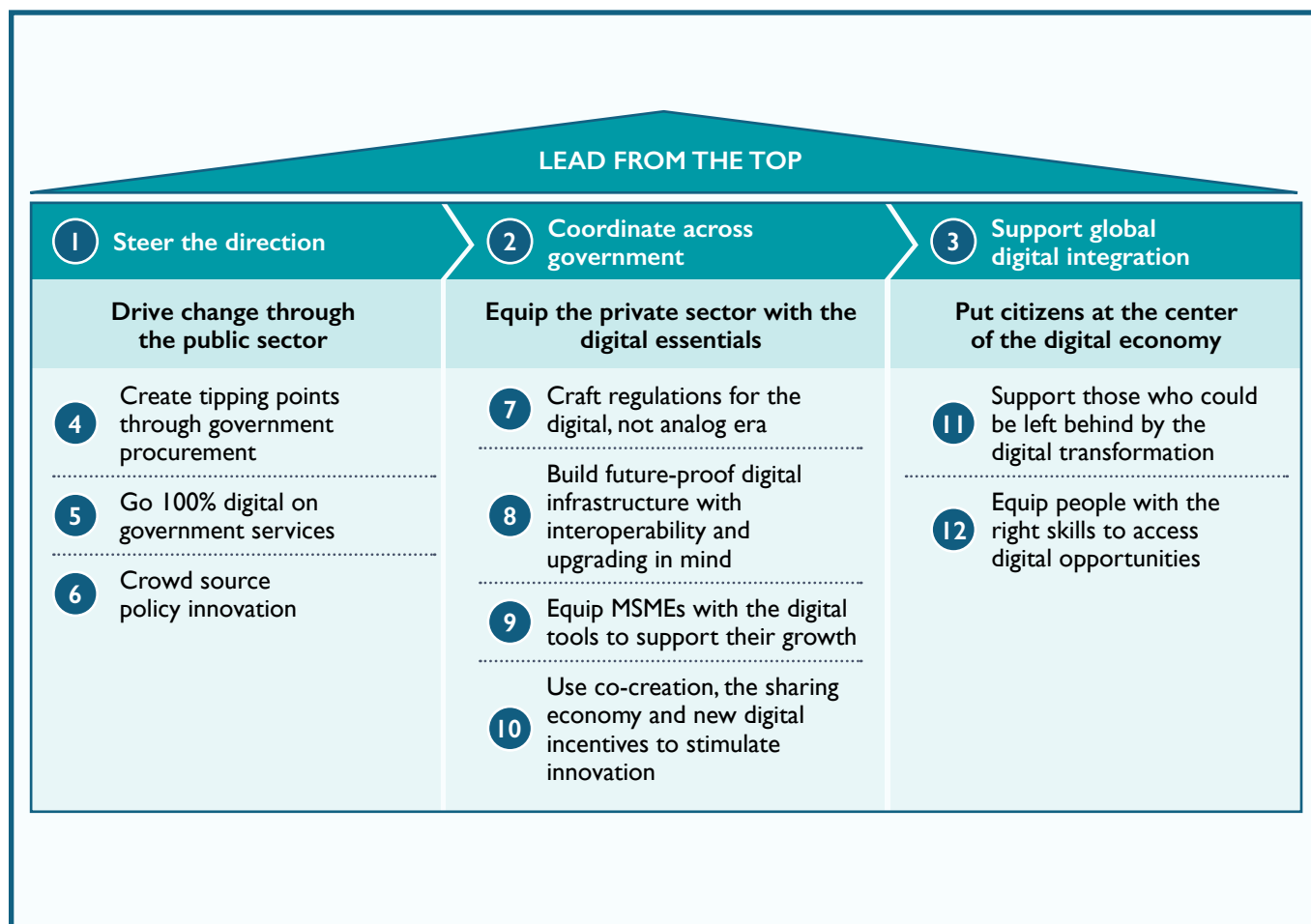
Based on the methodology described in Box 1, 12 policies (grouped into four strategic imperatives) emerged as being most impactful for creating digital-led economic development:

1. **Lead from the top.** These policy levers are concerned with setting the right direction for the digital transformation of the economy. They entail elevating digitization to the national agenda and developing concrete sector-level plans to guide progress. They also aim to strengthen coordination within governments and between other economies in key areas such as digital trade rules.
2. **Drive change through the public sector.** These levers leverage the position of government to directly drive the adoption of technology in the public sector as well as establishing public sector provisions that facilitate digital transformation for the private sector and citizens. They are also aimed at making government resources, data in particular, more available for the general public to be used in digital applications.
3. **Equip the private sector with the digital essentials.** Having established a clear direction for leveraging digital for economic development, policy levers should be focused at enabling the private sector. It includes establishing ground rules that enable digital transformation, rethinking infrastructure development, supporting micro-, small- and medium-sized enterprises (MSMEs), and developing new ways to spur innovation and entrepreneurship.
4. **Put citizens at the center of the digital economy.** Digital technologies provide both risks and opportunities to individuals. On the downside, there is the potential risk of automation of jobs. On the upside, there are significant opportunities to improve productivity, incomes and job satisfaction. Preparing individuals for this digital era requires going beyond just providing broadband access, instead focusing on innovative ways to provide individuals with the necessary skills, and also to support behavior change.



Exhibit 12:

INNOVATIVE DIGITAL POLICY CAN BE FRAMED ACROSS 12 LEVERS WITHIN A STRONG OVERARCHING GOVERNANCE AS WELL AS FOUR STRATEGIC IMPERATIVES



BOX 1.

APPROACH TO IDENTIFYING PUBLIC POLICIES TO AMPLIFY THE IMPACT OF DIGITAL TECHNOLOGIES AS ENABLERS OF ECONOMIC DEVELOPMENT

This research examines policy levers that have been implemented to drive successful digital transformation for economic development across different sectors. For the purpose of this research, policies considered included strategies, regulations and reforms as well as targeted initiatives and interventions. A three-step approach was used to identify and prioritize these policies:

STEP 1: BUILD A LONG LIST OF POLICY EXAMPLES

A long list of policy examples was identified via three separate methods. First, a top down approach relying mostly on a review of the relevant international literature (e.g. OECD, World Bank, Asian Development Bank, World Economic Forum, GSMA)⁶⁹ was used to ensure well-established best practices were included. In addition, the research also included two deliberate “bottom-up” reviews – reviewing sector-specific examples of successful policy (among the 10 sectors focused on in the Chapter 1 analysis) and identifying innovative policy examples among the Digital Sprinters.

STEP 2: PRIORITIZE WITHIN THE LONG LIST

The second step involved assessing whether policies in the long list satisfied a number of criteria, namely:

- **Evidence of impact.** There is evidence that the policy has had measurable impact relevant to economic development.
- **Innovation.** The policy goes beyond well-known policy approaches, particularly those linked to basic digital adoption (e.g. broadband access), is the first of its kind and or considers areas that are less explored and look to drive application of digital technologies in a unique manner.
- **Applicability.** The policy could be applicable to a broad range of emerging markets, and its success is not solely attributable to a very specific context. To fulfill this criterium the policy needs to have been implemented in an emerging market or, if an example from a developed market, does not require an advanced digital economy of digital infrastructure to be effective.

STEP 3: DEFINING POLICY LEVERS AND STRATEGIC IMPERATIVES

Policies that fulfilled at least two of the three criteria were considered for inclusion in the framework. The framework was then designed with common themes in mind. This resulted in a grouping into 12 common policy levers across four strategic imperatives to form the framework presented in Exhibit 12. For each of the 12 common policy levers, it was ensured that examples of “Evidence of Impact”, “Innovation” and “Applicability” (i.e. examples from emerging economies) were included. The framework was then referenced against established frameworks to understand if there were any blind spots. Examples of frameworks considered include the priorities in the Digital Road Map of the Pathways for Prosperity Commission;⁷⁰ Germany’s ROADMAP for Digitalization developed for the G20 in 2017;⁷¹ and the ADB’s Digital Agenda 2030.⁷²

69. Key sources included the OECD’s and World Bank’s The Innovation Policy Platform. Accessible here: <https://www.innovationpolicyplatform.org/www.innovationpolicyplatform.org/digital-innovation-seizing-policy-opportunities/index.html>; OECD and IDB (2016), Broadband Policies for Latin America and the Caribbean – A Digital Economy Toolkit. Available at: <http://www.oecd.org/internet/broadband/lac-digital-toolkit/>; and World Economic Forum (2017), Digital Policy Playbook 2017 – Approaches to National Digital Governance. Available at: http://www3.weforum.org/docs/White_Paper_Digital_Policy_Playbook_Approaches_National_Digital_Governance_report_2017.pdf; GSMA (2017), Embracing the Digital Revolution – Policies for Building the Digital Economy. Available at: https://www.gsma.com/publicpolicy/wp-content/uploads/2017/02/GSMA_DigitalTransformationReport2017_Web.pdf

70. Pathways for Prosperity Commission (2019), The Digital Roadmap: how developing countries can get ahead. Available at: https://pathwayscommission.bsg.ox.ac.uk/sites/default/files/2019-11/the_digital_roadmap.pdf

71. Federal Ministry for Economic Affairs and Energy of the Federal Republic of Germany (2017), A ROADMAP for Digitalisation: Policies for a Digital Future. Available at: https://www.bmwi.de/Redaktion/EN/Downloads/R/roadmap-for-digitalisation.pdf?__blob=publicationFile&v=2

72. Asian Development Bank (2018), Digital Agenda 2030: Special Capital Expenditure Requirements for 2019–2023. Available at: <https://www.adb.org/sites/default/files/institutional-document/472371/adb-digital-agenda-2030.pdf>

3.2 12 POLICY LEVERS ARE IMPORTANT WITHIN THESE FOUR STRATEGIC IMPERATIVES

Across the four imperatives, 12 policy levers are important for driving economic development. It should be noted that the specific policy approaches for each lever may differ by digital maturity of the economy and the relevant sector. For example, while certain policy levers have been shown to be successful across a number of markets and sectors, some levers have particular relevance to specific sectors. EXHIBIT 13 shows which levers are particularly relevant for which sectors and therefore which policy levers should be considered first by emerging economies with a particular sector focus. The methodology of how relevance was established can be found in Appendix B. Certain levers, such as “steer the direction”, “coordinate across government”, and “equip people with

the right skills to access digital opportunities” are crucial across all sectors. For other levers, such as “go 100% digital on government services”, the sectors most impacted are the government itself, plus sectors that engage frequently with the public sector for permits, approvals, etc. (e.g. infrastructure, mobility, financial services).

This section expounds on the identified policy levers in detail, providing innovative examples of policy use that have proven effective. Further, case studies have been provided that showcase potential implementation roadmaps for some of the key technologies identified in Chapter 1.

1. LEAD FROM THE TOP

STEER THE DIRECTION

From the outset, governments should create a clear plan, roadmap or national strategy for digitization with accountability residing at senior levels of government. While there is nothing novel about this per se and the principles of good government strategies have been discussed in the past literature,⁷³ several governments have adopted innovative frameworks or governance structures that set their plans apart. Some of the key elements of such plans include:

- **Keep the strategic focus to no more than 6 areas.** A compelling vision is needed to understand why digital transformation is important and what are the key strategies to support this. Based on academic evidence, successful strategies typically tend not to have more than four to six focus areas.⁷⁴ To improve the ability to drive economic and social development, these areas should be tightly linked to this objective. For example, Indonesia’s “Making Indonesia 4.0” strategy contains a clearly articulated 4IR vision, with specific and quantifiable targets, and clear links to how 4IR could benefit the

economy. Viewed as instrumental to achieving the country’s goal of becoming one of ten largest economies globally by 2030, 4IR is envisioned by its government to deliver three economic outcomes: boost net exports as a percentage of GDP by 13 times to reach 10 percent, double current labor productivity levels, and increase the share of R&D spending of GDP by 7 times from its 0.3 to 2 percent of GDP.⁷⁵ A lack of clear strategic focus related to digital technologies has been cited as one of the main themes preventing governments in Latin America to increase the adoption of cloud computing services.⁷⁶ A good example of strong focus is seen in the UAE’s Fourth Industrial Revolution Strategy’s framework which focuses on only five pillars: improving human capital in education and health outcomes; enhancing security (e.g. food, space, economic, and defense); promoting livability and ease of access (e.g. sustainable urbanization, consumer experience, government service experience); increasing economic productivity (e.g. manufacturing, supply chains); and exploring new frontiers in science and space.⁷⁷ A sixth pillar focuses on the foundations that link to each of the other pillars. Where digital visions or

73. OECD (2017), “Benchmarking Digital Government Strategies in MENA Countries”, OECD Digital Government Studies. Available at: <https://www.oecd.org/mena/governance/digital-governance-mena.pdf>

74. McKinsey (2012), *Delivery 2.0: The New Challenge for Governments*.

75. *Making Indonesia 4.0 strategy*

76. IDB (2018), *Cloud Computing: Opportunities and Challenges for Sustainable Economic Development in Latin America and the Caribbean*.

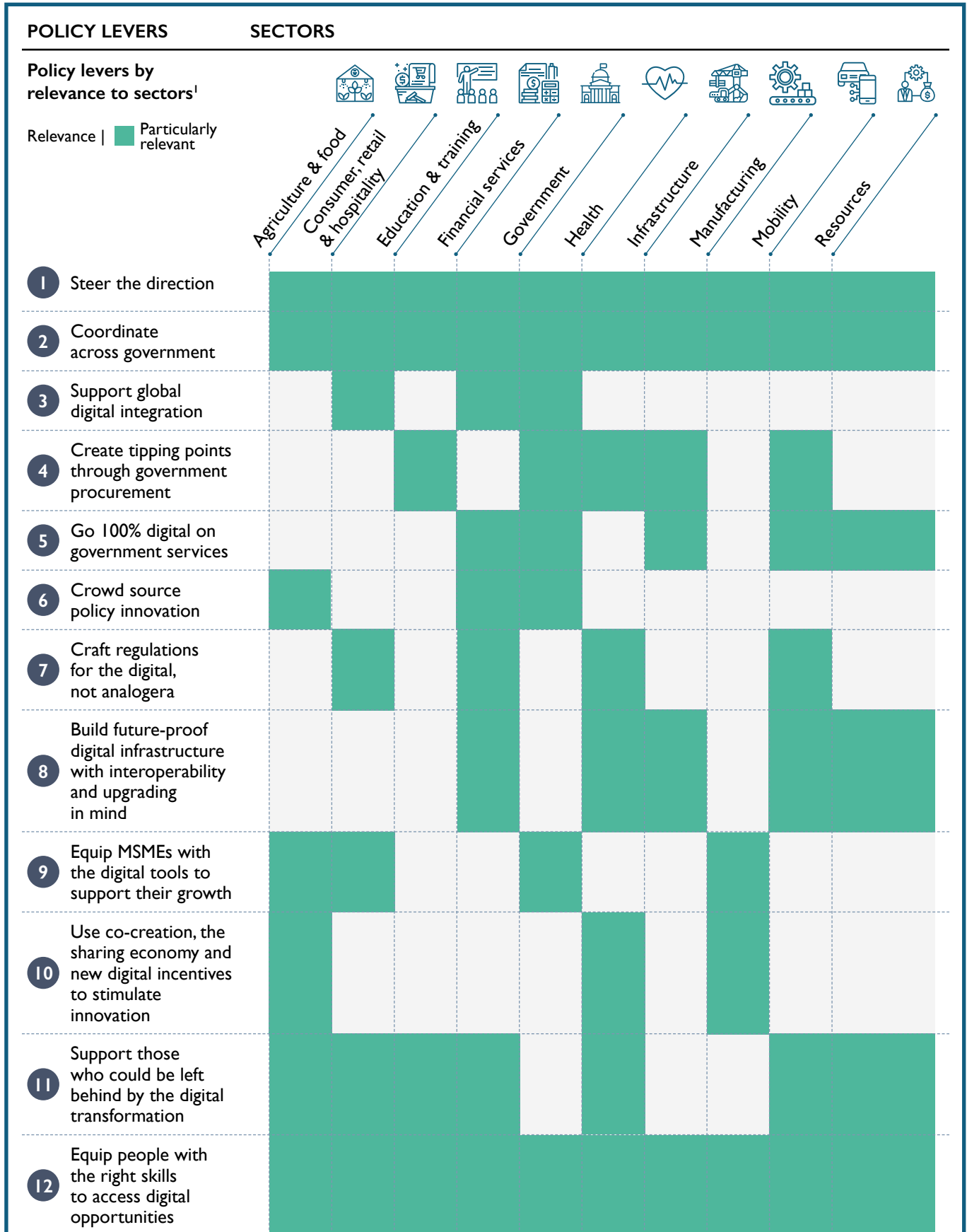
Available at <https://publications.iadb.org/en/cloud-computing-opportunities-and-challenges-sustainable-economic-development-latin-america-and>

77. UAE Ministry of Cabinet Affairs & The Future (2017), *UAE’s Fourth Industrial Revolution Strategy*.

Available at: <https://3r0eovlj2vmb3ino8b!g5v28-wpengine.netdna-ssl.com/wp-content/uploads/2019/09/En-UAE-4-IR-Strategy.pdf>

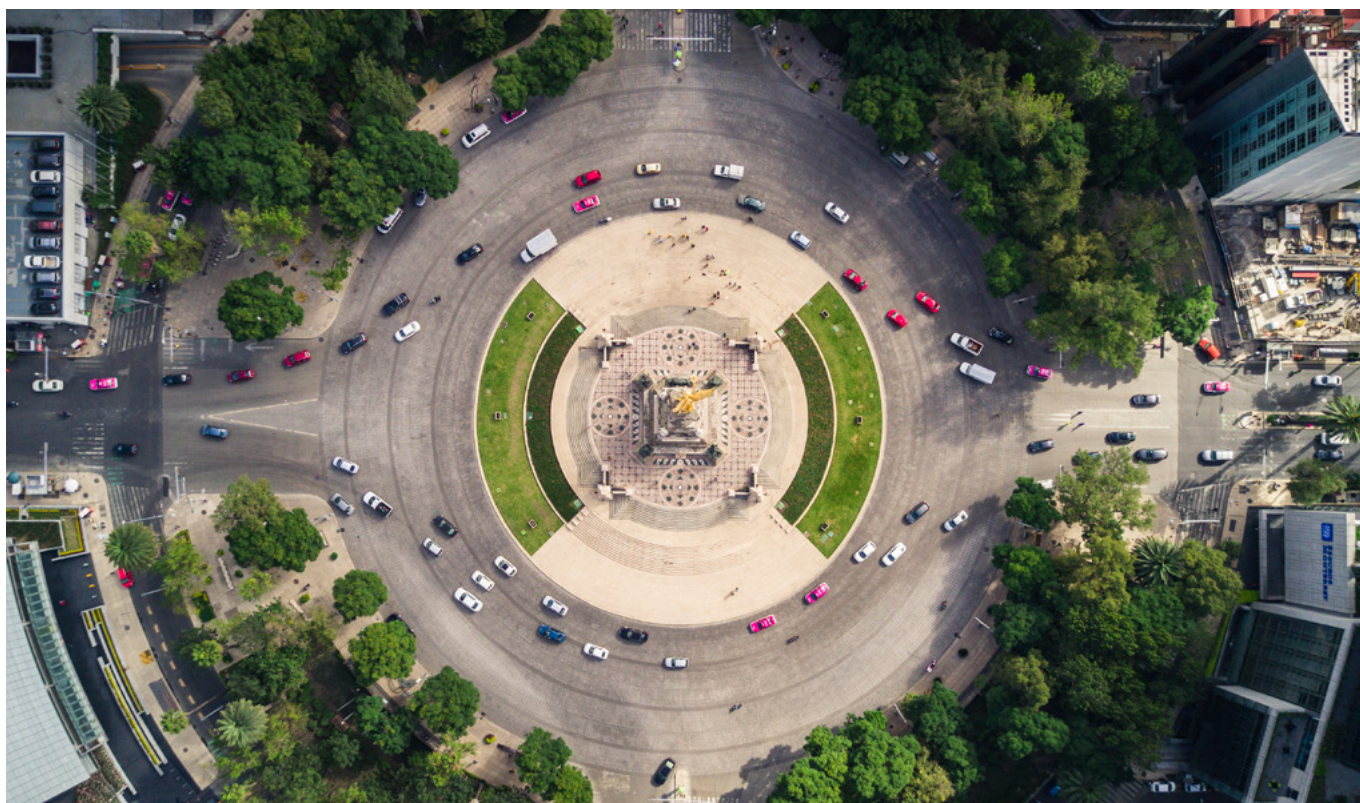
Exhibit 13:

SOME POLICY LEVERS ARE MORE RELEVANT TO CERTAIN SECTORS THAN OTHERS



1. Relevance is determined by evidence of application to a particular sector, or evidence of a cross-cutting policy having direct impact on economic growth or development in a particular sector.

