Ten ideas to maximize the socioeconomic impact of ICT in Indonesia

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Ten ideas to maximize the socioeconomic impact of ICT in Indonesia

As the new government of Indonesia begins its work, many expect a major transformation in Southeast Asia's largest country and economy. The government has announced it will focus its development priorities on improving citizens' lives, raising the quality of social and government services, and creating a dynamic and growing economy.

Indonesia is the world's 4th largest country by population and the 16th biggest economy, but it is in the middle of the pack when it comes to ICT capabilities (Exhibit 1).

Research has established the importance of ICT in fostering a nation's social and economic strength.

A World Economic Forum analysis shows a strong positive correlation between ICT readiness and an economy's competitiveness (Exhibit 2). Other research has found that for every 10 percent increase in broadband penetration, the positive impact on GDP growth is 1.21 to 1.38 percent.[1] A healthy ICT sector has a strong spillover effect; every ICT job creates about three jobs in other sectors.[2] In addition, a vibrant ICT sector may also contribute to more equitable social development and a more transparent and efficient public sector.

This report discusses ten ideas the Indonesian government might consider to maximize the socioeconomic impact of its ICT sector. It draws on McKinsey research and expert interviews and

Exhibit 1   **Indonesia ranks in the middle on most key ICT metrics.**

Country	Network-readiness score 2014 rank[1]	2013 rank[2]	Infrastructure and digital content 2014 rank	Affordability 2014 rank	Skills 2014 rank	Individual usage 2014 rank	Business usage 2014 rank	Government usage 2014 rank	Economic impact 2014 rank	Social impact 2014 rank
Singapore	2	2	16	46	2	10	15	1	6	1
Malaysia	30	30	71	48	67	49	27	9	30	25
Russia	50	54	47	14	64	46	84	61	41	41
China	62	58	86	60	59	80	44	38	81	44
Indonesia	**64**	**76**	**85**	**37**	**61**	**95**	**36**	**49**	**86**	**63**
Thailand	67	74	73	47	74	85	59	84	104	68
Brazil	69	60	56	91	91	59	41	54	64	58
Philippines	78	86	89	75	69	91	43	67	48	76
India	83	68	119	1	101	121	51	41	50	73
Vietnam	84	84	121	8	88	84	88	58	96	62

[1]2014 rank is out of 148 countries.
[2]2013 rank is out of 144 countries.
Source: *Global Information Technology Report 2014,* World Economic Forum, 2014

Exhibit 2   **ICT readiness is strongly correlated with global economic competitiveness.**

Increasing economic competitiveness,
Global Competitiveness Index[1]

Increasing ICT readiness,
Networked Readiness Index[2]
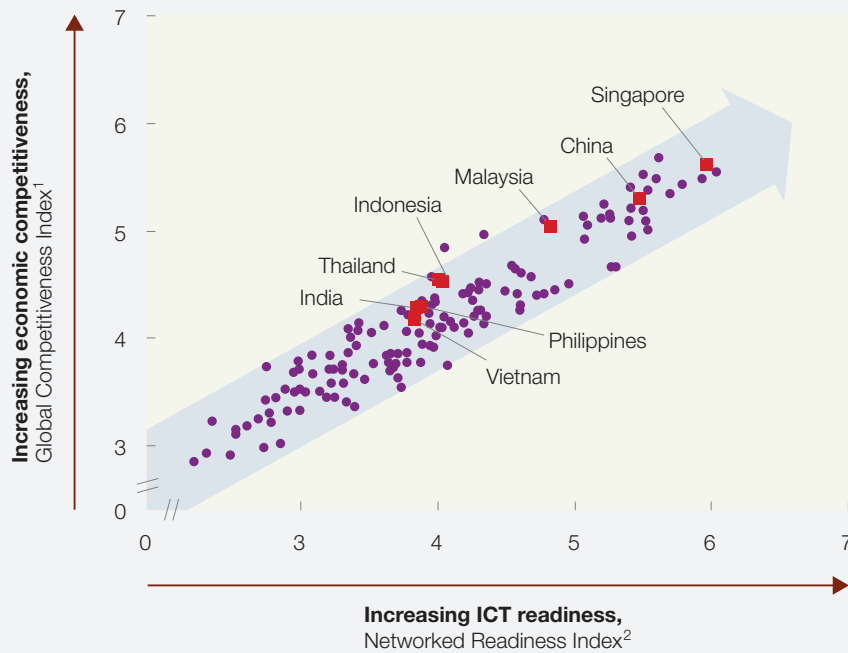
- Broadband access boosts a country's economic competitiveness and GDP
- Research points to 1.21–1.38% of GDP growth per 10% broadband-penetration increase