SOURCE: AlphaBeta consumer survey



roadmaps fail is often when they a) are too high level and broad; b) digital technology becomes an end rather than a means, or worse, digital is treated as a “silver bullet” while ignoring underlying structural issues. To avoid falling into this trap it is imperative that the vision sets clear and realistic objectives for what is to be achieved with digital technologies and provides clarity on the country context. There is evidence of the effectiveness of such targeted strategies as can be seen from the example of Colombia’s Vive Digital Plan and Mexico’s National Digital Strategy which has been successful in driving digital transformation by adopting a highly targeted approaches and securing digital champions at high levels of leadership (see below).⁷⁸ While predominantly focused on creating internet penetration, the Vive Digital Plan placed strong emphasis on information and trust building campaigns about the benefits of digital, behavior change and digital literacy and skills training (see more details of policies related to these components below).⁷⁹ Mexico’s National Digital Strategy ranked 1st place in Digital Services and e-Participation in the LAC region and 19th and 14th respectively at the global level in the UN e-government Survey 2016.

- Link the national vision to sector specific roadmaps.** Once a clear vision is established at the national level, it is crucial this leads directly into sector specific roadmaps to support specific objectives and goals. For example, under its SGD4.5 billion “Industry Transformation Programme”, Singapore is developing “Industry Transformation Maps” (ITMs) for 23 industries to address issues within each industry and deepen partnerships between government, industries, trade associations and chambers, as well as individual firms (Box 2). Sector-specific strategies driven by government have in the past had a decidedly mixed track record. If poorly planned, these strategies are often associated with limited changes in sector competitiveness, a large waste of taxpayer money, and capture of the process by a small number of connected firms.⁸⁰ Other barriers stem from rivalries between ministries or coordination challenges if a large number of sectors are involved. Critical to success is to have strong engagement with industry associations, MSMEs and employer groups, as well as ensure there is a strong fact base on the specific market failures and local context that will shape implementation.⁸¹

78. Mexico Digital (2017), *Experiences of the National Digital Strategy in Mexico – Advances in e-Government and Open Data*. Available at: <https://aimp2.apec.org/sites/PDB/Supporting%20Docs/3307/Completion%20Report/TEL%2005%202017S%20Presentation%20%20TEL%2055%20%20LSG%20Industry%20Roundtable%20Mexico%27s%20NDS%20Advances.pdf>

79. World Economic Forum (2017), *Digital Policy Playbook 2017 – Approaches to National Digital Governance*.

Available at: http://www3.weforum.org/docs/White_Paper_Digital_Policy_Playbook_Approaches_National_Digital_Governance_report_2017.pdf;

80. Shanta Devarajan (2016), “Three reasons why industrial policy fails”. Brookings Institute.

Available at: <https://www.brookings.edu/blog/future-development/2016/01/14/three-reasons-why-industrial-policy-fails/>

81. For further discussion, see McKinsey Global Institute (2010), *How to compete and grow: A sector guide to policy*. Available at: https://www.mckinsey.com/~/media/McKinsey/Industries/Public%20and%20Social%20Sector/Our%20Insights/How%20to%20compete%20and%20grow/IMG/How_to_compete_and_grow%20A_sector_guide_to_policy_Exec_Summary.pdf; and Eden Strategy Institute (2018), “Five Considerations When Planning Your Sector Development Roadmap”. Available at: <https://www.edenstrategyinstitute.com/2018/12/31/five-considerations-when-planning-your-sector-development-roadmap/>

BOX 2: SINGAPORE'S SECTOR ROADMAPS

Singapore's "Industry Transformation Maps" represent the roadmaps to Industry 4.0 (I4.0) adoption for an industry sector.⁸² ITMs are developed in partnership with industry and civil society actors and combine several aspects of a sector's transformation going far beyond the technologies that can be adopted. The emphasis on "Skills Frameworks" is particularly important – these provide key information on career pathways, the existing and emerging skills required for different occupations, and reskilling options for different sectors as a result of technology adoption. They often provide lists of training programs for skills upgrading. By virtue of the multi-stakeholder nature of ITM development, these frameworks are intended to benefit not just workers, but also employers (by enabling them to identify emerging skill needs for their workers and enhance talent attraction and retention efforts), training providers (by allowing them to gain better insights into emerging skill trends and more optimally target critical skill gaps through appropriate courses) and students (by facilitating them to make informed decisions on choice of study based on career aspirations). A 2018 survey of over 700 firms in Singapore found that 36 percent of firms take guidance from the ITMs in finding ways to improve their talent pipeline, and in addressing manpower challenges for different sectors.⁸³

COORDINATE ACROSS GOVERNMENT

Successful digital transformation has rarely been achieved without closely coordinated efforts across the entire government as an organization. While this may seem obvious, implementing good coordination mechanisms can be difficult in practice. Some mechanisms have worked better than others due to the following factors:

- Ensure there are public and private sector digital champions.** Technological reforms often encounter strong opposition from influential groups that have deeply vested interests in the status quo and inertia among government officials. High-level political or industry support can be crucial to achieve results. An emerging approach is the appointment of a digital champion, a senior government official that ensures that the government's digital vision is delivered promptly and that fiscal discipline during implementation is maintained. The appointment of a senior official to this position ensures that various government services are linked to each other and that information between government ministries are shared. The champion also plays a role in standardizing operating procedures across government departments. Some examples of country programs in this area are shared in Box 3. A key risk to avoid is to appoint champions that may have public visibility but lack decision-making powers making
- the role essentially superficial. One way of ensuring this does not occur is by providing support from the highest levels of government (e.g. Prime Minister or President's office), as has been the case in Singapore and UAE, as well as establishing clear reporting lines and granting the appointed digital champions the necessary powers.
- Be clear on who is the lead agency in each strategy.** It is important that there are clear government agency leads for different aspects of the digital agenda. In South Africa, the Department of Industry (DoI) and Department of Science and Technology (DoST) co-lead the national I4.0 policy, with contributions from the Economic Development Department (EDD), the Department of Defence (DoD) and the Department of Health (DoH).⁸⁴ In Chile, the governmental organization Production Development Corporation (CORFO) leads the implementation of the national I4.0 strategy, known as the 'Programa Estratégico Industrias Inteligentes 2015-2025'. As part of this, CORFO undertakes all coordination efforts with different government bodies overseeing the different industry sectors prioritized for I4.0 implementation.⁸⁵ Argentina and Egypt have also leveraged economic development and/or science, technology and innovation (STI) authorities to assume direct responsibility for I4.0. Regardless of whether an existing body is appointed to lead the coordination or authority is given to a new body, some of the common

82. Ministry of Trade and Industry, Singapore (2017), Media factsheet- Industry Transformation Maps.

Available at: <https://www.mti.gov.sg/-/media/MTI/ITM/General/Fact-sheet-on-Industry-Transformation-Maps--revised-as-of-31-Mar-17.pdf>

83. Tang (2019), "Singapore businesses not investing enough in employee training: SBF survey". Channel News Asia.

Available at: <https://www.channelnewsasia.com/news/business/singapore-companies-not-investing-employee-training-sbf-survey-11134230>

84. UNIDO (2018), You say you want a revolution: Strategic Approaches to Industry 4.0 in Middle-Income Countries.

Available at: <https://www.unido.org/api/opentext/documents/download/10031392/unido-file-10031392>

85. UNIDO (2018), You say you want a revolution: Strategic Approaches to Industry 4.0 in Middle-Income Countries.

Available at: <https://www.unido.org/api/opentext/documents/download/10031392/unido-file-10031392>

BOX 3: COUNTRY EXAMPLES OF DIGITAL LEADERSHIP

Many countries have benefitted from digital champions in the public sector. As a signal of the importance of Artificial Intelligence, the United Arab Emirates appointed Omar Bin Sultan as the country's first Minister of State for Artificial Intelligence in 2017.⁸⁶ In Finland, the Prime Minister personally led the effort to re-orient the economy around high-technology industries. Another success story is Mexico, where the synergies between digitization and PFM were realized at scale after 2013, when the president championed its National Digital Strategy that included a commitment to "encourage the innovation of digital services through the democratization of public spending".⁸⁷ The 2013 strategy reflected over 15 years of consistent senior-level sponsorship that was necessary for the complex coordination efforts required across government agencies.⁸⁸ Indicative estimates show that digitization



helped the government to save around 3.3 percent of its combined spend on wages, pensions and social transfers annually. Another example is Colombia. As the objectives of the country's ICT strategic sectoral plans moved from promoting universal access and services of ICTs to technology uptake by firms; digital content, exports promotion, training and education, the need to involve additional ministries and agencies grew. As a result, the Intersectoral Commission for the Development of the Digital Economy (CIDED) was created and a Presidential Advisor for Innovation and Digital Transformation was appointed.⁸⁹ The advisor is one of 14 presidential advisors established under the same decree in 2019. The functions of the Presidential Advisor for Innovation and Digital Transformation include:

- Leading the CIDED and advising the President and government on all matters concerned with the digital economy as well as monitoring and evaluating progress;
- Co-ordinating the governmental actors involved in the policy implementation in the above fields, including the adoption of smart regulations for the development of the digital economy;
- Leading the digital transformation across government; and
- Leading the digital human capital development to facilitate the digital transformation

Private sector champions can also be crucial. In Singapore, implementation of Industry 4.0 (I4.0) efforts, comprising the ITMs, is overseen by a dedicated body – the Future Economy Council (FEC) – which is chaired by the Deputy Prime Minister. Previously, this role was held by the Council for Skills, Innovation and Productivity (CSIP).^{90,91} To ensure relevance to the private sector, council members include C-suite leadership from a variety of private sector companies, but also come from unions and educational and training institutes. Members are appointed on two-year terms.⁹² Other countries have also identified key private sector champions to make sure the political will extends beyond government.

86. ITPnet (2017), "UAE appoints first Minister for Artificial Intelligence".

Available at: <https://www.itp.net/615396-uae-appoints-first-minister-for-artificial-intelligence>

87. Cangiano M, Gelb A and Goodwin-Groen R (2017). "Integration of Digitalization and Public Financial Management – Initial Evidence." Chapter 12 of Gupta S, Keen M, Shah A and Verdier G (eds), *Digital Revolutions in Public Finance*. International Monetary Fund.

88. Cangiano M, Gelb A and Goodwin-Groen R (2017). "Integration of Digitalization and Public Financial Management – Initial Evidence." Chapter 12 of Gupta S, Keen M, Shah A and Verdier G (eds), *Digital Revolutions in Public Finance*. International Monetary Fund.

89. OECD (2019), *OECD Reviews of Digital Transformation: Going Digital in Colombia*. Available at: <https://doi.org/10.1787/781185b1-en>

90. Ministry of Trade and Industry, Singapore (2019), *The Future Economy Council*. Available at: <https://www.mti.gov.sg/FutureEconomy/TheFutureEconomyCouncil>

91. Ministry of Education, Singapore (2016), "Press release: Formation of the Council for Skills, Innovation and Productivity", Press releases.

Available at: <https://www.moe.gov.sg/news/press-releases/formation-of-the-council-for-skills-innovation-and-productivity>

92. Ministry of Education, Singapore (2016), "Press release: Formation of the Council for Skills, Innovation and Productivity".

Available at: <https://www.moe.gov.sg/news/press-releases/formation-of-the-council-for-skills-innovation-and-productivity>



success factors include clear leadership from the highest levels of government (as highlighted earlier) and finding ways for different departments to lead relevant elements. In Singapore, each ITM is championed by a different government agency whose purview is most relevant to the sector.⁹³ For example, the ITM for the manufacturing sector is led by the Economic Development Agency (EDB), while the ITM for the built environment sector is led by the Building and Construction Authority (BCA). Traps to avoid include appointing ministries which are ill-suited to lead the digital agenda (e.g. some countries have given control of digital economy issues to ministries of defense due to concerns over cyber-security) and a lack of clarity of different ministerial responsibilities.

SUPPORT GLOBAL DIGITAL INTERGRATION

Global data flows are surging, and digital flows now exert a larger impact on GDP growth than trade in goods.⁹⁴ Digital trade is also supporting large productivity improvements in domestic sectors, underpinning production and quality improvements, and international competitiveness. Yet, there is a risk that these benefits may not be captured unless there is strong collaboration across countries on trade rules and standard setting. It is also crucial to ensure that local firms have the capabilities to capture the emerging digital trade opportunities (discussed in further detail later in this chapter) in order to overcome resistance from some firms that may fear and resist the removal of protectionist measures.

- Integrating digital transformation into trade negotiations.** Countries should work with their trading partners to mutually support their digital transformation. They should incorporate key concerns such as cross-border data flows, non-taxation of electronic transmissions and intermediate liability issues into trade negotiations to support digital trade. A novel approach could include participating in multilateral digital trade agreements, like the digital Economy Partnership Agreement (DEPA). DEPA, a deal inked between Chile, New Zealand and Singapore in January 2020, which aims to develop a harmonized framework for the digital economy.⁹⁵ The agreement will help to promote the adoption of digital solutions, like digital payments, and also support the growth of digitalized sectors, like e-commerce.⁹⁶ Another example is the United States and South Korea Free Trade Agreement (FTA). To improve the country's cloud computing sector, the United States ensured that its free trade agreement with South Korea included provisions to maintain the free flow of electronic information between both countries.⁹⁷ There is no doubt that balancing free digital trade with issues of national concern (e.g. cyber-security, data privacy, taxation, fraud and money laundering), is highly complex and that trade negotiators may lack familiarity of technical details related to digital matters. However, if training of trade negotiators on digital trade issues can be provided and coalitions of partners countries can be formed, resulting agreements can have positive impact. Recent research has shown that the economic impact of digital

93. Ministry of Trade and Industry, Singapore (2017), *Media factsheet- Industry Transformation Maps*.

Available at: <https://www.mti.gov.sg/-/media/MTI/ITMI/General/Fact-sheet-on-Industry-Transformation-Maps--revised-as-of-31-Mar-17.pdf>

94. McKinsey Global Institute (2016), *Digital globalization: The new era of global flows*.

Available at: <https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-globalization-the-new-era-of-global-flows>

95. Asian Trade Center, "Unpacking the Digital Economy Partnership Agreement (DEPA)".

Available at: <http://asiantradecentre.org/talkingtrade/unpacking-the-digital-economy-partnership-agreement-depa>

96. Asian Trade Center, "Unpacking the Digital Economy Partnership Agreement (DEPA)".

Available at: <http://asiantradecentre.org/talkingtrade/unpacking-the-digital-economy-partnership-agreement-depa>

97. United States International Trade Commission (2012), "Policy Challenges of Cross-Border Cloud Computing".

Available at: <https://www.usitc.gov/publications/332/journals/policychallenges.pdf>



trade, if fully leveraged, across four emerging ASEAN economies – namely Indonesia, Malaysia, the Philippines and Vietnam – could amount to approximately USD300 billion in 2030.⁹⁸

- Cooperate on standards.** Our world is made up of standards which are sets of agreed-upon rules that tell us how to do something. Standards exist in every field, including healthcare, aerospace, construction, measurement, and technology. Standards are particularly crucial to not only ensure some minimum safeguards for safety and security, but also to ease the ability of consumers and businesses to transact. For instance, imagine if credit cards were different sizes and could not work in different ATMs, or if the letters on English keyboards were all different than the current “QWERTY” framework. Standards are particularly crucial for digital technologies to provide safeguards on emerging technologies and also to ease international cooperation, given that many digital services are applied across borders (where different rules could add significant costs to businesses, particularly MSMEs). Standards impact everything from security issues through to the provision of open data. For example, adopting international security standards not only assists governments in the design and development of their own security frameworks, but also provides comfort and reassurance to organizations. Countries should therefore cooperate with others to develop legal frameworks and standards (particularly on security frameworks for

the public cloud). Further, it decreases the barriers for domestic firms to export their operations abroad, as their security standards are likely to already comply with international markets, and vice-versa reduces the barriers to entry for foreign firms for the same reasons. Australia’s Information Security Registered Assessors Program (IRAP), Singapore’s Multi-Tier Cloud Security Standards (MTCS), and South Korea’s Cloud Security Assurance Program (CiSAP) have set up security frameworks for the public cloud that follow international best practice frameworks such as the ISO 27000 series.⁹⁹ It is key that these frameworks are fully interoperable. The frameworks created by agencies such as the National Institute of Standards and Technology (NIST) and the Federal Risk and Authorization Management Program (FedRamp) in the United States, and the European Union Agency for Cybersecurity (ENISA) can also serve as effective benchmarks for security standards. Cooperating on standard setting can also facilitate the provision of open data.¹⁰⁰ For example, the ASEAN Secretariat is currently developing an open data dictionary (with common standards across ASEAN Member States) to share information to the public of available government data. Even if international standards are adopted, however, it is important that countries engage in thorough reviews with heavy local and international stakeholder consultations, industry and standards bodies in particular, to solicit feedback and make sure standards are fit for the local context.

98. Hinrich Foundation (2018), *Digital Trade Research*. Available at: <https://hinrichfoundation.com/trade-research/digital-trade-research/>

99. BCG (2019), *Ascent to the cloud – How six key APAC economies can lift-off*.

Available at: http://image-src.bcg.com/Images/Ascent_to_the_Cloud_Report_21Oct_tcm9-231826.pdf

100. ASEAN Secretariat (2016), *Master Plan on ASEAN Connectivity 2025*. Available at: <https://asean.org/storage/2016/09/Master-Plan-on-ASEAN-Connectivity-20251.pdf>

2. DRIVE CHANGE THROUGH THE PUBLIC SECTOR

CREATE “TIPPING POINTS” THROUGH GOVERNMENT PROCUREMENT

This involves identifying ways in which governments can stimulate demand for emerging technologies and their application in different sectors. Tipping points are crucial for the adoption of new technologies. This is because many technologies provide economies of scale or network effects that only kick in once there are sufficient users. Governments can accelerate the uptake of technologies to reach tipping points faster by directly procuring technology through government tenders. For example, recognizing that AI can help to save the public sector an estimated GBP4 billion a year, the United Kingdom began amending public procurement regulation to maximize the opportunities for companies working in the field to bid for government projects.¹⁰¹ There are a number of pitfalls to avoid. First, any procurement process should be conducted as transparent as possible and be based on rigorous analysis to understand the cost-benefit of technologies. Second, contracts should be flexible and time constrained and technology if possible modular, open source and interoperable in nature. This is to avoid “lock in”



with particular providers or outdated, expensive technologies. Finally, not only the purpose of the technology but also capabilities of governments to leverage the technology should be considered and weighed against each other.

GO 100% DIGITAL ON GOVERNMENT SERVICES

Successfully digitizing the public service and leveraging public sector adoption of technologies can be a strong catalyst for more general adoption across the economy. As an example, Singapore has a target that nearly all government services in Singapore will be delivered digitally by 2023.¹⁰² Developing countries can also push towards going digital with government services. For example, Rwanda has implemented “Irembo”, a globally recognized e-government portal that puts over 100 government services at citizens’ fingertips.¹⁰³ Key elements include:

- Leverage cloud computing for efficiency gains across the government.** As discussed in chapter 2, adopting cloud computing technologies across government can lead to significant efficiency gains and cost savings for governments’ ICT budgets. For example, Saudi Arabia’s Ministry of Communications and Information Technology has put forward a “Cloud First Policy” which encourages government entities to consider cloud solutions first for every new IT investment – this is expected to provide around 30 percent cost savings of total cost of ownership.¹⁰⁴ But beyond the savings, cloud computing, in particular storage and cloud computing power, is an enabling or infrastructure technology (referred to as infrastructure as a service) that allows users to utilize it for different applications – in a similar vein to internet connectivity. Cloud services can become a critical component of a government’s digital transformation.¹⁰⁵ Box 4 discusses some innovative applications of cloud technology in government policy. However, adopting cloud computing across government can be a challenging process. Key challenges include overcoming cultural barriers in agencies, meeting new network infrastructure requirements (e.g. internet speeds and reliability, energy capacity), having appropriate expertise for acquisition processes and sufficient funding for implementation.¹⁰⁶ To support the required mindset shift to a digital-first approach, South Africa introduced performance rewards linked to the use of data in decision-making.¹⁰⁷

101. House of Lords (2018), “AI in the UK: ready, willing and able?”. Available at: <https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf>

102. Strait Times (2018), “Almost all government services in Singapore to go digital by 2023”.

Available at: <https://www.straitstimes.com/tech/almost-all-govt-services-to-go-digital-by-2023>

103. Rockefeller Foundation (2019), “To See How Digital Government Can Boost an Economy, Learn from Rwanda”.

Available at: <https://www.rockefellerfoundation.org/blog/see-digital-government-can-boost-economy-learn-rwanda/>

104. Ministry of Communications and Information Technology, Saudi Arabia

105. OECD (2017), Digital Economy Outlook 2017. Available at: <https://www.oecd.org/internet/oecd-digital-economy-outlook-2017-9789264276284-en.htm>

106. Congressional Research Service (2015), Overview and Issues for Implementation of the Federal Cloud Computing Initiative: Implications for Federal Information Technology Reform Management. Available at: <https://fas.org/sgp/crs/misc/R42887.pdf>

107. AlphaBeta and the Bill & Melinda Gates Foundation (2018), Digital Innovation in Public Financial Management (PFM): Opportunities and implications for low-income countries.

Available at: <https://www.alphabeta.com/wp-content/uploads/2018/07/pfm-technology-paper-summary-version.pdf>

BOX 4: COUNTRY EXAMPLES OF LEVERAGING CLOUD COMPUTING FOR PUBLIC POLICY

Cloud computing can enable or improve the efficiency of a range of digital services and products. Many governments, including some in the Digital Sprinters, are already taking advantage of the cloud in the public sector:

Cloud computing has been leveraged in the planning and running of cities, often referred to as Smart Cities.¹⁰⁸ Rio de Janeiro has begun to implement smart solutions to improve urban planning and operations such as using data applications and technology to help improve transport flows, improve city fleet management systems and allow fleet vehicles to communicate with headquarters for maintenance checks on schedule. Panama City has leveraged the cloud to address congestion by developing a centralized valet parking scheme where electronic tags stored in the cloud allow drivers to park and pick up cars from anywhere in the neighborhood.

Peru's government has used the cloud to increase citizen engagement by developing a cloud-native app that located the nearest polling station for voters. Some research has attributed a reduction of nearly 60 percent in voter absenteeism in 2016 compared to the 2011 presidential elections as a result of the new app.¹⁰⁹



Digitize payments to create incentives for adoption and plug leakages. Governments around the world are increasingly allowing for online and mobile payment methods for government services as well as distributing government payments including subsidies through digital means. There are several advantages to leveraging digital channels for these payments. First, doing so can drive top-down adoption of FinTech products in the population which can reduce the handling costs of carrying cash. Second, in many regions, in particular across Africa, digital financial services, such as mobile wallets, are often the first

type of accounts individuals hold, making it a direct channel for financial inclusion. It can often also be considered a gateway to more formal financial inclusion such as taking out bank accounts or utilizing more sophisticated financial products such as savings, loans and credit facilities. This is particularly true if digital payment technology is interoperable between third-party providers and banks (See Box 8 on the experience of India in rolling out Real-time Payment, RTP). Third, using digital payments allows for better tracking and more efficient collection of payments which can reduce financial leakages due to illicit activity

108. IDB (2018), *Cloud Computing: Opportunities and Challenges for Sustainable Economic Development in Latin America and the Caribbean*. Available at <https://publications.iadb.org/en/cloud-computing-opportunities-and-challenges-sustainable-economic-development-latin-america-and>
109. IDB (2018), *Cloud Computing: Opportunities and Challenges for Sustainable Economic Development in Latin America and the Caribbean*. Available at <https://publications.iadb.org/en/cloud-computing-opportunities-and-challenges-sustainable-economic-development-latin-america-and>

and corruption. For example, the use of digital channels to distribute subsidies has been estimated to have saved India's government INR1.7 trillion (~USD23.7 billion) from reduced leakages from 2014-19.¹¹⁰ Shifting payments for government service delivery to digital means can be a difficult undertaking and requires some significant upfront costs, meaning the long-term future-discounted savings and impacts need to be well understood. Further, obtaining buy-in from stakeholders can be difficult as the new ways of collecting payments can lead to redundancies of previous processes, including government bodies managing welfare payments. There are a number of pre-conditions

that are required to increase the likelihood of successful digitization of payments. For starters, a reliable digital connectivity infrastructure is needed so that payments can be made even for remote communities. There need to exist secure and efficient payment networks so that users will have enough trust and confidence to share their details online and so that are protected from fraud. Security and simple authentication have been a key driver of the success of India's Universal Payment Interface (UPI) which has been successfully leveraged for government payments.¹¹¹ Interoperability across different payment systems and providers is also crucial to ensure broad-based adoption.

BOX 5. COUNTRY EXAMPLES OF DIGITIZING PAYMENTS

Mobile money and other digital financial services have shown great success in driving financial inclusion, in particular across Africa. For example, several African countries including Tanzania, Uganda have established channels for tax payments via mobile-money and online payment services. In South Korea, the tax authority provides a mobile app to taxpayers which provides information on filing and payment schedules, as well as allowing for calculation of deductions. For MSMEs / entrepreneurs, smartphones allow using and filing of pre-filled tax returns and digital invoicing.

When Sierra Leone faced severe pressure to pay healthcare workers on time during the Ebola crisis in 2014, the government decided to test digital payment through mobile wallets of salaries to healthcare workers. The government reported savings of USD10.7 million in avoided payroll leakages in the 13 months from Dec 2014 to Jan 2016 and cut payment times by over 80 percent from, more than a month to less than a week.

Digitization of G2P payments can also help address the problems of fake "ghost" recipients, since it creates a digital record of the money issued and received, imposing stricter standards of identifications and proof of entitlement at all stages.¹¹² In India, switching the payment of social security pensions from manual cash pay-out to smart cards resulted in a reduction of ghost recipients of 11 percent.¹¹³



110. Aman Sharma (2020), "PDS biggest saver for government in DBT in 2019-20", *The Economic Times*.

Available at: <https://economictimes.indiatimes.com/news/economy/policy/pds-biggest-saver-for-government-in-dbt-in-2019-20/articleshow/73569155.cms?from=mdr>

111. Google (2019), *Real Time Payments Systems & Third Party Access – A perspective from Google Payments and sources within*.

Available at: https://static.googleusercontent.com/media/pay.google.com/en//about/business/static/data/GPay_RTP_2019.pdf

112. Klapper L (2014). "The Opportunities for Digitizing Payments; How Digitization of payments, transfers, and remittances contributes to the G20 Goals of broad-based economic growth, financial inclusion, and women's economic empowerment." World Bank, Better Than Cash Alliance, Gates Foundation, G20, Global Partnership for Financial Inclusion.

113. Cangiano P, Muralidharan K, Niehaus P, Sukhtankar S (2014). "Payments Infrastructure and the Performance of Public Programs: Evidence from Biometric Smartcards in India".

NBER working paper 19999. Available at: <http://www.nber.org/papers/w19999.pdf>

- **Establish electronic procurement (e-procurement) to address corruption and inefficiencies.** Public procurement is central to government service delivery and involves large quantities of money, however; in many emerging corruption and inefficiencies can lead to significant losses. For example, evidence that senior public officials in Tanzania had been siphoning USD 180 million (almost 3 percent of total government revenues) worth of public funds led international aid donors to withhold critical payments in 2015 and 2016.¹¹⁴ Meanwhile, irregularities in Nigeria's procurement processes reportedly account for over 70 percent of the government's budget.¹¹⁵ In South Africa, 60 percent of all tenders were found to be subject to untoward influence.¹¹⁶ An e-procurement system can effectively help address these issues. It is essentially an integrated, centralized and internet-enabled information system that automates and integrates all parts of the procurement process in order to improve efficiency, transparency and accountability.¹¹⁷ E-procurement has been found to increase competition and quality of purchases; enhance

oversight and accountability; as well as creating operational efficiencies and cost savings. However, there can be significant challenges when trying to implement such systems across governments. Adoption of the new system across government agencies might be rigid due to a lack of willingness to change existing processes, lack of relevant skills or – in the worst case – resistance from stakeholders who have benefited from lack of transparency (e.g. corrupt government officials). Limited digital connectivity amongst companies can also limit potential users, creating distortive effects on competition amongst government suppliers. Some of these challenges may be addressed by putting in place some basic requirements for success. These would include political support from the highest levels to overcome bureaucratic resistance, focus on building staff skills and mindset shift and user-friendly design with strong focus on communicating changes to users (both suppliers and government staff). Adopting a phased approach, piloting the e-procurement systems in specific ministries, can also be a good way to identify challenges early and address these in the broader roll-out.¹¹⁸

BOX 6: E-PROCUREMENT BENEFITS IN BRAZIL

Brazil's e-procurement system, Comprasnet, was introduced in 2000. Before the implementation of the system, tenders (from publication of tender to final adjudication) took more than four months on average. This was reduced to 20 days after the introduction of online auctions and facilitated the participation of a wider number of MSMEs. Furthermore, the federal government saved 4 percent on its purchase of goods and service in the first year of implementation, where just 20 percent of total purchases went through Comprasnet.¹¹⁹



SOURCE: <https://www.consultre.com.br/lead/ao-vivo/pratico-de-pregao-eletronico-comprasnet-online/>

114. GAN Integrity (2017). "Tanzania Country Report." Available at: <http://www.business-anti-corruption.com/country-profiles/tanzania>

115. News Agency of Nigeria (2017), "Corruption in procurement makes up 70% of budget, says ex-Minister"

Available at: <http://www.nan.ng/news/corruption-procurement-makes-70-budget-says-ex-minister/>

116. Business Tech (2016), "60% of tenders are corrupt in some way: Deputy Public Protector"

Available at: <https://businesstech.co.za/news/general/116470/60-of-tenders-are-corrupt-in-some-way-deputy-public-protector/>

117. Vaidya K. (2007). *Electronic Procurement in the Australian Public Sector: The Organisational Assimilation Process and Its Impact on Public Procurement Performance*. University of New England.

118. AlphaBeta and the Bill & Melinda Gates Foundation (2018), *Digital Innovation in Public Financial Management (PFM): Opportunities and implications for low-income countries*. Available at: <https://www.alphabeta.com/wp-content/uploads/2018/07/pfm-technology-paper-summary-version.pdf>

119. OECD (2003). *Transparency in Government Procurement: The Benefits of Efficient Governance and Orientations for Achieving It*. Working Party of the Trade Committee. Available at: https://www.researchgate.net/publication/281450537_Transparency_in_Government_Procurement_The_Benefits_of_Efficient_Governance_and_Orientations_for_Achieving_IT

- Leverage cloud computing and big data analytics to improve tax compliance.** Tax fraud and evasion – not declaring and/or not fully paying tax liabilities – costs governments billions in lost revenue each year.¹²⁰ For example, Nigeria suffers from significant tax evasion – in 2016, only 17.5 percent of the adult labor force are registered taxpayers, just 12 percent of registered businesses pay VAT, and the government's overall tax revenue as a percentage of GDP hovers around 6 percent (compared to the OECD average of over 34 percent).¹²¹ Many developed countries have begun to use sophisticated data recording and analytics to detect and prevent tax

crimes. For example, the Tax Authority of Mexico (SAT) optimized the processing of electronic invoices using cloud computing. In 2012, SAT processed 25 million invoices a month. After moving to the cloud in March 2015, SAT managed to process 35 million invoices in one day.¹²² Such analytics can result in the recovery of billions of dollars in tax revenue and can be important for boosting equality by targeting large income earners who may not be meeting their tax commitments.¹²³ However, many low- and lower-middle income countries have not yet made use of such monitoring technologies, partly because of cost and technical constraints and also because their economies are

BOX 7: COUNTRY EXAMPLES OF USING BIG DATA TO TACKLE TAX EVASION

Previous research by AlphaBeta has identified several countries among the Digital Sprinters that are already utilizing big data analytics to tackle tax compliance issues for different types of taxes.

- Corporate tax.** Brazil has emerged as a leader in the use of big data for corporate tax audits. Its digital bookkeeping system, SPED, analyzes large business-to-business transactions for inconsistencies and flags potential shell company networks. Since moving to the new system in 2010, Brazilian tax authorities have used data analytics to generate a 50 percent increase of close to BRL3 million (~USD674,000) per average value of individual audits undertaken (or size of suspected tax fraud), resulting in a 12.5 percent increase in federal tax collections.¹²⁴
- VAT and other taxes.** Russia's tax authorities use big data technologies to increase their Value Added Tax (VAT) revenue, which in recent years has been falling short of expectations (over 12 percent gap between expected and actual tax collection in 2015). Data analytics match digital VAT files with incoming transaction data to spot payment irregularities. Fraudulent returns are then isolated, connected organizations identified, and targeted audits undertaken.¹²⁵ As part of its big data approach, Mexico introduced mandatory e-invoicing for all businesses in 2015 to combat false invoicing and unrecorded transactions in the informal sector. Mexican businesses are required to issue electronic invoices to customers and retain digital records. These sales invoices are then provided to the tax authority where various data techniques are applied to uncover irregularities in the invoices. The Monterrey Technology Institute estimates that the obligation for e-invoicing not only led to growth in income tax collected (six percent for businesses and 21 percent for individuals), but also brought 4.2 million MSMEs previously undetected by the tax authority into the formal economy.¹²⁶

120. World Economic Forum (2017), "Which countries are worst affected by tax avoidance?"

Available at: <https://www.weforum.org/agenda/2017/04/which-countries-are-worst-affected-by-tax-avoidance/>

121. Nigeria is estimated to have only 14 million registered taxpayers, out of a labour force of close to 77 million (going by national statistics). See Business Day Online (2017), "Nigeria targets 17m tax base with proposed new advocates" Available at: <https://www.businessdayonline.com/nigeria-targets-17m-tax-base-proposed-new-advocates/>

For VAT compliance statistics, see PwC (2016), "Guess how many Nigerians pay tax and how our government spends the money"

Available at: <https://www.pwc.com/ng/en/assets/pdf/tax-watch-june-2016.pdf>

Recently, Finance Minister Kemi Adeosun was quoted as saying Nigeria's tax to GDP ratio is at 6 percent – among the lowest in the world. See This Day (2017), "Adeosun: Nigeria's tax to GDP ratio among lowest in the world" Available at: <https://www.thisdaylive.com/index.php/2017/04/23/adeosun-nigerias-tax-to-gdp-ratio-among-lowest-in-the-world/>

122. IDB (2018), *Cloud Computing: Opportunities and Challenges for Sustainable Economic Development in Latin America and the Caribbean*.

Available at: <https://publications.iadb.org/en/cloud-computing-opportunities-and-challenges-sustainable-economic-development-latin-america-and>

123. OECD (2017), "Technology offers critical solutions to prevent, identify and tackle tax evasion and tax fraud, says OECD"

Available at: <http://www.oecd.org/tax/technology-offers-critical-solutions-to-prevent-identify-and-tackle-tax-evasion-and-tax-fraud-says-oecd.htm>

124. Ernst and Young (2016). *Tax administration is going digital: Understanding the challenges and opportunities*.

Available at: [http://www.ey.com/Publication/vwLUAssets/EY-tax-administration-is-going-digital/\\$FILE/EY-tax-administration-is-going-digital.pdf](http://www.ey.com/Publication/vwLUAssets/EY-tax-administration-is-going-digital/$FILE/EY-tax-administration-is-going-digital.pdf)

125. OECD (2016). *Technologies for better tax administration: A practical guide for revenue bodies*.

Available at: <http://www.oecd.org/publications/technologies-for-better-tax-administration-9789264256439-en.htm>

126. OECD (2017). *Technology tools to tackle tax evasion and tax fraud*. Available at: <https://www.oecd.org/tax/crime/technology-tools-to-tackle-tax-evasion-and-tax-fraud.pdf>

still primarily cash-based.¹²⁷ The drastic decreases in the cost and availability of cloud computing power over the recent decade have made such methods more affordable. Powered by cloud computing, big data analytics can be used to detect tax fraud and evasion more effectively than traditional methods of transaction monitoring, anti-money laundering (AML) or due diligence (DD).¹²⁸ Computer algorithms can reveal patterns and trends, and gather meaningful insights about the complex relationships between people, businesses and tracked transactions.¹²⁹ Some of the challenges that policymakers will likely have to contend with include a lack of data driven culture amongst their ministries of finance, a lack of the required specific talent (e.g. data scientist, financial crime forensics, AML lawyers) and unsurprisingly resistance from stakeholders, in particular tax avoiders.¹³⁰

CROWD SOURCE POLICY INNOVATION

Governments can crowd source innovation on public policy issues through sharing of data and supporting collaborative platforms. Key elements of this could include:

- **Create one stop-shops for open data.** Open data—machine-readable information, government and private sector data, that is made available to others—has generated a great deal of excitement around the world for its potential to empower citizens, change how government works, improve the delivery of public services and drive innovation through Research and Development (R&D) in the private and academic sectors. One of the key complexities of using existing open data is that it can be housed in multiple locations. Having a single portal to access information can play a crucial role in disseminating data. Singapore, for example, operates an Open Data Resources portal that provides access to an array of government data from over 70 public agencies, direct developer support and special sub-portals for data from tax authorities, land transport, monetary authority and geo-spatial data, to name a few.¹³¹ Colombia also operates an open data resources portal (“Datos Abiertos Colombia”) that provides access to an array of government data from over 1,200 public agencies, developer support and special

sub-portals for niche data from government entities.¹³² Some of the challenges to expect are that governments often find it difficult to distinguish between high and low value data. This value proposition can be further diminished if sharing platforms are not user friendly or data is not machine readable or indexed.

- **Establish platforms to interact and crowd-source innovation.** Innovations to improve government services can come from anyone and anywhere; governments should engage and empower citizens to participate in this process. One such example is Bangladesh’s “Innovation for All (a2i)” fund. The fund provides financing for low-cost, user-centric, home-grown innovations to leverage digital innovation to solve policy problems. To date, over 30,000 government agencies, academic institutions, individuals, and private companies have been awarded USD3.7 million worth of grants to design and implement their solutions.¹³³ Projects have included initiatives to improve livestock information in real-time, a mobile app to promote good agricultural practices, and digitizing government services (e.g. driving license). Tam Development, a Forbes-recognized Saudi Arab-based startup, has also proven that crowd-sourced innovation could work after successfully co-creating 50 local and regional ground-up programs with 20 government entities in the Saudi Arabia and the Arab region.¹³⁴ In Russia, Moscow city’s crowd sourcing platform “Active Citizen” uses blockchain technology to collect feedback from citizens and run online votes on questions related to urban planning in order to build trust amongst citizens and combat voter fraud.¹³⁵ Unfortunately, poor design of events, platforms or incentives can lead to low quality proposals or a lack of key questions posed to guide analysis and discussion, and a poor mix of participants. Sometimes, governments can also be overwhelmed by the amounts of contribution, leaving them with limited resources to follow up on ideas and hence limited translation into implementation. To address these challenges, a key set of governmental and societal challenges should be the focus to help frame the objective of the open data effort. Any efforts need to ensure mechanisms and reporting procedures to maximize the likelihood of implementation of emerging ideas.