[1]Composite index of indicators relating to institutions, infrastructure, macroeconomy, health, education, market efficiency, technological readiness, business sophistication, and innovation.
[2]Composite index of indicators relating to electricity, mobile-network coverage, international Internet bandwidth, secure Internet servers and accessibility of digital content, affordability of services (prepaid and fixed broadband tariffs and Internet and telephony competition), and skills.

Source: International Telecommunications Union; World Economic Forum

on perspectives from multiple stakeholders on our initial thinking. We have grouped these into three themes:

- developing a vibrant ICT ecosystem

- using ICT to foster accelerated, equitable economic growth

- using ICT to enable sustainable social development

Developing a vibrant ICT ecosystem in Indonesia

Idea 1: Develop a national ICT agenda and road map linked to Indonesia's economic and social-development priorities
Governments everywhere are realizing the importance of an ICT master plan. Such a plan

articulates how ICT supports their citizens, businesses, and economies. A national ICT plan could help achieve Indonesia's development goals.

An effective ICT plan includes clear objectives and initiatives underpinned by the government's broad social and economic-growth aspirations. Goals can include targets for affordability, availability, quality, and reach of ICT services. While Indonesia is doing better on such metrics compared with half of its regional peers, it trails Brazil and Russia in ICT infrastructure[3] (Exhibit 3).

Emerging countries like Brazil, India, Mexico, and Turkey are creating ICT road maps and setting clear broadband coverage targets (see sidebar "What other countries are doing").

Exhibit 3   **Indonesia does well against its regional peers on key infrastructure and digital content indicators but trails some of its global peers.**

Infrastructure and digital-content rank (out of 148)	Country	Electricity production, kWh/capita[1]		Mobile-network coverage, % of population		International Internet bandwidth, kbps[2] per user		Secure Internet servers/million population		Accessibility of digital content	
		Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value
16	Singapore	19	8873.8	1	100.0	4	387.6	25	635.3	9	6.3
47	Russia	29	7365.7	101	95.0	51	32.8	64	38.9	66	5.2
56	Brazil	73	2700.2	28	100.0	41	44.8	59	54.3	92	4.7
71	Malaysia	50	4523.5	93	96.8	79	16.4	57	65.7	44	5.5
73	Thailand	78	2343.0	1	100.0	61	26.6	83	19.6	82	4.8
85	**Indonesia**	**104**	**748.1**	**1**	**100.0**	**77**	**17.1**	**105**	**3.9**	**80**	**4.9**
86	China	61	3508.4	54	99.5	125	3.3	111	3.1	67	5.2
89	Philippines	105	727.8	58	99.0	86	14.3	96	8.6	73	5.1
119	India	101	861.7	122	83.0	111	5.3	108	3.6	84	4.8
121	Vietnam	96	1129.1	132	70.0	90	13.4	99	6.7	61	5.3

[1]Kilowatt-hours per capita.
[2]Kilobits per second.

Source: *Global Information Technology Report 2014, World Economic Forum, 2014*

Idea 2: Work with the ICT industry to resolve major infrastructure bottlenecks and improve reach, cost, and bandwidth

Indonesia could take several steps to expand its ICT infrastructure:

Address bottlenecks through regulatory and supply-model policies

Countries have used the following models to fund infrastructure and could serve as examples for Indonesia:

- **Market competition among private operators.** This is the most common approach in Asia, Europe, and the United States. Governments could spur new and existing operators to expand broadband coverage by issuing licenses and offering subsidies to invest in infrastructure. In 1995, the South Korean government proposed increasing broadband penetration from zero to universal coverage. To encourage competition among private operators, it offered to issue new licenses, delay implementation of local loop unbundling, and provide subsidies for which all operators could apply. The approach proved tremendously successful, with broadband now available in almost all homes.