127. Oxford University Centre for Business Taxation (2009), *Tax evasion, tax avoidance and tax expenditures in developing countries: A review of the literature*. Available at: https://www.sbs.ox.ac.uk/sites/default/files/Business_Taxation/Docs/Publications/Reports/TaxEvasionReportDFIDFINAL1906.pdf

128. OECD (2016). *Technologies for better tax administration: A practical guide for revenue bodies*.

Available at: <http://www.oecd.org/publications/technologies-for-better-tax-administration-9789264256439-en.htm>

129. SAS (2017). “Big Data: What it is and why it matters” Available at: https://www.sas.com/en_sg/insights/big-data/what-is-big-data.html

130. Congressional Research Service (2015), *Overview and Issues for Implementation of the Federal Cloud Computing Initiative: Implications for Federal Information Technology Reform Management*. Available at: <https://fas.org/sgp/crs/misc/R42887.pdf>

131. See Smart Nation Singapore – Resources – Open Data Resources. Available at: <https://www.smartnation.sg/resources/open-data-resources>

132. See Datos Abiertos Colombia. Available at: <https://www.datos.gov.co/en/>

133. “Innovation Lab is changing the scenario,” A2i, accessed April 1, 2019, <https://a2i.gov.bd/innovation-lab/>

134. TAM, Available at: <https://tamhub.com/>

135. Bloomberg (2017), “Can the Blockchain Tame Moscow’s Wild Politics?”

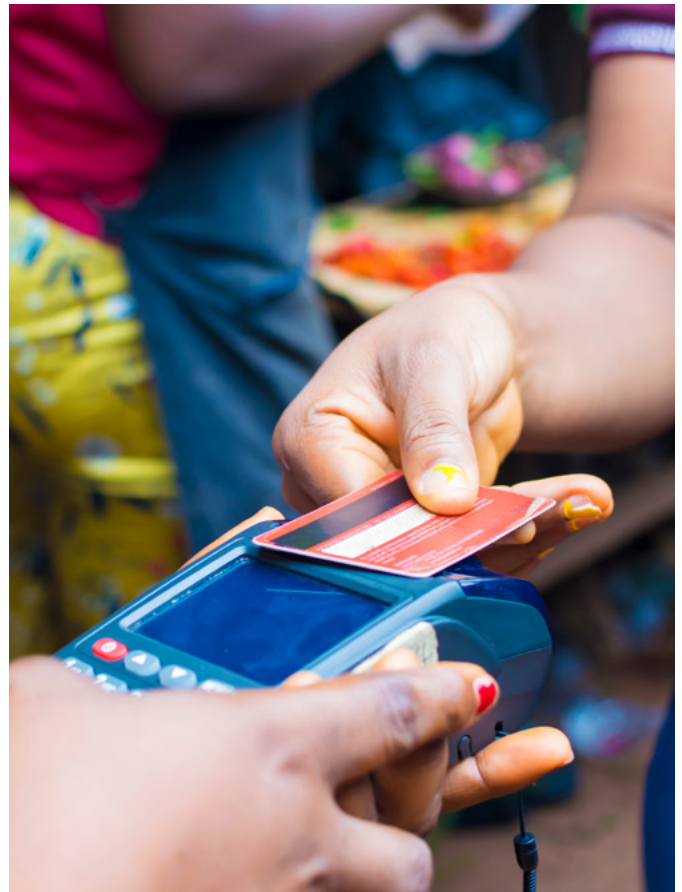
Available at: <https://www.bloomberg.com/news/articles/2017-12-22/moscow-s-active-citizen-app-goes-on-the-blockchain>

3. EQUIP THE PRIVATE SECTOR WITH THE DIGITAL ESSENTIALS

CRAFT REGULATIONS FOR THE DIGITAL, NOT ANALOG ERA

Government officials should not assume that laws and regulations tailored for an analog past will remain fit for purpose in the digital era.¹³⁶ This involves going beyond adjusting regulations for a digital economy in an ad-hoc manner to actively experimenting with new regulatory approaches (e.g. regulatory sandboxes) that enable firms to explore new digital products and services. Key elements of this include:

- Overhaul regulation to be technology neutral.** Technological progress in many fields is too fast for any form of regulatory process to keep up, even in the least rigid of political systems. Regulation should therefore be framed in a technology agnostic manner, focusing rather on the uses and objectives of such technologies, sometimes referred to as “outcome-based” regulation.¹³⁷ For example, several African countries have moved away from mobile money-specific regulations towards a National Payment Systems Acts. In Nigeria, for example, this could mean integrating e-Money and Payment Services regulation with the Payment System Management Bill of 2017.¹³⁸ Such moves would allow service providers, regardless of technology (i.e. mobile money, e-wallets etc.) to be regulated based on the financial services they provide. A critical element for success is deep and frequent engagement with private sector players and users in developing and refining regulations.¹³⁹
- Build sandboxes, not castles.** Regulatory sandboxes refer to a regulatory approach that allows companies to conduct time-bound testing of innovative products in the real world. These products tend to be on the edges or outside of the country’s existing regulatory framework (e.g. alternative credit scoring, blockchain-based remittances, and biometric identification). Regulatory sandboxes are useful policy tools to understand the policy implications of introducing certain products while continuing to promote technological innovation.¹⁴⁰ They can help regulators better understand new technologies



and work collaboratively with the private sector to develop appropriate rules and regulations for emerging technologies and business models. From a private sector perspective, sandboxes reduce the costs of production and time-to-market. While most regulatory sandboxes have been focused in the financial sector, for example in the UAE, there have been several innovative uses of these sandboxes in other areas, including with autonomous vehicles in Singapore and with drone regulation in Malawi.¹⁴¹ Such adaptive regulation does require a significant culture shift in government, and policymakers must become comfortable with the occasional mistake.¹⁴² When structuring the sandboxes, early engagement with the tech sector, research and academic institutions, civil society and consumer protection agency and the broader private sector is important. Further, in order to overcome the barriers to bringing lessons from pilot sandboxes into broad-based regulation, strong review processes are crucial.

136. Pathways for Prosperity Commission (2019), *Digital roadmap: How developing countries can get ahead*.

Available at: https://pathwayscommission.bsg.ox.ac.uk/sites/default/files/2019-11/the_digital_roadmap.pdf

137. Deloitte (2018), “The future of regulation – Principles for regulating emerging technologies”, *Deloitte Insights*.

Available at: <https://www2.deloitte.com/us/en/insights/industry/public-sector/future-of-regulation/regulating-emerging-technology.html>

138. USAID (2018), *The Digital Financial Services Landscape in Nigeria: Enabling Market Conditions for Pay-As-You-Go Solar*.

Available at: https://www.usaid.gov/sites/default/files/documents/11860/Enabling_Market_Conditions_for_Pay-As-You-Go_Solar_Executive_Summary.pdf

139. Deloitte (2018), “The future of regulation – Principles for regulating emerging technologies”, *Deloitte Insights*.

Available at: <https://www2.deloitte.com/us/en/insights/industry/public-sector/future-of-regulation/regulating-emerging-technology.html>

140. Financial Conduct Authority, “Regulatory Sandboxes.” Available at: <https://www.fca.org.uk/firms/innovation/regulatory-sandbox>

141. GovInsider (2019), “We can be “bolder” on tech regulation, says Singapore’s Puthucheary.”

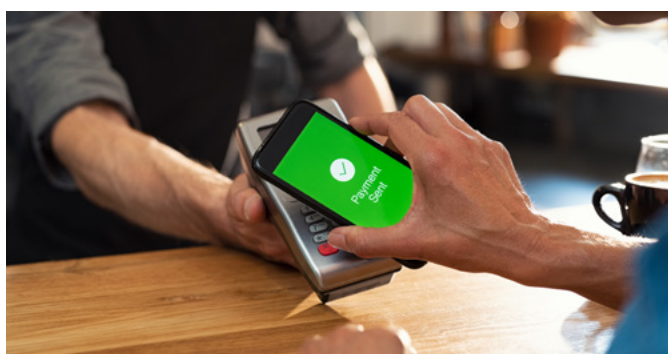
Available at: <https://govinsider.asia/connected-gov/we-can-be-bolder-on-tech-regulation-says-singapores-puthucheary/>

142. Pathways for Prosperity Commission (2019), *Digital roadmap: How developing countries can get ahead*.

Available at: https://pathwayscommission.bsg.ox.ac.uk/sites/default/files/2019-11/the_digital_roadmap.pdf

BUILD FUTURE-PROOF DIGITAL INFRASTRUCTURE WITH INTEROPERABILITY AND UPGRADING IN MIND

Going beyond universal broadband access to support investment in critical infrastructure (including 5G networks) requires new approaches, with a strong focus on developing mechanisms to create shared and interoperable infrastructure. In the fast-evolving technology landscape, challenges arise when digital infrastructure is created with a specific technology in mind, but then becomes obsolete when this technology inevitably becomes outdated. Similarly, if infrastructure is built with particular providers in mind, it can lead to interoperability issues that can drive fragmentation, transaction costs and give rise to competition issues. For example, a severe challenge to Nigeria's fast growing mobile-money industry is a fragmented agent network, suffering from limited interoperability. Modular and open source approaches to digital infrastructure and early integration of third parties can address these challenges. For example, the Central Bank of Nigeria is amending the country's Agent Banking Guidelines to allow the TELCOS and any other interested entities to build and manage a Shared Agent Network (SAN) for the provision of mobile money services.¹⁴³ Such shared infrastructure can also improve efficiency by avoiding doubling up on infrastructure. India has also had great success with the development of its Unified Payments Interface (UPI) that facilitates inter-bank transactions. The payment gateway allows customers of different banks to transfer funds between each other in a seamless fashion. Third party payment providers such as Google Pay, PhonePe and Paytm can also leverage the gateway in particular by helping customers of banks transact that currently do not have their own payment platforms. Despite the benefits, implementing such approaches can be challenging and can require higher upfront costs and significant political will (given the vested interests involved). Early engagement with all stakeholders, users and technology



providers and focusing on systems that provide maximum flexibility is essential. Subsidizing early adoption, until sufficient scale is reached for network effects to kick in, can also be crucial to drive growth (e.g. India's central bank mandated that digital payments on UPI would be free of charge for the first few years).

EQUIP MSMEs WITH THE DIGITAL TOOLS TO SUPPORT THEIR GROWTH.

Micro-, Small- and Medium Enterprises (MSMEs) account for the majority of businesses worldwide and are important contributors to job creation and economic growth. Globally, they represent about 90 percent of businesses and more than 50 percent of employment.¹⁴⁴ In emerging economies, formal SMEs contribute up to 40 percent of GDP.¹⁴⁵ MSMEs can also be some of the biggest beneficiaries of the digital economy. For example, past research has shown that the digital economy offers an opportunity to overcome traditional small-business hurdles to export, lowering export costs of an average MSME by as much as 82 percent and reducing time involved in exporting for MSMEs by up to 29 percent.¹⁴⁶ Helping MSMEs capture that potential requires a focused approach to build their capabilities and shift their behavior. Key elements of this approach include:

- **Develop digital transformation (innovation) centers and model (learning) factories.** These refer to physical places where entrepreneurs, business owners, researchers and innovators can come to try their hands at new technologies and digital applications. Often such places also provide training and skills development. For example, Turkey has rolled out digital transformation centers where MSMEs can receive experimental training and consultancy services in real production environments.¹⁴⁷ Since 2019, the government of Colombia in alliance with the local chambers of commerce have also implemented 18 Digital Transformation Centers across the country to support and engage MSMEs' digital transformation and MinTIC have planned to invest COP 8 billion (approximately USD 2.43 million) to finance up to 24 Centers for Business Digital Transformation (Centros de Transformación Digital Empresarial, CTDE) by end of 2020.¹⁴⁸ Successfully implementing such initiatives requires strong industry engagement to ensure they see the benefits of the collaboration, adopting a rigorous approach to identifying the key technologies and sectors to focus (not neglecting traditional sectors

143. Central Bank of Nigeria (2019), "Financial Service Providers". Available at: <https://www.cbn.gov.ng/FinInc/finservproviders.asp>

144. World Bank, "Improving SMEs' access to finance and finding innovative solutions to unlock sources of capital". Available at: <https://www.worldbank.org/en/topic/sme/finance>

145. World Bank, "Improving SMEs' access to finance and finding innovative solutions to unlock sources of capital". Available at: <https://www.worldbank.org/en/topic/sme/finance>

146. Asia Pacific MSME Trade Coalition [AMTC] (2018), *Micro-Revolution: The new stakeholders of trade in APAC*. Available at: <https://www.alphabeta.com/our-research/micro-revolution-the-new-stakeholders-of-trade-in-apac/>

147. Gunes and Sahin (2018), "Turkey to establish digital transformation centers", Anadolu Agency. Available at: <https://www.aa.com.tr/en/economy/turkey-to-establish-digital-transformation-centers/1258349>

148. OECD (2019), *OECD Reviews of Digital Transformation: Going Digital in Colombia*. Available at: <https://www.oecd-ilibrary.org/docserver/781185b1-en.pdf?expires=1597820132&id=id&accname=guest&checksum=87E4DAFC2F097215015BC179F68F6985>

such as textile manufacturing), and ensuring there are clear frameworks governing the use of the intellectual property generated. Other examples of such initiatives include Chile's Digital Extension Centers and Germany's Mittelstand 4.0 Competence Centers.¹⁴⁹ Russia's Agency for Strategic Initiatives (ASI) has also established a number of collaborative work centers referred to as "Boiling Points".¹⁵⁰

- **Implement targeted trainings, socialization and behavioral levers for technology adoption.**

Despite best intentions, conventional supply-side policy interventions, like grants and tax incentives, might not convince businesses and individuals to adopt emerging digital technologies. Targeted training initiatives can be effective at exposing MSMEs to new sector-relevant digital technologies, as well as developing their skills, and driving adoption. Trainings can be developed in partnership with solution providers. For example, "Gapura Digital", a company supported by Google, aims to train about 1.47 million MSME workers in Indonesia by 2020 on how digital platforms such as digital marketing channels could be leveraged to scale up their businesses.¹⁵¹ Google's Digital Skills Africa is another example of how digital skills training,

specifically designed with entrepreneurs, MSMEs and youth in mind, can be very effective. The program was initially rolled out across Nigeria, Kenya and South Africa in 2016 but has been expanded to 29 countries across Africa. According to Google, which has committed to training 20,000 additional women in digital skills across Africa in 2020, over 60 percent of Digital Skills for Africa trainees have confirmed recording business growth, starting new businesses, finding jobs or growing in their current jobs.¹⁵² Sweden's Digilyft Kickstart program is an example of how such initiatives can be effectively driven by governments in close cooperation with industry bodies.¹⁵³ Often, training programs alone are not sufficient and additional focus on technological socialization and social proofing is required to change MSME behavior and create impact (Box 8). Successfully implementing such training and behavioral influence programs requires a strong understanding of key barriers that MSMEs face with technology adoption and understanding how to incorporate behavioral "nudges" and other actions to address them. Further, MSMEs are likely to struggle with finding the time for their managers and employees to attend these trainings. This means that the flexibility of delivery mechanisms is crucial (e.g. on-site training, online learning).

BOX 8: IMPROVING ADOPTION OF PRECISION AGRICULTURE

Despite significant funding to support R&D, provision of business cases and digital infrastructure, the adoption rate for precision farming has remained low in the Netherlands. However, after a thorough review, the government revisited its policy focus and launched the National Experimental Ground for Precision Farming (NPPL) in 2018.¹⁵⁴ The aim of this program was to support the ground-up adoption of precision farming technologies by farmers. Six farms were selected to be part of the first batch of participants. These farms were offered technical support from leading universities and farming journals to implement precision farming techniques that improve the management of farming inputs. In exchange, farmers had to share their experience – be it good or bad – to the public via the NPPL's portal.¹⁵⁵

The NPPL has been successful from an environmental and adoption standpoint. All farms have reported a decrease in the use of agricultural inputs required for farming - the volume of chemical agents used by farms decreased by an average of 23 percent. From a technological adoption standpoint, the candid sharing of the success and failures of precision farming has spurred other farmers to enroll in the program. In 2019, the program was expanded to include three new agricultural sectors and ten new farms.¹⁵⁶

149. OECD's and World Bank's The Innovation Policy Platform.

Accessible here: <https://www.innovationpolicyplatform.org/www.innovationpolicyplatform.org/digital-innovation-seizing-policy-opportunities/index.html>

150. ASI (2019). Agency for Strategic Initiatives Supervisory Board meeting. Available at: <http://en.kremlin.ru/events/president/news/59675>

151. Google (2020), "Gapura Digital". Available at: <https://gapuradigital.withgoogle.com/stories>

152. Malinga (2020), "Google to train 20 000 women across Africa this year", ITweb. Available at: <https://www.itweb.co.za/content/01jr5Mx9mYKqKdWVl>

153. Readie and Nesta (2018), *Delivering Digital Skills – A guide to preparing the workforce for an inclusive digital economy*.

Available at: https://media.nesta.org.uk/documents/Readie_Digital_Skills_booklet_online.pdf

154. GIM International (2018), "Precision agriculture for people planet and profit."

Available at: <https://www.gim-international.com/content/article/precision-agriculture-for-people-planet-and-profit>

155. See www.proeftuinprecisielandbouw.nl

156. Future Farming (2019), "Successful first year for NPPL precision ag project."

Available at: <https://www.futurefarming.com/Smart-farmers/Articles/2019/11/Succesful-first-year-for-NPPL-precision-ag-project-386858E/>.

USE CO-CREATION, THE SHARING ECONOMY AND NEW DIGITAL INCENTIVES TO STIMULATE INNOVATION

This involves providing ecosystem support to encourage innovation, through co-creation with the private sector, stimulating the sharing economy, and providing new digital era incentives:

- Co-create new products and services with the private sector.** Governments and the private sector could work together to leverage their respective expertise to co-create mutually beneficial products. One example is Masterchain, an Ethereum-based blockchain digital payments system developed by the Russian Central Bank and supported by several of Russia's largest local banks.¹⁵⁷ Once implemented, Masterchain will be able to reduce the operating costs for participating banks while enhancing the security of the country's banking sector through a distributed registry. In December 2019, it became the first Russian blockchain platform certified ready for commercial operation and compliant with all the requirements of information security.¹⁵⁸ While such ventures can be highly mutually beneficial, they can also be difficult to implement. For starters, in many emerging economies, governments lack a culture that encourages cooperation with the private sector. Further, private sector players often lack trust in the governments and regulatory uncertainty can be a significant barrier for cooperation. Conflicts of interest also exist if public agencies become invested in technologies or services they are meant to be regulating. In order to mitigate these challenges, clear guidelines on cooperation and avoidance of non-competitive lock in of supply of products and or services are required.
- Encourage a sharing economy for non-services sectors.** Sharing of fixed assets (e.g. equipment, warehouses), which reduces fixed costs by transforming them into ongoing variable costs, is enabled by digital technologies such as the Internet of Things. However, much of the innovation to date has been in service sectors (e.g. car sharing, home sharing), with limited traction in traditional sectors such as manufacturing and agriculture. For example, Moscow has one of the largest car sharing fleets in the world.¹⁵⁹ The upside potential in
- other sectors, though, is significant. An example is Hello Tractor, which works with smallholder farmers in Africa by aggregating smallholder farmers' requests for tractor service on behalf of tractor owners, while providing enhanced security through remote asset tracking and virtual monitoring.¹⁶⁰ In other parts of the world, national and local governments have even launched their own equitable sharing services, such as Toronto's Tool Libraries, which provide free access to power tools and 3-D printers for low-income households; or shared community facilities, such as Vancouver's Incubator Kitchen, which provides low-cost access to commercial kitchen space for community organizations.¹⁶¹ One key challenge is that in the sharing economy, the responsibilities of each party involved in transactions are not usually well defined.¹⁶² Governments can enable such sharing models through providing clear regulation supporting these activities (balancing the concerns of incumbents that may seek to block such models) and understanding how public infrastructure could be used to support such programs (such as the use of community facilities).
- Develop innovative incentives tailored for the digital era.** Traditionally, policy makers have provided incentives such as research grants, patents and tax credits to encourage and promote R&D for technological innovation. However, as R&D becomes digital, these government policies require adaptation to remain effective. For example, digitalization allows for more external collaboration and outsourcing of R&D. Traditional incentives, such as tax incentives, however, are often restricted to in-house R&D and require ex-ante approval, i.e. firm research proposals.¹⁶³ Governments can consider new instruments such as centralized data pools or targeted support for open source software. In order for these alternative instruments to traditional incentives to be successful policymakers need to thoroughly understand incentive structures in an industry, i.e. which instruments will actually encourage open-source approaches and collaboration, and the externalities that arise from R&D or technology adoption in the industry, i.e. are there any negative externalities in addition to positive spillover effects to consider? Before instruments are launched at large scale, they also first need to be piloted and evaluated based on strong engagement with the private sector.

157. <http://documents.worldbank.org/curated/en/860291539115402187/pdf/Competing-in-the-Digital-Age-Policy-Implications-for-the-Russian-Federation-Russia-Digital-Economy-Report.pdf>

158. PLUS Journal (2019), "Masterchain certification kicks-off commercial operation of blockchain in Russia," Available at: <http://www.plusworld.org/daily/masterchain-certification-kicks-off-commercial-operation-of-blockchain-in-russia/>

159. MOS.ru (2016), "Moscow car sharing fleet to reach 1,000 cars". Available at: <https://www.mos.ru/en/news/item/115173073/>

160. <https://www.hellotractor.com/about-us/>

161. One Earth (2015), *Local Governments and the Sharing Economy*. Available at: http://www.oneearthweb.org/uploads/2/1/1/3/2/1333498/localgovsharingecon_report_full_oct2015.pdf

162. Caixa Bank Research (2018), *The challenges of regulation of the sharing economy*. Available at: <https://www.caixabankresearch.com/en/challenges-regulation-sharing-economy>

163. El-Dardiry et al. (2019), "Three guiding principles for R&D policies in the digital era", VOX CEPR Policy Portal. Available at: <https://voxeu.org/article/three-guiding-principles-rd-policies-digital-era>



4. PUT CITIZENS AT THE CENTER OF THE DIGITAL ECONOMY

SUPPORT THOSE WHO COULD BE LEFT BEHIND BY THE DIGITAL TRANSFORMATION

Policy approaches need to ensure the benefits of the digital economy are available to all. Key elements of an inclusive approach include:

- Repurpose existing public infrastructure to provide digital access.** Public infrastructure can be repurposed to provide access to the internet for underserved communities. This requires a network of public infrastructure (e.g. public buildings, transport, utilities or ICT infrastructure) that can be leveraged for people to access the internet. Biblionet is a national program in Romania which provides hardware, software and IT support for 2280 public libraries.¹⁶⁴ Romania suffered from a significant “broadband divide” between urban and rural areas, however, its library network had been well established with strong geographical coverage. In partnership with the Bill & Melinda Gates Foundation, ANBPR, the Ministry of Culture, local and national governments, and public libraries across the country, Biblionet helped establish training centers within each of Romania’s 41 county library systems. The program was hugely successful and equipped over 80 percent of Romania’s libraries with tech tools
- and internet connectivity, reaching over 600,000 first-time Internet users. Policymakers can consider the replicability of these successes with other well-established infrastructure, such as post offices, schools or religious institutions. A key requirement for success is that the existing public infrastructure is carefully chosen so it is readily accessible, in particular by underserved communities. Further, strong outreach is required to encourage adoption by the public.
- Leverage digital services for access to economic necessities.** Providing a tangible service (such as access to energy) that requires customers to sign up for and start using a digital platform (for example e-money, i.e. mobile money and prepaid cards) can demonstrably drive digital inclusion. Nigeria’s pay-as-you-go solar scheme provides one such example (Box 9). Another example is from the Ivory Coast where in 2011 the Ministry of National and Technical Education (MENET) began collaborating with mobile money and digital payment providers to digitalize annual school registration fee payments.¹⁶⁵ Challenges can arise if the underlying platform or ICT infrastructure is not stable and prone to outages. Since citizens depend on the platform for access to basic goods such as energy or water, disruptions can have drastic consequences.

164. European Union (2018) “Biblionet”, Shaping Europe’s digital future – Projects. Available at: <https://ec.europa.eu/digital-single-market/en/content/biblionet>

165. GSMA (2016), Mobile for Development Utilities: Assessing the Opportunity for Pay-as-you-go Solar in Nigeria.

Available at: https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/02/GSMA_Etisalat_PAYG_Final-20160211.pdf



BOX 9: PAY-AS-YOU-GO SOLAR IN NIGERIA

In many emerging economies, electrical grids are unstable and fail to reach beyond urban areas, forcing households to rely on small-scale generators for primary or back-up power. In Nigeria, households and businesses spend almost USD14 billion a year on inefficient electricity generation that is often unreliable, noisy, polluting and expensive (USD0.40/kWh or more).¹⁶⁶ Pay-as-you-go (PAYG) solar could address this issue; however, traditional methods of payment are not suitable for these rural customers since most of them are financially excluded. Using innovative mobile payment solutions to reach a wider customer base than previously accessible through traditional sales and distribution models can circumvent this problem.¹⁶⁷ In Nigeria, such models could save the government USD5-9 billion annually.¹⁶⁸ A Consultative Group to Assist the Poor (CGAP) study estimated that between 15-30 percent of PAYG customers accessed mobile money for the first time through the purchase of a solar home system and one solar company reported that over 90 percent of their customers had never made a digital bill payment before they acquired PAYG solar.¹⁶⁹ Government led pilots in the form of PPPs between energy agencies and payment providers can provide practical test cases demonstrating ideal legal and regulatory requirements, consumer protection provisions, and optimal business and financing models. Pilots could also provide ideal “mini regulatory sandboxes” to test innovation and promote advantageous legislation.¹⁷⁰

166. GSMA (2016), *Mobile for Development Utilities: Assessing the Opportunity for Pay-as-you-go Solar in Nigeria*.

Available at: https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/02/GSMA_Etisalat_PAYG_Final-20160211.pdf

167. USAID (2018), *The Digital Financial Services Landscape in Nigeria: Enabling Market Conditions for Pay-As-You-Go Solar*.

Available at: https://www.usaid.gov/sites/default/files/documents/11860/Enabling_Market_Conditions_for_Pay-As-You-Go_Solar_Executive_Summary.pdf

168. Mastercard Foundation & IFC (2018) *Digital Access: The Future of Financial Inclusion in Africa*. Available at: https://www.ifc.org/wps/wcm/connect/96a4f610-62b1-4830-8516-f11642cfeafd/201805_Digital-Access_The-Future-of-Financial-Inclusion-in-Africa_v1.pdf?MOD=AJPERES&CVID=mdz-QFO

169. Sources: CGAP (2014) *Access to Energy via Digital Finance: Overview of Models and Prospects for Innovation*. Available at: <https://www.cgap.org/research/publication/access-energy-digital-finance-models-innovation>; CGAP (2017) *Exploring Opportunities for PAYG Solar as a Driver of Financial Inclusion*. Available at: <https://cleanenergysolutions.org/training/exploring-opportunities-payg-solar-driver-financial-inclusion>

170. USAID (2018), *The Digital Financial Services Landscape in Nigeria: Enabling Market Conditions for Pay-As-You-Go Solar*.

Available at: https://www.usaid.gov/sites/default/files/documents/11860/Enabling_Market_Conditions_for_Pay-As-You-Go_Solar_Executive_Summary.pdf



- **Social protection for people, not jobs.** Health insurance and other benefits are typically designed for employees who remain with a single employer for many years. This is ineffective for individuals in the digital economy who take on flexible forms of labor, such as short-term contractors who work for multiple companies simultaneously, self-employed individuals (freelancers) or part-time workers. The overall coverage of social protection programs in most of our focus countries is low. Box 10 provides some examples of “digital-era” social protection policies. These approaches may not be feasible, however, if emerging economies do not have the underlying welfare systems to support them, i.e. if support for traditionally employed is already poor.
- **Leverage behavioral levers to drive adoption and enhance usage.** Governments around the world are using behavioral techniques in their digital communications to influence individual behavior and drive digital adoption (Box 11 provides some examples). Some successful approaches are also utilizing peer groups to shift behavior. In 2016, HSBC bank used specific nudges that utilized comparisons to peer groups to encourage better spending

BOX 10: SOCIAL PROTECTION POLICIES FOR THE DIGITAL ERA

Some innovative policy and business approaches are now being trialed to support workers in the digital era. Examples include:

- Enhancing the income security for on-demand workers through government policy. In Australia, workers on short-term contracts are entitled to an increment of 25 percent for each hour worked compared to a worker doing the same job on an ongoing basis.¹⁷¹ Such workers also benefit from minimum-hour guarantees – employers have to pay them for at least three hours of work each time they engage their services.
- Working with key employers to champion corporate policies mandating income stability for on-demand workers. Given that the use of on-demand labor has been demonstrated to reduce labor costs for firms – a study found that 43 percent of global organizations engaging such labor have saved at least 20 percent in labor costs – there is much scope for companies to develop policies that mandate the income stability for on-demand workers, such as minimum pay, without incurring higher net labor costs.¹⁷²
- Working with existing online job or sharing economy platforms to mandate social security contributions for on-demand workers. For example, Care.com is a platform for caregivers to seek work, enables families seeking such services (the customers) to contribute to their caregiver’s benefits in a way that is similar to how traditional corporate employers fund employee benefits.¹⁷³ A strong government push for similar measures implemented in other platforms could be effective in creating stronger safety nets for on-demand workers.

171. OECD (2018), *The future of social protection: What works for non-standard workers?* Available at: <https://doi.org/10.1787/9789264306943-en>

172. Kelly OCG (2018), *From Workforce to Workfit*. Available at: https://www.kellyocg.com/user_area/content_media/raw/FromWorkforceToWorkFit_GigEconomy.pdf

173. Sources include: Bonoli (2019), “Ensuring economic security in the gig economy”. *The Business Times*.

Available at: <https://www.businesstimes.com.sg/opinion/ensuring-economic-security-in-the-gig-economy>; Microsoft (2018), *The future computed*.

Available at: https://blogs.microsoft.com/wp-content/uploads/2018/02/The-Future-Computed_2.8.18.pdf

and saving habits amongst customers.¹⁷⁴ A specifically designed app informed customers about how much they were spending or saving versus other customers in the same income bracket. Similar techniques have been used by energy companies to reduce energy consumption. As with the application of behavioral techniques to shift business behavior, a thorough understanding of decision-making biases and processes among targeted end-users is required and pilot studies require thorough reviews.

- **Leverage novel sources of data to provide access to financial services.** Digital inclusion can provide sources of data that can be leveraged to extend critical services such as financial products to the unbanked population. In Kenya, Uber formed a partnership with Kenya's Sidian Bank to offer unsecured loans to drivers at favorable interest rates and with no down payment, allowing them to purchase suitable vehicles.¹⁷⁵ The driver's eligibility to receive such a loan is based on data collected by the Uber app, such as the number and regularity of trips which could proxy for regular cashflow to make repayments and customers ratings which could give insights into reliability, rather than on traditional credit references, which are not widely available in Kenya. Besides the obvious benefits to the ride-sharing company this data can be leveraged to

provide further targeted financial services such as loans and savings products.

EQUIP PEOPLE WITH THE RIGHT SKILLS TO ACCESS DIGITAL OPPORTUNITIES

This involves creating a workforce with the capabilities they will require to be successful in the digital economy. For example, in Latin America and the Caribbean, the Inter-American Development Bank (IADB) previously estimated a gap of 628,000 full-time equivalent workers with digital skills in 2019.¹⁷⁶ Some key elements of this could include:

- **Increase curriculum responsiveness.** The inability of educational curriculums to keep pace with the evolving skill needs of a digital economy is a key challenge. This can be driven by a range of factors, including lack of awareness of training institutes of new skill requirements; averseness of students to new courses; high setup costs including expenditures on teaching materials, teacher trainings and new program branding; and lengthy approval processes. An example of an education system that has continually adapted to the evolving skill needs of the economy over the past two decades is Singapore's, which halved its curriculum to allocate more time to honing soft skills such as creative and critical thinking.¹⁷⁷ In order for this

BOX 11: EXAMPLES OF BEHAVIORAL POLICIES USED IN COMMUNICATION MESSAGING

In Singapore, SMS notifications are used to provide reminders when to file and to pay taxes.¹⁷⁸ The content and timing of these messages is designed to "nudge" taxpayers to comply e.g. those who filed late in the previous years are reminded to file on time to avoid penalties, property taxpayers informed of their liability, and so on.¹⁷⁹ Kenya has tested different communication-based approaches to encourage credit compliance, through an m-money credit product called "Top Cash". In a field experiment, Top Cash was introduced as a zero-cost loan payable in one week, and each repayment ensured a larger future loan. Different messages were sent to borrowers to see their impact on repayment. The experiment showed that a 14 percent increase in the likelihood of a consumer viewing their credit liability resulted in a seven percent decline in credit default. Further, respondents receiving messages in the evening were eight percent likelier to not default, as opposed to those receiving morning messages.¹⁸⁰

174. The Thinking Brand (2016), "HSBC #Nudge Campaign". Available at: <https://thethinkingbrand.wordpress.com/2016/10/31/hsbc-nudge-campaign/>

175. World Economic Forum (2017), Digital Policy Playbook 2017 – Approaches to National Digital Governance.

Available at: http://www3.weforum.org/docs/White_Paper_Digital_Policy_Playbook_Approaches_National_Digital_Governance_report_2017.pdf;

176. Inter-American Development Bank [IDB] (2016), Workforce Training in Latin America. Available at: www.thedialogue.org/resources/workforce-training-in-latin-america/

177. Ong Ye Kung (2018), "Helping Singapore's students to learn for life". Available at: <https://www.todayonline.com/commentary/helping-singaporean-students-learn-life>

178. Information obtainable from Inland Revenue Authority of Singapore at: <https://www.iras.gov.sg/irashome/Businesses/Employers/Auto-Inclusion-Scheme-AIS-//Inform-Employees-to-File-Tax>Returns/>

179. Civil Service College Singapore (2017), "Using Behavioural Insights to Strengthen Enforcement", Ethos.

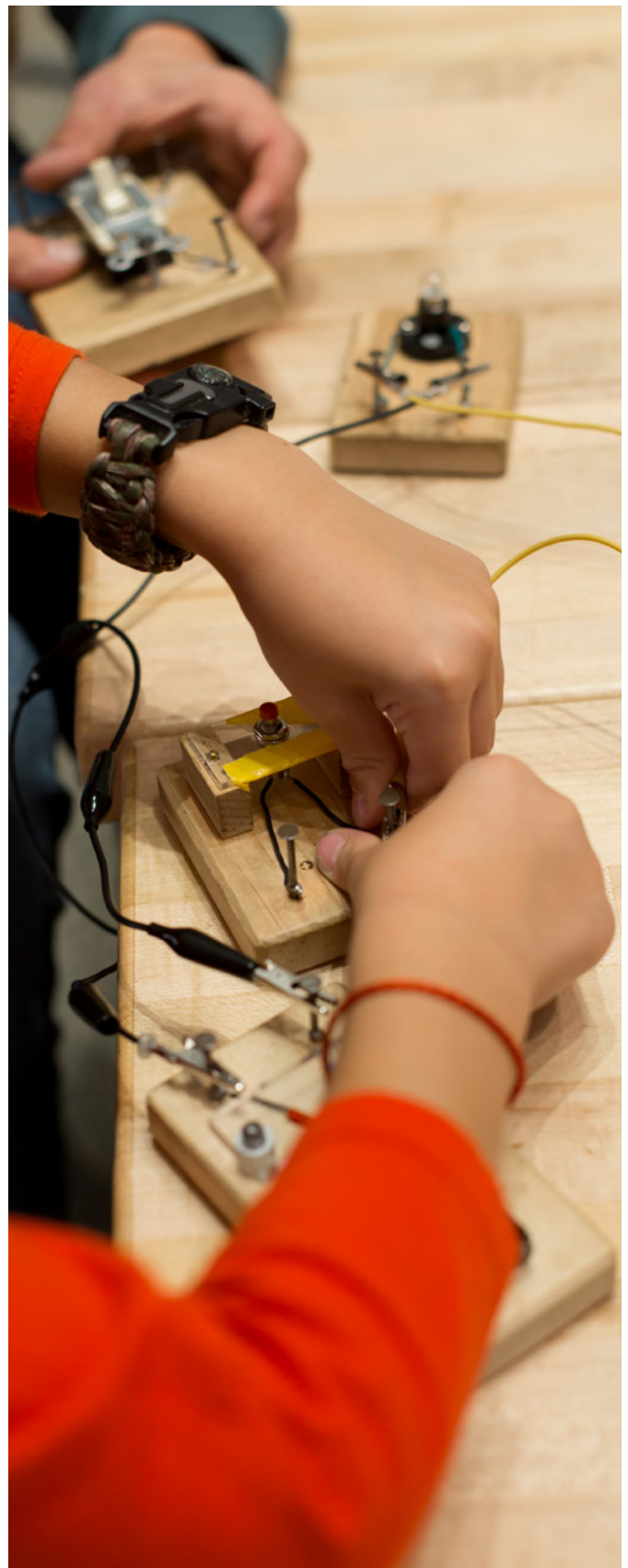
Available at: <https://www.csc.gov.sg/articles/using-behavioural-insights-to-strengthen-enforcement>

180. Mazer et al. (2016), "Finding 'Win-Win' in Digitally-Delivered Consumer Credit", CGAP blog.

Available at: <https://www.cgap.org/blog/finding-win-win-digitally-delivered-consumer-credit>

mechanism to be effective, there is a need for continuous dialogue between industry, government and education institutions. The Singapore government set up a dedicated unit to reach out to firms and educate them about worker reskilling needs and opportunities under the government's skills training courses.¹⁸¹ Education interventions can be very difficult to implement for a number of reasons. Key challenges include a lack of awareness of training institutes of new skill requirements, averseness by students to new courses due to perceived risk, high initial setup costs for new programs, and lengthy approval processes. Countries that have successfully improved the responsiveness of their curricula have done so through close and ongoing dialogue with relevant stakeholders.

- Embed technology in the classroom.** An effective way of preparing students or future workers for Industry 4.0 – or at least equipping them with the basic digital literacy skills necessary to excel in the future economy – is to apply digital technologies in classrooms. AI-enabled immersive computer games, for instance, have been used for STEM education in some schools in the US.¹⁸² Technologies that support personalized learning, essentially mimicking a responsive tutor, and a greater focus on training teachers on how to incorporate technology into their lesson plans have significantly improved education outcomes at relatively low costs per student. Simply adding these technologies to existing instructional approaches is less effective.¹⁸³ High capital costs are often prohibitive for education institutions in emerging economies to adopt digital technologies at large scale. Tackling this requires multi-stakeholder partnerships to pilot schemes and demonstrate a strong cost-benefit outcome, which can then spur greater adoption.
- Prevent brain drain and retain local talent.** Governments can also address the talent gap by supporting the return of its talented citizens based in other countries. For example, China's "Thousand Talents" program has attracted highly skilled Chinese working in high-tech industries and in new fields at the frontiers of science back to China. The program offers incentives that include comparable pay to expatriates, job opportunities for the spouse and quality placements for children in schools. Since its inception in 2008, the program has attracted several thousand Chinese to return to China.¹⁸⁴ Singapore has had some success with its "Returning Singaporean Scientists Scheme" which provided research funding and leadership positions at local research institutes



181. Mokhtar (2018), "SkillsFuture Singapore to deepen skills of training and adult education providers", *Today*.

Available at: <https://www.todayonline.com/singapore/skillsfuture-singapore-deepen-skills-training-and-adult-education-providers>

182. Ketelhut et al. (2009), "A multi-user virtual environment for building and assessing higher order inquiry skills in science", *British Journal of Educational Technology*.

Available at: <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-8535.2009.01036.x>

183. *The Economist* (2017), "Technology is transforming what happens when a child goes to school".

Available at: <https://www.economist.com/news/briefing/21725285-reformers-are-using-new-software-personalise-learning-technology-transforming-what-happens>.

184. Peter Martin and Dandan Li, "Spy Fears Prompt China to Censor Its Own Recruitment Drive," *Bloomberg* September 20, 2018, <https://www.bloomberg.com/news/articles/2018-09-19/china-censors-mentions-of-thousand-talents-as-spy-fears-grow>.

and universities.¹⁸⁵ Singapore is also famous for its range of government scholarships that entail “bonding” students to the public service or working in the Singapore private sector for a fixed timeframe post university graduation. Similar models are being adapted in emerging economies such as Kazakhstan. Having a targeted value proposition for individuals is crucial as students will only be willing to participate in schemes if they believe that their long term employment prospects are desirably improved.

- **Introduce digital bootcamps.** Short-term, focused education courses, which are run by employers can be crucial to fill in necessary skill gaps. For example, the “Generation Program” focuses on four sectors with teaching facilities in 119 cities in six continents. The program is offered to 18- to 29-year-olds.¹⁸⁶ Among the program’s features are direct contact with potential employers, matching trainee attributes with employer needs, courses that cover technical, behavioral, and mental skills, continuous monitoring and support during and after the program, and a strong alumni network. Since its inception, 31,600 people have gone through

the training with 80 percent finding jobs within three months of finishing the program and 65 percent of those stayed with their jobs for at least one year.¹⁸⁷ Employers also rate program graduates as higher performing than their peers.¹⁸⁸ Multinational tech companies can partner with governments and local industry on the provision of training in such bootcamps. For example, Google runs “Bangkit” – an academy developed in collaboration with local unicorns Go-Jek, Tokopedia and Traveloka to train and produce high-caliber digital talent for Indonesian technology companies and start-ups.¹⁸⁹ This six-month program aims to train 300 individuals chosen through a highly selective process by the end of 2020. Where attempts at such bootcamp based interventions can fall short is when national (or international) programs fail to focus on the local job market context and opportunities. Further, if the effort is led by one dominant local employer, the skills taught can end up being too firm-specific and non-transferrable which is problematic if the employer cannot commit to hiring the entire cohort of workers, who would then be forced to look for employment elsewhere.

3.3 PUTTING IT ALL TOGETHER



Policy does not happen in isolation. Successful digital transformations will require policymakers to find ways to integrate and sequence the implementation of the 12 policy levers highlighted earlier. While the specific approach will depend crucially on local context, India’s experience in developing Real-time Payments (RTP) systems can provide a useful example of how many of these different levers can come together to effect change (Box 12).

Translating digital technologies into broad-based economic development will be one of the crucial policymaking challenges of the 21st century. Utilizing the 12 policy levers highlighted in this chapter can help guide policymaker efforts most effectively. The specific implementation of these policy levers could look very different in each country, dependent on the country context (e.g. regulatory processes, history of engagement with the private sector, etc.), but we hope that this report can provide the stimulus for these country-level discussions on how to strengthen the potential of emerging markets to enhance their economic development through digital technologies.

185. National Research Foundation (2020), “Returning Singaporean Scientists Scheme”, Programmes.

Available at: <https://www.nrf.gov.sg/programmes/returning-singaporean-scientists-scheme>

186. Generation Program (2019). Available at: <https://www.generation.org/>

187. Generation Program (2019). Available at: <https://www.generation.org/>

188. Asia Philanthropy Circle (2017), *Catalysing productive livelihood: A guide to education interventions with an accelerated path to scale and impact*.

Available at: <http://www.edumap-indonesia.asiaphilanthropycircle.org/wp-content/uploads/2017/11/APC-Giving-Guide-Book-Final-Report-17112017.pdf>

189. Google Indonesia (2020), “Bangkit”, Events. Available at: <https://events.withgoogle.com/bangkit/>

BOX 12. INDIA'S EXPERIENCE IN DEVELOPING REAL-TIME PAYMENTS (RTP) SYSTEMS

RTPs are being rolled out rapidly across both developed and emerging economies globally. Mexico, for example, has been an early adopter of RTP with a strong focus on P2P, C2B and B2C transactions.¹⁹⁰ There are clear business benefits from RTP. For example, one distinguishing feature of RTP is two-way communication, allowing for instant payment confirmation as well as secure and instant payment requests.¹⁹¹ Further, RTPs can simplify business processes by allowing data to accompany transactions that is needed to identify payments and any reasons for exceptions. Payees hence require fewer resources for receivables posting and reconciliation.



The roll out of such a complex undertaking comprehensively illustrates the importance of the innovative policy levers outlined in this chapter, from having a clear national roadmap and public sector investment into technology to setting the ground rules for financial institutions and businesses to getting consumers to trust and use the system. One country with successful implementation of an RTP model is India. The country utilized a number of the policy levers discussed in this chapter to push through its ambitious plan that brought together government, financial institutions and third parties.

LEAD FROM THE TOP:

India rolled out its RTP, or Unified Payments Interface (UPI) – an overlay on its existing Immediate Payment Service (IMPS) – in 2016. The use of champions across government and private sector has been catalytic for the successful implementation. In many countries, the RTP government champion role has been played by the central bank, but competition authorities and infrastructure institutions have also shown to be viable champions. In India, the Reserve Bank of India (RBI) and the National Payments Corporation of India (NPCI), which oversees retail payments and settlement systems, have been instrumental in fueling innovation through digital payments.¹⁹²

DRIVE CHANGE THROUGH THE PUBLIC SECTOR:

India started setting the ground rules for this digital transformation early, leading to the 2007 Payment and Settlement System Act, which in turn led to the creation of the NPCI. The country also leveraged UPI to digitize government services. For example, in late 2019, the NPCI announced that it would be partnering with India's income tax department to enable individuals to pay their income tax using UPI.¹⁹³ UPI is also used to disburse social benefits and subsidies from the government to individuals (G2P).¹⁹⁴ Under India's Direct Benefit Transfer (DBT) scheme, subsidies (such as Liquid Petroleum Gas subsidies for cooking) can be transferred directly to recipient's bank accounts. The system uses a unique digital identification

¹⁹⁰ Deloitte (2015), *Real-time Payments are changing the reality of payments*.

¹⁹¹ J.P. Morgan (2017), "The Real Value of Real-Time Payments", *Treasury Services & Trade Insights*.

Available at: <https://www.jpmorgan.com/global/cib/treasury-services/real-value-real-time-payments>

¹⁹² Google (2019), *Real Time Payments Systems & Third Party Access – A perspective from Google Payments and sources within*.

Available at: https://static.googleusercontent.com/media/pay.google.com/en//about/business/static/data/GPay_RTP_2019.pdf

¹⁹³ Aman Rawat (2019), "Income Tax Payment Using UPI To Become A Reality Soon", *Inc42*.

Available at: <https://inc42.com/buzz/income-tax-payment-using-upi-to-become-a-reality-soon/>

¹⁹⁴ Unique Identification Authority of India, "Direct Benefit Transfer (DBT)", *FAQs*.

Available at: <https://uidai.gov.in/contact-support/have-any-question/308-faqs/direct-benefit-transfer-dbt.html>



number, Aadhaar, and BHIM Aadhaar pay, an Aadhaar based payments interface which allows real time payments to merchants using the Aadhaar number of customers and authenticating them through biometrics.¹⁹⁵ The use of the DBT is estimated to have saved India's government INR1.7 trillion from reduced leakages from 2014-19.¹⁹⁶

ENABLE THE PRIVATE SECTOR:

Building the UPI's infrastructure took an open approach aimed at interoperability and innovation. UPI exposes an API so that third parties can initiate payments through the interface, thereby guaranteeing interoperability between different third-party applications and payment services. Allowing third-party payment service operators and not only banks and financial institutions onto RTP platform was crucial in supporting innovation and increasing merchant adoption. Notably, UPI was designed from the ground up to include third-party technology players leveraging private sector champions – a role taken traditionally by large banks – in the form of telecommunication providers (telcos) or tech firms such as Google. RBI further provided both capacity building, financial and technical support to merchants on the use of request to pay, in-app, and QR payments further driving MSME adoption.

PROVIDE INDIVIDUALS WITH THE DIGITAL TOOLKIT:

The RBI also took significant steps to make sure consumer adoption of digital payments took off and was inclusive. For example, it was mandated that payments made over UPI be free of charge for the first few years to drive adoption and not exclude financially vulnerable individuals. The bank also supported the development of virtual payment aliases/ addresses (VPAs) by inviting major banks to agree on common authentication systems. These VPAs and Aadhaar made peer-to-peer payments easier and could help consumers feel that their privacy is protected. Common authentication systems also meant the cost of switching financial service providers was easier.

Today, India's UPI has been ranked as the top RTP system in the world on the basis of the system's standards, published Application Program Interface (API) and participation of third-party vendors.¹⁹⁷ The cumulative value of transaction on UPI has overtaken that of credit and debit cards in India.¹⁹⁸ There is little doubt that the inclusion of third parties and interoperability was crucial for the RTPs success. It has accelerated adoption, increased competition and driven the emergence of new products.

195. NPCI, "Product Overview – BHIM Aadhaar". Available at: <https://www.npci.org.in/product-overview/bhim-aadhaar>

196. Aman Sharma (2020), "PDS biggest saver for government in DBT in 2019-20", The Economic Times.

Available at: <https://economictimes.indiatimes.com/news/economy/policy/pds-biggest-saver-for-government-in-dbt-in-2019-20/articleshow/73569155.cms?from=mdr>

197. Google (2019), Real Time Payments Systems & Third Party Access – A perspective from Google Payments and sources within.

Available at: https://static.googleusercontent.com/media/pay.google.com/en//about/business/static/data/GPay_RTP_2019.pdf

198. Caesar Sengupta (2019), "Banks, governments and tech need to work together to digitize economies and increase financial inclusion", Google Blog.

Available at: <https://www.blog.google/perspectives/caesar-sengupta/banks-governments-and-tech-need-work-together/>



APPENDIX A

SIZING THE ECONOMIC VALUE OF DIGITAL TECHNOLOGIES

This document provides a detailed methodology on the assumptions and sources of information used in the AlphaBeta research on quantifying the future 2030 potential economic impact of digital technologies for the following 16 countries, referred to throughout as the “Digital Sprinters”: Argentina, Brazil, Chile, Colombia, Egypt, Israel, Kenya, Mexico, Nigeria, Peru, Russia, Saudi Arabia, South Africa, Turkey, United Arab Emirates (UAE), Ukraine.

APPENDIX A1: OVERALL APPROACH

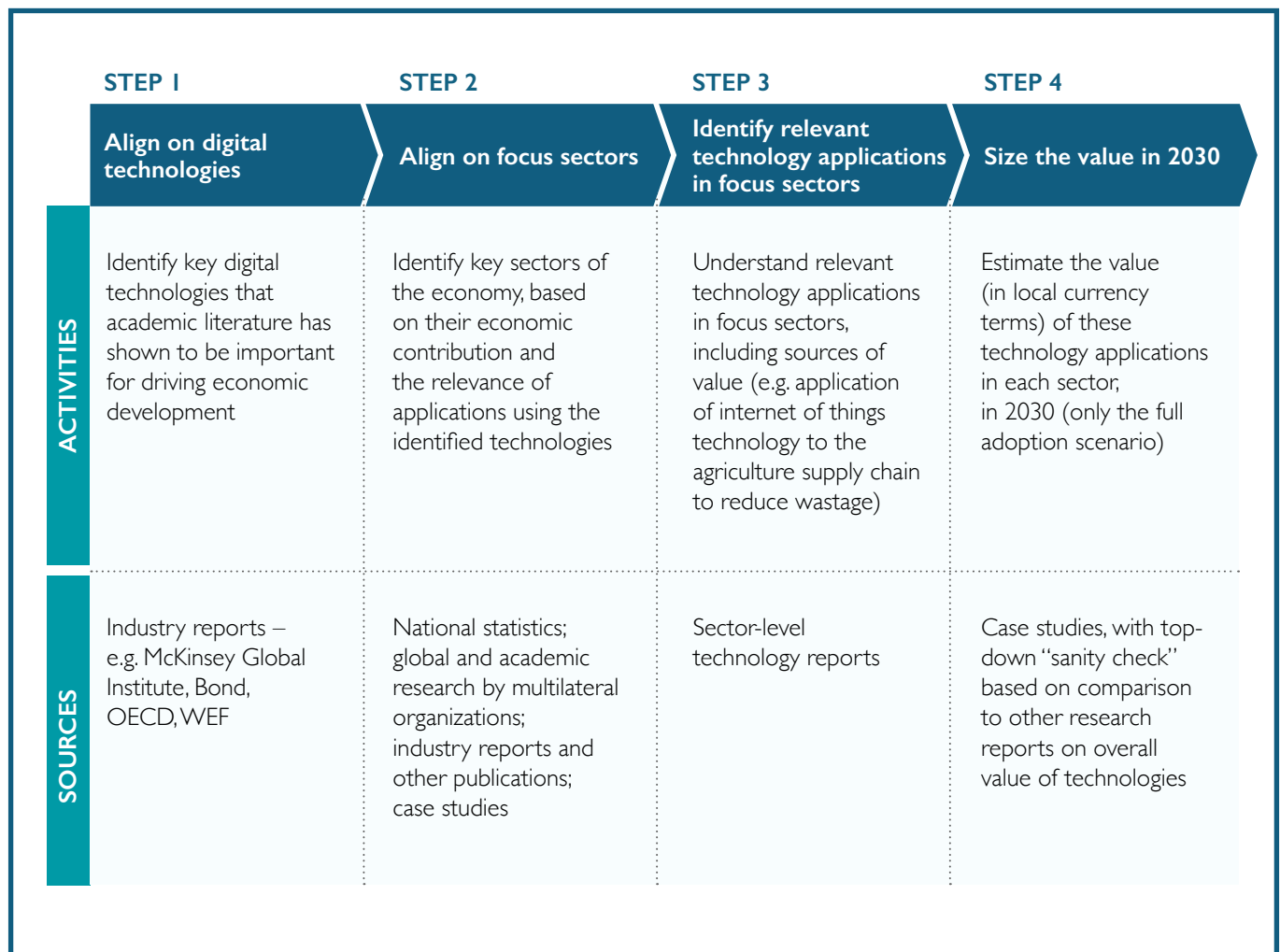
A four-step methodology was used to understand the potential economic impact created by digital technologies in 2030 (Exhibit A1).

STEP 1: ALIGN ON DIGITAL TECHNOLOGIES

Several existing research reports on current and emerging digital technologies were reviewed to identify the most relevant technologies to focus on for this analysis in terms of their potential economic impact. There is a large body of research by academics, development practitioners, non-for-profits as well as the private and public sector on the interaction between technologies and economic development. In 2013, McKinsey Global Institute identified 12 disruptive technologies that would transform life, business and the global economy.¹⁹⁹ Of these technologies, seven are considered digital in nature: mobile internet; automation of knowledge; IoT which is often combined with geospatial and satellite technology (e.g., remote sensing); cloud technology; advanced robotics; autonomous

and near autonomous vehicles; and additive manufacturing (more commonly known as 3D printing). Since 2013, several technologies have been added to this list due to potentially transformational economic and social impact. For example, the UK based international development network Bond noted rapid changes in the technologies shaping international development between 2016 and 2019. Emerging technologies included big data, financial technology (FinTech), machine learning and even blockchain. These technologies are by no way mutually exclusive and the line between what constitutes a different technology versus an application of a technology can be blurred. For example, Artificial Intelligence (AI) utilizes big data which often relies on cloud computing technology to provide the storage and computational horsepower to run machine learning algorithms and other analytics. Similarly, autonomous vehicles contain a multitude of sensors, many of which are internet-enabled i.e. IoT. Exhibit A2 provides an overview of eight key digital technologies with significant implications for economic development.

EXHIBIT A1: A FOUR-STEP METHODOLOGY WAS USED TO UNDERSTAND THE IMPORTANCE OF DIGITAL TECHNOLOGIES



199. McKinsey Global Institute (2013), *Disruptive technologies: Advances that will transform life, business, and the global economy*. Available at: <https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/disruptive-technologies>

STEP 2: ALIGN ON FOCUS SECTORS

To understand the current and potential economic output of these digital technologies, a set of focus sectors need to be identified. These sectors were selected based on two steps:

- Clustering industries, at the ISIC 1 digit level, into broader sectors for convenient analysis.²⁰⁰ This is guided by the individual industry's relevance for digital technologies (based on past research quantifying the potential industry benefits of these digital technologies in the focus countries).²⁰¹
- Prioritizing the sectors based on their importance for Gross Domestic Product (GDP), proxied by the sector's share of national GDP in the focus countries. Each selected sector must represent more than 1.5 percent of the national GDP for at least 75 percent of the countries.

The Information and Communication Technology (ICT) industry classification was excluded due to its value-added

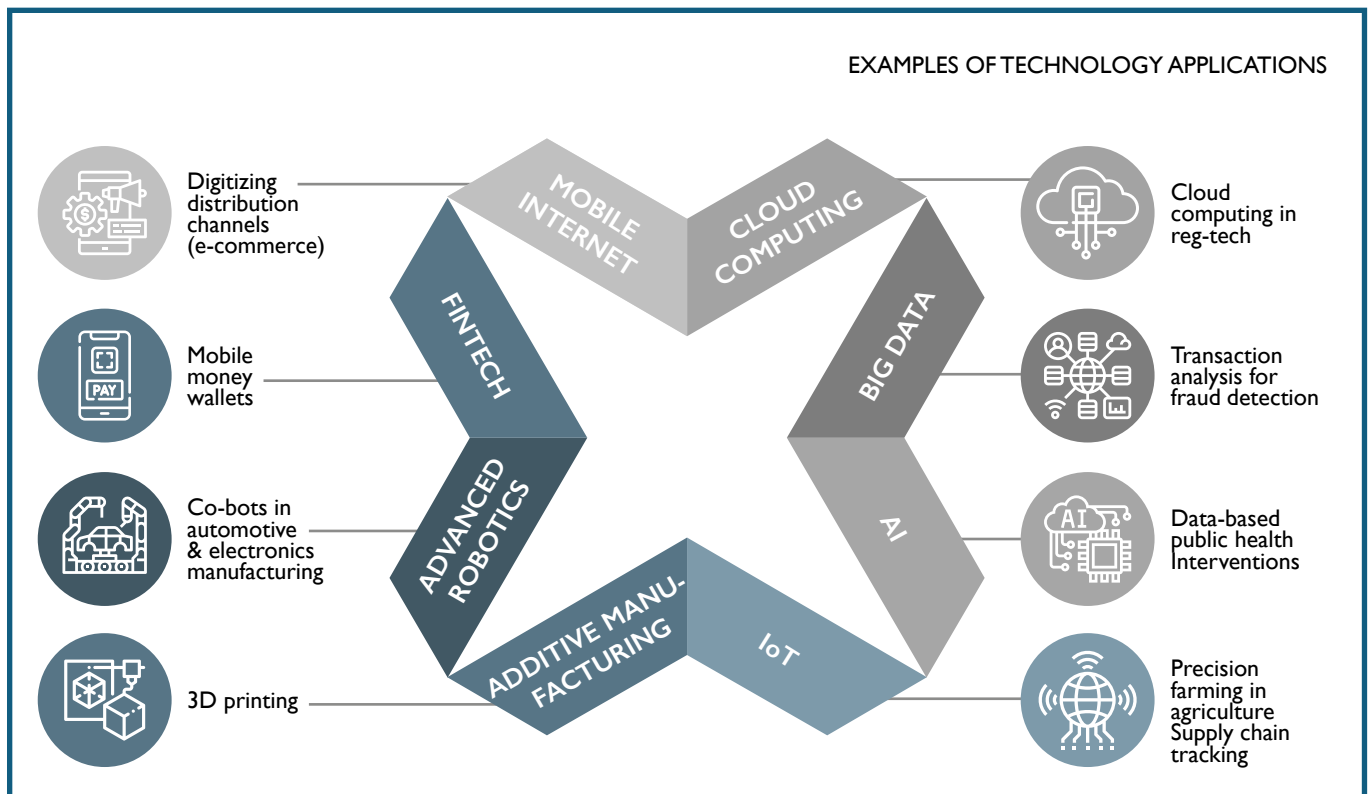
to the economy being almost entirely driven by technology and most of the value from digital technologies in this sector being actually captured in other sectors as an input to production.

Based on these steps, ten sectors were selected.²⁰²

These sectors are Agriculture and food (including food manufacturing); Consumer, retail and hospitality services; Education and training; Financial services; Government; Health; Infrastructure (including utilities such as energy and water); Manufacturing; Mobility; Resources (including mining and oil & gas).

These ten sectors account for 89 percent of the combined GDP of the Digital Sprinters in 2018. In 14 out of these 16 emerging countries, the ten sectors accounted for at least 85 percent of the GDP in 2018 (in Nigeria and Israel, the shares were 81 percent and 77 percent respectively). In five countries (Chile, Egypt, Kenya, Saudi Arabia and South Africa), the ten sectors made up more than 95 percent of the GDP in 2018.

EXHIBIT A2: PREVIOUS LITERATURE HAS IDENTIFIED 8 TECHNOLOGIES WITH SIGNIFICANT IMPLICATIONS FOR ECONOMIC DEVELOPMENT



200. These sectors uniquely match to the relevant International Standard Industrial Classification of All Economic Activities (ISIC) with the exception of "Consumer, retail & hospitality", combining ISIC Sector G: Wholesale and retail trade; repair of motor vehicles and motorcycles and Sector I: Accommodation and food service activities; "Infrastructure", which combines ISIC Sectors F: Construction and L: Real estate activities; and "Resources", combining the ISIC Sector B: Mining and quarrying; Sector D: Electricity, gas, steam and air conditioning supply and Sector E: Water supply, sewerage, waste management and remediation activities.

201. This was based on a range of reports. See for example, McKinsey Global Institute (2014), *Southeast Asia at the crossroads: Three paths to prosperity* (Available at: https://www.mckinsey.com/~/media/McKinsey/Featured%20Insights/Asia%20Pacific/Three%20paths%20to%20sustained%20economic%20growth%20in%20Southeast%20Asia/MGI%20SE%20Asia_Executive%20summary_November%20202014.ashx); and McKinsey Global Institute (2014), *India's tech opportunity: Transforming work, empowering people* (Available at: <https://www.mckinsey.com/industries/high-tech/our-insights/indias-tech-opportunity-transforming-work-empowering-people>).

202. In the Digital Sprinters, all ten sectors have fulfilled the criterion in Step 2 except the following sectors which account for less than 1.5 percent of the national GDP: Health sector in Nigeria; Education and training as well as health sectors in Saudi Arabia; Health sector in South Africa; Agriculture and food, education and training as well as the health sectors in the United Arab Emirates, and Agriculture and food sector in Israel.

EXHIBIT A3: 39 DIGITAL TECHNOLOGY APPLICATIONS ACROSS 10 INDUSTRIES WERE IDENTIFIED

RELEVANT DIGITAL TECHNOLOGY APPLICATIONS BY SECTOR¹

¹ These sectors uniquely match to the relevant International Standard Industrial Classification of All Economic Activities (ISIC) with the exception of "Consumer, retail & hospitality", combining ISIC Sector G: Wholesale and retail trade; repair of motor vehicles and motorcycles and Sector I: Accommodation and food service activities; "Infrastructure", which combines ISIC Sectors F: Construction and L: Real estate activities; and "Resources", combining the ISIC Sector B: Mining and quarrying; Sector D: Electricity; gas, steam and air conditioning supply and Sector E: Water supply, sewerage, waste management and remediation activities.

SOURCE: AlphaBeta analysis

STEP 3: IDENTIFY RELEVANT TECHNOLOGY APPLICATIONS IN FOCUS SECTORS

Relevant technology applications in the focus sectors and their sources of value (e.g., reduced wastage in production, enhanced consumer offerings) were identified based on a detailed review of the academic literature for each of the 8 focus technologies. These technology applications include tangible drivers of business value, such as the use of remote patient monitoring to enable hospital-level care in homes through the use of advanced sensors, smart medical devices, and robotics. A list of these technology applications, categorized by sector and key digital technology, is shown below in Exhibit A3. Several emerging digital technologies such as blockchain were considered but not analyzed as they are still in the nascent stages and economic impact estimates are difficult to obtain.

STEP 4: SIZE THE VALUE IN 2030


The value (in local currency terms) of these technology applications in each sector was then quantified in 2030 (based on assessed potential linked to benchmarks).

The **“Full adoption” scenario** was analyzed. In this scenario, all countries manage to achieve full digital adoption (100 percent) in the 39 digital technology applications in the ten sectors. This implies that these ten sectors will become “Digital leaders” with significant leap-frogging (see Appendix A3 for more details on the classification). A “Full adoption” scenario is unlikely to be realistic but still useful as a thought experiment and to frame the total opportunity.

A series of international and country-specific case studies were used for each technology application in the sizing. When there were sufficient data sources, only the high-end estimates were calculated. A “sanity check” of the results was then done by comparing the overall sector and economy-wide estimates with other research reports. **These estimates do not represent GDP or market size (revenue), but rather economic impact such as productivity gains, increased revenues and cost savings.**

An example of the sizing approach for Brazil in one technology application is shown below to illustrate the approach (Exhibit A4).

EXHIBIT A4: SIZING THE BUSINESS IMPACT OF BIG DATA APPLIED TO SME LENDING IN BRAZIL

 SECTOR: Finance APPLICATION: Increased revenue from higher lending to SMEs at greater margins due to the use of big data		
What was measured?		
Sized based on the cost savings from lower default rates due to higher accuracy of analytics tools, as well as additional revenue through increased lending to SMEs at higher margins		
VARIABLE	VALUE (2030 FULL ADOPTION)	SOURCE/COMMENTS
A. Total lending to SMEs	BRL 1,500 billions	OECD statistics; 2030 based on growth in financial industry
B. Penetration of big data analytics in decision-making	100%	Based on full digital adoption rate
C. % increase in lending to SMEs due to big data analytics improving risk assessment capabilities	33%	Assumptions taken from MGI report
D. % increase in margins of lending to SMEs (Post-risk)	1.8%	Assumptions taken from MGI report
Total	~BRL 8.9 billions	High-end estimates

APPENDIX A2: SPECIFIC APPROACHES, ASSUMPTIONS AND SOURCES

Table 1 summarizes the key metrics and sources used commonly across the sizings of the digital technology applications.

TABLE 1

METRICS	SOURCES
GDP / GDP per capita	<ul style="list-style-type: none"> World Bank GDP statistics International Monetary Fund (IMF) Real GDP growth estimates National statistical organizations
Population	<ul style="list-style-type: none"> United Nations Department of Economic and Social Affairs Population datasets
Labor force	<ul style="list-style-type: none"> International Labor Organization (ILO) World Bank Labor Force statistics Local country sources
Wage	<ul style="list-style-type: none"> Local country sources
Exchange rates	<ul style="list-style-type: none"> IMF Exchange Rates Database X-rates XE

The specific assumptions and sources of information used to size each digital technology application in each sector are shown below. These assumptions were used to estimate the “Full adoption” scenario in 2030.

AGRICULTURE AND FOOD

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
1. Precision farming – Productivity gains / cost savings		
Data-driven optimization of crop and meat production	Sized based on the productivity gains from increased yield, as well as cost savings from the use of fewer resources in farming. Country-level estimates based on the effectiveness of the technology within the context of the country's agricultural landscape and its agricultural sector GDP.	<ul style="list-style-type: none"> MGI (2014)²⁰³ Expert interview
2. Supply chain management – Increased revenues		
IoT technology to help reduce supply chain food waste	Sized based on the additional revenues from reduced food losses that occur in the supply chain. MGI (2014) has estimated 10 percent to 15 percent of all food waste throughout the supply chain is recoverable from technology-enabled supply chain management. Country-level estimates based on annual food waste from the supply chain which was assumed to grow at constant rates.	<ul style="list-style-type: none"> MGI (2014)²⁰⁴ Expert interviews Food and Land Use Coalition²⁰⁵

203. McKinsey Global Institute (2014), *India's technology opportunity: Transforming work, empowering people*.

Available at: https://www.mckinsey.com/~/media/McKinsey/Industries/Technology%20Media%20and%20Telecommunications/High%20Tech/Our%20Insights/Indias%20tech%20opportunity%20Transforming%20work%20empowering%20people/MGI%20India%20tech_Full%20report_December%202014.ashx

204. McKinsey Global Institute (2014), *Southeast Asia at the crossroads: Three paths to prosperity*.

Available at: <https://www.mckinsey.com/featured-insights/asia-pacific/three-paths-to-sustained-economic-growth-in-southeast-asia>

205. Food and Land Use Coalition (2019), *Reducing Food Loss and Waste*.

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AGRICULTURE AND FOOD

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
3. Real-time market information – Increased revenues		
Provision of real-time market information on prices	Sized based on increased farmers' revenues from access to real-time information. MGI (2014) estimates this positive impact to be 10 percent to 15 percent of agricultural GDP. Country-level estimates based on the country's agriculture sector GDP.	<ul style="list-style-type: none"> • MGI (2014)²⁰⁶ • Expert interviews
4. Food safety – Cost savings		
Using sensors, data monitoring and analysis techniques to ensure the biosecurity of food products and predict when concerns may arise	Sized based on cost savings from reduced food contamination losses. Fast Company (2017) reports that improving food traceability via sensing, tracking and data monitoring technologies could allow an improvement in the percentage of food that arrives at the retailers' premises with target freshness, from 30 percent to 90 percent. PWC (2014) estimates the global cost of food fraud, proxied by lost sales due to adverse health consequences, to be between USD30 billion to USD40 billion a year. Country-level estimates of food contamination losses based on the relative share of global GDP.	<ul style="list-style-type: none"> • Fast Company (2017)²⁰⁷ • PWC (2014)²⁰⁸

CONSUMER, RETAIL AND HOSPITALITY

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
1. Digitizing channels – Productivity gains		
Productivity gain of delivering retail goods through digital channel reducing labor, inventory, and real estate costs	Sized based on productivity gains from delivering goods digitally. MGI (2013) estimates that the productivity gains from selling goods through digital channels to range from 6 percent to 15 percent, based on reduced labor requirements, inventory efficiencies and lower real estate costs. Country-level estimates based on domestic e-commerce retail sales and operating costs (assuming constant growth rates).	MGI (2013) ²⁰⁹
2. Inventory management – Increased revenues		
Use of IoT to reduce stock outs	Sized based on increased revenues from avoidance of sales lost due to stock outs. MGI (2013) estimates that 4 percent of retail sales are lost due to stock outs, and that 35 percent to 40 percent of this value may be recaptured using IoT. Country-level estimates based on domestic retail sales.	MGI (2013) ²¹⁰

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EDUCATION AND TRAINING

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
1. E-career centers and digital jobs platform – GDP increments		
Online platforms where job openings are posted, and compatible candidate profiles are matched to available jobs based on algorithms	Sized based on GDP contributions from increased employment rates. MGI (2015) estimates the impact on employment rates on different countries, stating that these are different for each country, depending on its labor market characteristics, education and income levels and demographic trends. Country-level estimates based on national employment rate, labor force and GDP per capita.	MGI (2015) ²¹¹
2. Personalized learning – GDP increments		
Use of digital technologies to provide personalized and remote learning opportunities for students	Sized based on increased GDP from increased employment. MGI (2018) estimates that these levers would lead to an increase in employment rate by 0.5 percent in high-income countries, and 0.9 percent in other countries. Classification of “high income” countries based on the World Bank’s definition. Country-level estimates based on national employment rate, labor force and GDP per capita.	<ul style="list-style-type: none"> • MGI (2018)²¹² • World Bank²¹³
3. Online retraining programs – GDP increments		
Lifelong learning opportunities delivered in digital format to help individuals gain new skills	Sized based on increased GDP from higher employment. MGI (2018) estimates that these levers would lead to an increase in employment rate by 0.1 percent in “high income” countries, and 0.3 percent in “middle-income” countries. Classification of countries by income based on the World Bank’s definition. Country-level estimates based on national employment rate, labor force and GDP per capita.	<ul style="list-style-type: none"> • MGI (2018)²¹⁴ • World Bank²¹⁵

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FINANCIAL SERVICES

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
1. Big data analytics – Increase revenues		
Increased lending to Small and medium-sized enterprises (SMEs) at higher margins due to the use of big data	Sized based on additional revenue through increased lending to SMEs at higher margins. MGI (2014) suggests lending to SMEs increases by 16 percent to 33 percent due to big data analytics, with increased margins between 1.4 percent to 1.8 percent. Country-level estimates based on annual total lending to SMEs.	MGI (2014) ²¹⁶
2. Financial inclusion – Increased wages		
Mobile Internet supporting digital financial inclusion	Sized based on the number of persons who became financially included due to mobile money as of 2030 based on projections from 2014 and 2017 estimates (at historical growth rates). MGI (2014) suggests that individuals gain a 15 percent increase in their wages due to financial inclusion, with this wage being gauged at the country's minimum wage rate as such individuals typically come from lower-income backgrounds. Country-level estimates based on the country's financially-included population (ages 15+), the proportion of them who became financially included due to mobile money, and annual minimum wage.	<ul style="list-style-type: none"> World Bank Global Findex Database²¹⁷ MGI (2014)²¹⁸
3. Digitizing marketing, distribution, and services – Cost savings		
Internet and mobile technologies that reduce operational and risk costs and improve service delivery	Sized based on the cost savings from digitization such as the electronic onboarding of clients, leveraging machine learning and robotics to create operational improvements and the use of public cloud infrastructure to reduce processing capacity. MGI (2017) estimates that the potential savings from retail banking operational costs and risk costs are 20 percent to 30 percent and 10 percent to 30 percent, respectively. Country-level cost savings based on estimates of domestic banking sector operating costs.	MGI (2017) ²¹⁹
4. Reg tech – Cost savings		
AI and machine learning which enables automation of document review, risk analysis and other repetitive compliance tasks	Sized based on the cost savings in compliance expenditure due to the increased efficiency brought about by these technologies. Juniper Research (2017) suggests up to 50 percent reduction in compliance expenditure. KPMG (2013) indicates that compliance expenditure is on average 10 percent of banks' operating costs. Country-level estimates of efficiency savings based on domestic banking sector costs.	<ul style="list-style-type: none"> Juniper Research (2017)²²⁰ KPMG (2013)²²¹

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GOVERNMENT

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
1. Cloud computing – Cost savings		
Use of cloud-based software to reduce costs	Sized based on the estimated savings from cloud computing, specifically in the reduction in hardware costs. Brookings (2010) reports government agencies experiencing between 25 percent to 50 percent in moving to the cloud. Country-level estimates based on government ICT expenditure and hardware costs.	Brookings (2010) ²²²
2. E-services – Cost savings		
Reduction in operating expenditure from using e-services	Sized based on the reduction in operating expenditure from moving services online, pre-filing of tax forms, data availability and performance dashboards. MGI (2011) estimates an annual reduction in operating expenditure of between 15 percent to 20 percent in Europe from moving to e-services. The study also reports that the addressable base for such a reduction is between 20 percent to 25 percent of government expenditure. Country-level estimates based on government operating expenditure.	MGI (2011) ²²³
3. E-procurement – Cost savings		
Reduction in costs from using e-procurement channels	Sized based on the reduction in transaction costs from moving to e-procurement for government projects. In South Korea, the Public Procurement Service estimated that the government is saving transaction costs of USD8 billion annually through reduced labor costs, reduced lead-time and a more streamlined process. Country-level estimates based on public procurement volumes.	Public Procurement Service ²²⁴
4. Geographic information system enabled tax collection – Increased tax collection		
Use of big data and location-based information to enable tax collection	Sized based on the increased tax collection from using big data and GIS-enabled services. In Brazil, the government managed to raise its Federal Tax collection by about 13 percent through the use of big data to audit corporate tax declaration. Country-level estimates based on public procurement volumes.	Bill & Melinda Gates Foundation and AlphaBeta (2018) ²²⁵
5. Digitization of government payments – Cost savings		
Use of digital services to distribute payments	Sized based on reduction in costs from distribution of government payments using digital services. Better than Cash Alliance (2013) estimates that when Mexico digitized government payments, the cost to distribute wages, pensions and social welfare has dropped by 3.3 percent. Country-level estimates based on government funding for social benefits and subsidies.	BTCA ²²⁶

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HEALTH

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
1. Remote patient monitoring – Cost savings		
Application of remote monitoring systems to improve patient care	Sized based on cost savings to the healthcare system through reduced hospital visits, length of patients' stays and medical procedures. MGI (2013) suggests 10 percent to 20 percent savings to the healthcare system from the resultant reduced hospital visits, length of patients' stays and number of procedures relating to chronic diseases. Country-level estimates based on total healthcare spend based on World Bank data and the share of spending on chronic diseases.	<ul style="list-style-type: none"> • MGI (2013)²²⁷ • World Bank²²⁸
2. Telehealth – Cost savings		
Increasing the use of internet and mobile technologies for medical consultations	Sized based on cost savings to the healthcare system through reduced doctor visits. Goldman Sachs (2015) suggests USD 100 billion savings to US healthcare from telehealth. Country-level estimates based on relative national healthcare expenditure.	Goldman Sachs (2015) ²²⁹
3. Data-based public health interventions – GDP increments		
Use of analytics to direct highly targeted health interventions for at-risk populations	Sized based on the economic value of reduced disability-adjusted life years (DALYs) due to timely public health interventions. MGI (2018) indicates that the most significant and measurable impacts are on maternal and child health, as well as public sanitation and hygiene. It estimates a 0.4 percent reduction in DALYs for "high-income" countries, and 1.5 percent for other countries. Classification of countries by income based on the World Bank's definition. Economic value is taken to be this multiplied by GDP per capita, and is estimated based on the proportion of the population suffering from chronic diseases. Country-level estimates based on national population sizes and GDP per capita.	<ul style="list-style-type: none"> • MGI (2018)²³⁰ • UN Population Division (2018)²³¹ • World Bank²³²
4. Detection of counterfeit drugs – Cost savings		
Use of IoT and advanced analytics to detect counterfeit drugs	Sized based on the cost savings from reduced counterfeit drugs in the country due to a higher rate of detection. EU IPO (2016) estimates that the annual cost of counterfeit drugs to Europe's pharmaceutical industry is €10 billion. MGI (2013) also assesses that 30 percent to 50 percent of all drugs sold are addressable by this technology, and that its success rate is 80 percent to 100 percent. Country-level estimates of the national cost of counterfeit drugs based on the country's relative healthcare expenditure.	<ul style="list-style-type: none"> • EU Intellectual Property Office (2016)²³³ • MGI (2013)²³⁴

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HEALTH

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
5. Smart medical devices – GDP increments		
Analyzing data across connected implants, smart medical devices and wearables can lead to personalized and predictive care	Sized based on the economic value of reduced disability-adjusted life years (DALYs) due to health improvement measures prompted by data from such devices. MGI (2018) indicates a 1 percent reduction in DALYs for “high-income” countries, and 0.6 percent for other countries. Economic value is taken to be this multiplied by GDP per capita. Classification of countries by income based on the World Bank’s definition. Country-level estimates based on national population sizes and GDP per capita, and is estimated based on the proportion of the population suffering from chronic diseases.	<ul style="list-style-type: none"> • MGI (2018)²³⁵ • UN Population Division (2018)²³⁶ • World Bank²³⁷
6. Electronic medical records – Cost savings		
Expansion of cloud-based electronic medical record systems	Sized based on the cumulative savings opportunities (such as saving of physician and nursing time) from adopting electronic health records (EHR). MGI (2014) estimates that the widespread adoption of electronic medical records can create an economic impact of USD3 billion per year in India. Accounting for India’s share of global healthcare expenditure, the global economic impact is estimated. Country-level estimates based on relative national healthcare expenditure based on World Bank data and the global EHR market growth rates.	<ul style="list-style-type: none"> • MGI (2014)²³⁸ • World Bank²³⁹ • Transparency Market Research²⁴⁰

INFRASTRUCTURE

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
I. Smart grids – Cost savings		
Using digital communications technology to detect, react and optimize electricity networks	Sized based on cost savings from energy savings due to lower consumption and efficiency improvements. Smart Energy Consumer Collaborative (2018) estimates 5 percent to 10 percent energy savings. Country-level estimates based on total electricity consumption. Business and Sustainable Development Commission (2017) suggests that the global average wholesale price of electricity is USD100/Mwh.	<ul style="list-style-type: none"> • Smart Energy Consumer Collaborative²⁴¹ • World Bank²⁴² • Business and Sustainable Development Commission (2017)²⁴³

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INFRASTRUCTURE

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
2. 5D BIM and project management technologies – Cost savings		
Integrated modeling platforms simulating construction cost and timeline impacts of decisions in project planning, design, construction, operations, and maintenance	Sized based on cost reductions from improved coordination between different development parameters, as well as the continuous insight provided on project costs. MGI (2013) suggests that streamlining project delivery could bring about 15 percent savings to infrastructure cost, with 15 percent to 25 percent of these savings coming from 5D BIM technologies. Country-level estimates based on domestic construction sector costs.	<ul style="list-style-type: none"> • MGI (2013)²⁴⁴ • Global Infrastructure Outlook²⁴⁵
3. Predictive maintenance – Cost savings		
Using data from sensors to ensure prompt and predictive maintenance, minimizing downtime	Sized based on the economic value of benefits from sizeable applications including the predictive maintenance of public transit systems and water leakage detection and control. MGI (2018) estimates a 2.3 percent reduction in average commuting time from predictive transit for “high-income” countries, and 1.4 percent for other countries. Average commuting time by country derived from Dalia Research. On water leakage detection and control, MGI (2018) estimates a 1.4 percent reduction in water consumption for “high-income” countries, and 17.4 percent for other countries. Classification of countries by income based on the World Bank’s definition. Business and Sustainable Development Commission (2017) suggests that the global average price of water is USD0.90/m ³ . Country-level estimates based on average commuting time, population, GDP per capita and domestic water consumption.	<ul style="list-style-type: none"> • MGI (2018)²⁴⁶ • Dalia Research²⁴⁷ • World Bank²⁴⁸ • UNESCO-IHE (2011)²⁴⁹ • Business and Sustainable Development Commission (2017)²⁵⁰
4. Smart buildings – Cost savings		
Physical sensor networks, energy storage and data analytics which help improve resource efficiency of buildings and reduce energy and water consumption, as well as carbon emissions	Sized based on the economic value of the reduction in greenhouse gas emissions (GHG) and water consumption by building automation systems. MGI (2018) estimates a 2.9 percent reduction in GHG emissions and a 1.7 percent reduction in water consumption for “high-income” countries. The corresponding figures for other countries are 1.4 percent and 1.1 percent. Classification of countries by income based on the World Bank’s definition. Country-level estimates based on greenhouse gas emissions and water consumption from buildings. Business and Sustainable Development Commission (2017) suggests that the global average price of water is USD0.90/m ³ and GHG price is valued at USD50/ton (a global proxy price that equates roughly to the financial incentives needed to achieve carbon emissions consistent with a 2-degree pathway).	<ul style="list-style-type: none"> • MGI (2018)²⁵¹ • IPCC²⁵² • World Bank²⁵³ • Business and Sustainable Development Commission (2017)²⁵⁴

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MANUFACTURING

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
1. Big data analytics – Increased revenues		
Use of big data analytics in demand forecasting / shaping, and supply planning	Sized based on increased revenue from more accurate demand-supply matching leading to increased sales. MGI (2011) suggests a 2.5 percent to 3 percent increase in profit margin. Country-level estimates based on domestic manufacturing sector GDP.	MGI (2011) ²⁵⁵
2. Additive manufacturing – Productivity gains / cost savings		
Use of dynamic, resource efficient 3D printing and related technologies to enable 'on-time' manufacturing & rapid manufacturing	Sized based on the incremental economic value of faster time-to-market due to quicker prototyping and design adjustments, reduced production time, higher material productivity as well as more efficient sales process due to product customization. McKinsey & Company (2017) estimates that the global economic value of this could reach between USD100 billion and USD250 billion by 2025. Current economic value is calculated based on today's global manufacturing sector GDP, and assuming a constant growth rate for the 2030 forecast. Country-level estimates based on the domestic manufacturing sector GDP as a share of the global figure.	McKinsey & Company (2017) ²⁵⁶
3. Supply chain management – Cost savings		
Savings in operating costs from IoT-enabled supply chain management and distribution network management	Sized based on increased revenue from more accurate demand-supply matching leading to increased sales. MGI (2011) suggests a 2.5 percent to 5 percent savings in distribution and supply chain operating costs, and that these costs make up 2 percent to 6 percent of manufacturing sales. Country-level estimates based on domestic manufacturing sector operating costs.	MGI (2011) ²⁵⁷
4. Automation and robotics – Productivity gains		
Productivity boost from automating mundane and repetitive production tasks	Sized based on productivity boost to manufacturing processes from robots performing mundane and repetitive tasks. World Economic Forum and AT Kearney (2017) estimate 20 percent increased production. Country-level estimates based on domestic manufacturing sales.	World Economic Forum and AT Kearney (2017) ²⁵⁸

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MOBILITY

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
1. Smart roads – Time savings		
Real-time public transit information, intelligent traffic signals and real-time road navigation which reduce commuting time	Sized based on the economic value of real-time public transit information, intelligent traffic signals and real-time road navigation. MGI (2018) estimates a 2.2 percent reduction in average commuting time for “high-income” countries, and 5.5 percent for other countries. Classification of countries by income based on the World Bank’s definition. Country-level estimates based on average commuting time, population and GDP per capita.	<ul style="list-style-type: none"> • MGI (2018)²⁵⁹ • Dalia Research²⁶⁰ • World Bank²⁶¹
2. Smart ports – Cost savings		
Use of IoT to enhance port efficiency	Sized based on cost savings from reduced logistics costs due to IoT-enabled data collection and monitoring, as well as intelligent decision-making capabilities. Accenture and SIPG (2016) suggest 3.6 percent savings in logistics costs. Country-level estimates based on logistics sector costs (based on indicated percentages of the country’s GDP).	<ul style="list-style-type: none"> • Accenture and SIPG (2016)²⁶² • Council of Supply Chain Management Professionals (2013)²⁶³ • World Bank (2016)²⁶⁴
3. Autonomous vehicles – Cost savings		
Use of AI and sensors to increase fuel efficiency	Sized based on the projected gains in fuel efficiency, compared to conventional vehicles. MGI (2013) estimates that autonomous cars could travel more closely together, reducing air resistance and improving fuel efficiency by 15 percent to 20 percent. Country-level estimates based on number of cars, projected number of autonomous vehicles, annual fuel requirement, and cost of fuel.	MGI (2013) ²⁶⁵
4. Geospatial services – Productivity gains / cost savings		
Productivity impact of using location-based information	Sized based on estimated productivity impact geospatial services in the transport sector (land, sea and air). AlphaBeta (2017) has estimated that geospatial services could have between 2.5 percent and 5 percent of productivity impact on the land, sea and air transport. These benefits range from reduced logistics costs, improved network design and management. Country-level estimates based on the size of the land, sea and air transport sector.	<ul style="list-style-type: none"> • AlphaBeta (2017)²⁶⁶ • Expert interviews • University of Groningen²⁶⁷

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264. World Bank (2016), *Logistics performance index: Ranking by countries*. Available at: <https://lpi.worldbank.org/international/global>

265. McKinsey Global Institute (2013), *Disruptive technologies: Advances that will transform life, business and the global economy*. Available at: https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Disruptive%20technologies/MGI_Disruptive_technologies_Full_report_May2013.ashx

266. AlphaBeta (2017), *The Economic Impact of Geospatial Services: How Consumers, Businesses And Society Benefit from Location-Based Information*.

Available at: https://www.alphabeta.com/wp-content/uploads/2017/09/GeoSpatial-Report_Sept-2017.pdf

267. University of Groningen. Available at: <https://www.rug.nl/ggdcl/productivity/110-sector/>

RESOURCES

DESCRIPTION	SIZING ASSUMPTIONS	SOURCES
1. Operations management: Smart exploration & autonomous mining equipment – Productivity gains / cost savings		
Use of big data to analyze large amounts of geoscience and drilling data to locate probable deposits proactively and efficiently, and automation of extraction and transport	Sized based on the potential global economic value of such technologies in mining. McKinsey & Company (2015) estimates this to be USD250 billion, based on an 80 percent adoption rate scenario. Country-level estimates based on the relative share of global mining sector GDP.	McKinsey & Company (2015) ²⁶⁸
2. Predictive safety – Productivity gains / cost savings		
Technologies that improve productivity and safety such as wearables with in-built sensors that monitor fatigue, location, atmosphere and vitals, and augmented reality interfaces that improve human-machine interaction	Sized based on the potential global economic value of such technologies in mining. McKinsey & Company (2015) estimates this to be USD15 billion, based on a 100 percent adoption rate scenario. Country-level estimates based on the relative share of global mining sector GDP.	McKinsey & Company (2015) ²⁶⁹
3. Predictive maintenance – Productivity gains / cost savings		
Remote operations centers and data-collecting sensors on mining equipment which help improve failure anticipation, reduce unscheduled breakdowns and increase equipment life	Sized based on the potential global economic value of such technologies in mining. McKinsey & Company (2015) estimates this to be USD105 billion, based on a 100 percent adoption rate scenario. Country-level estimates based on the relative share of global mining sector GDP.	McKinsey & Company (2015) ²⁷⁰

268. McKinsey & Company (2015), *How digital innovation can improve mining productivity*.

Available at: <https://www.mckinsey.com/industries/metals-and-mining/our-insights/how-digital-innovation-can-improve-mining-productivity>

269. McKinsey & Company (2015), *How digital innovation can improve mining productivity*.

Available at: <https://www.mckinsey.com/industries/metals-and-mining/our-insights/how-digital-innovation-can-improve-mining-productivity>

270. McKinsey & Company (2015), *How digital innovation can improve mining productivity*.

Available at: <https://www.mckinsey.com/industries/metals-and-mining/our-insights/how-digital-innovation-can-improve-mining-productivity>

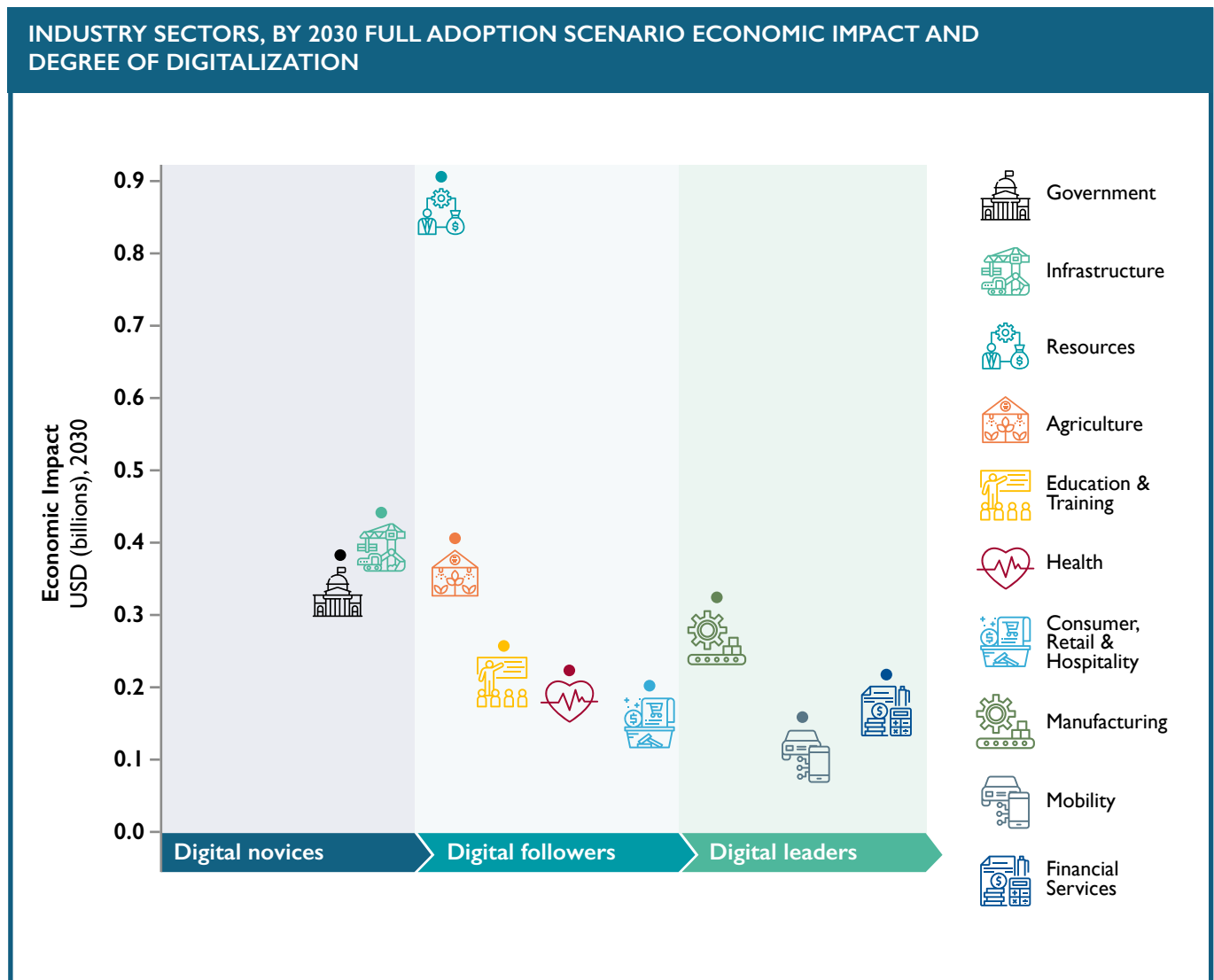
APPENDIX A3: CLASSIFICATION OF SECTORS

Based on existing literature (e.g., studies from McKinsey & Company, McKinsey Global Institute and Accenture) and expert interviews, sectors could be categorized into three groups in terms of their digital technology adoption (Exhibit A5)²⁷¹

CLASSIFICATION OF SECTORS BY DIGITAL TECHNOLOGY ADOPTION

- Digital novices:** The first group of sectors exhibit the lowest digitalization rates and includes the infrastructure and government sectors.
- Digital followers:** The second group of sectors exhibits varying levels of digitalization rates but is still lagging behind the “Digital leaders”. This group consists of the resources, agriculture and food, education and training, health as well as consumer, retail and hospitality sectors.
- Digital leaders:** The third group of sectors exhibits the highest digitization rates and are typically the early adopters of digital technology applications. This group includes the manufacturing, mobility and financial services sectors.

EXHIBIT A5: THE “DIGITAL SPRINTERS” COULD IMPROVE DIGITAL TECHNOLOGY ADOPTION SIGNIFICANTLY ACROSS MOST INDUSTRY SECTOR



SOURCE: AlphaBeta analysis, McKinsey, Accenture

271. Sources include McKinsey & Company (2018), *The Rise of Digital Challengers*. Available at: <https://www.mckinsey.com/~/media/McKinsey/Featured%20Insights/Europe/Central%20and%20Eastern%20Europe%20needs%20a%20new%20engine%20for%20growth/The-rise-of-Digital-Challengers.ashx>, AlphaBeta (2017), *Digital Nation: Policy Levers for Investment and Growth*. Available at: https://www.alphabeta.com/wp-content/uploads/2017/05/DigiNations_FA.pdf, Accenture (2017), *Accenture Turkey Digitization Index*. Available at: https://www.accenture.com/_acnmedia/pdf/48/accenture-turkey-digi-ind-report-english.pdf?fla=en and Harvard Business Review (2016), “Which Industries Are the Most Digital (and Why)?”. Available at: <https://hbr.org/2016/04/a-chart-that-shows-which-industries-are-the-most-digital-and-why>



APPENDIX B
POLICY FRAMEWORK

APPENDIX B1: POLICY SELECTION

The methodology how individual policy levers were selected is outlined in Box 1 in Chapter 3.

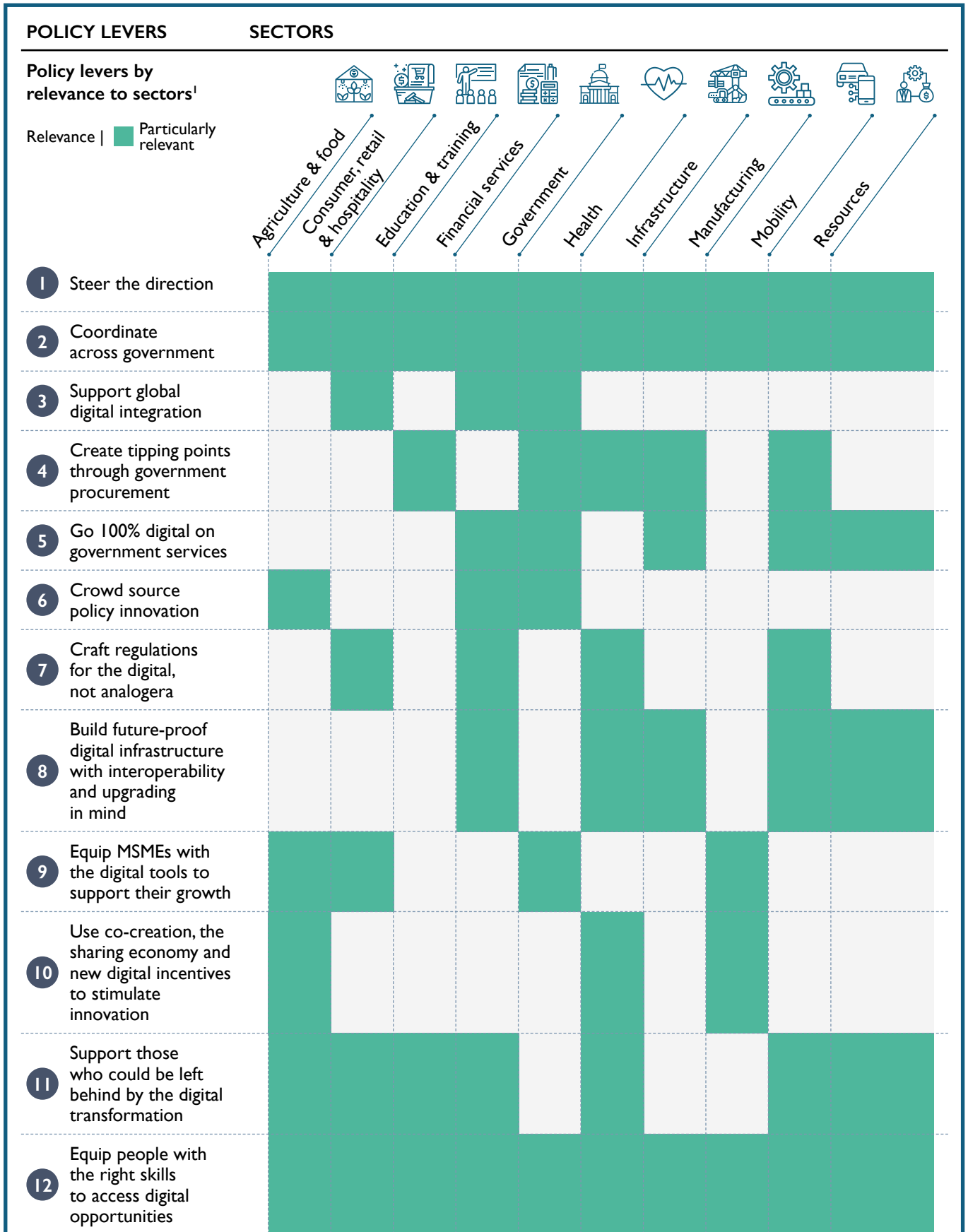
APPENDIX B2: SECTOR RELEVANCE

EXHIBIT B1 shows which policy levers are particularly relevant for which sectors and therefore which policy levers should be considered first by emerging economies with a particular sector focus.

Relevance to sectors by policy lever was established in the following ways:

- **Steer the direction.** The policy actions outlined under this lever are cross-cutting and therefore equally relevant to each sector.
- **Coordinate across government.** The policy actions outlined under this lever are cross-cutting and therefore equally relevant to each sector.
- **Support global digital integration.** This policy lever is particularly relevant for sectors that depend significantly on trade and cross-border data flows such as cross-border e-commerce and cross-border financial transactions. This lever is also highly relevant for the government sector for addressing non-tariff barriers to trade such as the ease of business registration.
- **Create “tipping points” through government procurement.** These policy actions are of particular relevance to sector in which products or services exhibit high-levels of the characteristics of public goods. This means that these are good that the private sector traditionally struggles to provide by relying on market forces of demand and supply due to the presence of positive externalities. These include any sectors that provide public infrastructure such as education & training, health, infrastructure and mobility.
- **Go 100% digital on government services.** On top of the obvious importance to the government sector these policy actions are of particular relevance to sectors that in turn rely heavily on government services or are subject to stringent regulations such as financial services, infrastructure, mobility and resources.
- **Crowd source policy innovation.** This policy lever can be relevant to a number of sectors, however, the most common use in recent years has been around developing suitable policy and regulation for innovative technologies in sectors that require strong government oversight such as food & ag-tech as well as fintech.
- **Craft regulations for the digital, not analog era.** This policy lever is most relevant to sectors that have seen drastic shifts in business models that have changed the incentive structures of market players for investment and collaboration. Examples are e-commerce and
- **Build future-proof digital infrastructure with interoperability and upgrading in mind.** These policy levers are particularly relevant for sectors dependent on heavy infrastructure investments or involved in the construction of such infrastructure. With the obvious relevance to the infrastructure sector, these include, for example, financial services, mobility and resources.
- **Equip MSMEs with the digital tools to support their growth.** These policy levers are most relevant to sectors where SMEs make up a large share of employment or output such as agriculture & food; consumer, retail & hospitality and manufacturing. It is also relevant to the government sector as digital penetration of MSMEs can be driven by delivering digital government services such transfers from credit schemes, digital invoicing, or business registration processes.
- **Use co-creation, the sharing economy and new digital incentives to stimulate innovation. ...**
- **Support those who could be left behind by the digital transformation. ...**
- **Equip people with the right skills to access digital opportunities.** The policy actions outlined under this lever are cross-cutting and therefore equally relevant to each sector.

EXHIBIT B1: SOME POLICY LEVERS ARE MORE RELEVANT TO CERTAIN SECTORS THAN OTHERS



1. Relevance is determined by evidence of application to a particular sector, or evidence of a cross-cutting policy having direct impact on economic growth or development in a particular sector.

SOURCE: AlphaBeta consumer survey



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strategy x economics