- **Supportive regulation.** Regulators could promote high-speed broadband rollouts through regulatory holidays, spectrum allocation, and a universal-service-obligations (USO) fund. For instance, India is laying a

What other countries are doing

India's new prime minister, Narendra Modi, emphasizes using technology to address issues ranging from farming to governance. The government has rolled out the Digital India project to support the effort. It plans to offer a one-stop shop for government services, using the mobile phone as the backbone of the initiative. Between 2014 and 2019, the government aims to invest $18.65 billion to transform India into a connected economy, attract investment in electronics manufacturing, create millions of jobs, and support trade. Digital India's goals span the banking, education, health, public, and social-services sectors. Prime Minister Modi has said he wants to ensure there is a smartphone in the hands of every citizen by 2019. About 74 percent of the population has mobile phones, most of which are owned by urban Indians.[1]

Mexico's National Digital Strategy (2013–18) would encourage the adoption and development of ICT for the social and economic benefit of the people. The plan focuses on government transformation, digital economy, quality education, universal effective healthcare, and public safety. By 2018, Mexico aims to be the leading Latin American country in terms of digitization (it was ranked fifth in 2011) and to be at par with OECD countries.[2]

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[1] Romit Guha and Anandita Singh Mankotia, "PM Modi's Digital India project: Government to ensure that every Indian has smartphone by 2019," *Economic Times*, August 25, 2014, indiatimes.com.

[2] Patrick Nixon, "Peña Nieto presents 2013–18 National Digital Strategy," *BNamericas*, November 26, 2013, bnamericas.com.

national fiber-optic network using state-run telecom, power, and railway companies. In the next five years, the government will invest about $5 billion from a $6.3 billion USO fund, paid by private service providers, to offer broadband and mobile service in 55,000 villages.[4]

- **Public-private partnerships.** The government could collaborate with the private sector to support infrastructure rollout. For instance, Malaysia established a high-speed broadband program, in which the government funded 21 percent of the cost while the incumbent operator, Telekom Malaysia, shouldered the remaining 79 percent. As of the third quarter of 2014, broadband penetration had reached 67.8 percent, surpassing the 2012 target of 65 percent.[5]

Review policies on spectrum to find ways to use this scarce resource more efficiently
In today's mobile-broadband world, network data traffic is growing exponentially while growth in subscribers is slowing. Existing cellular-spectrum policies were developed for voice and low-speed-data services when rapid subscriber growth was the main factor behind increasing demand. Today's

broadband networks ideally need a mix of low- and mid-range frequency for coverage, a blend of mid- and high-range frequency for capacity, and large channel sizes (20 megahertz) to better handle data congestion and minimize throughput loss. Thus, historic allocation principles are not well suited for data, and the government could consider reevaluation of spectrum policies.

Application of technology- and service-neutrality policies in all future spectrum auctions could also prove effective. Many other countries have adopted technology neutrality in spectrum licensing, including Brazil, Colombia, India, Pakistan, and Tanzania.[6] Technology-neutral licenses allow operators to choose from a mix of technologies (for example, 2G, 3G, 4G, and fixed wireless) in serving different areas and customer profiles. This lowers deployment cost, as operators are able to employ the most appropriate technology. There are other benefits, including faster network deployment and penetration. An important exercise to consider before introducing license neutrality is spectrum rearrangement. The goal is to create contiguous bands that maximize spectral efficiency and ensure a level playing field among operators.

Another approach is spectrum refarming. This would enable existing license holders to retain rights to a spectrum and to alter or update its use to accommodate new technology. For instance, refarming would allow operators to use existing 2G allocations in 900 megahertz or 1,800 megahertz for 3G or 4G. Many countries already use this strategy, as telecom players refarm 2G and 3G spectrums for use in 4G and mobile-broadband services. Other countries require reallocation or reauction of some part of the spectrum.

Fast-track reallocation of the 'digital dividend'
Indonesia could accelerate its allocation of the "digital dividend"—spectrum made available by moving TV and radio channels from existing frequencies to lower ones, freeing 700 megahertz for wireless broadband. Indonesia has already stated its commitment to award 700 megahertz for wireless-broadband use in line with the Asia–Pacific Telecommunity agreement, but time lines have yet to be announced. Various countries have already auctioned 700 megahertz, including the United States, which began to license its use as early as March 2008.

Create contiguous blocks of spectrum and issue larger blocks for operators
Spectrum rearrangement to create contiguous blocks and allocation of larger amounts of spectrum are essential to efficiency and better quality of service. For example, the US Federal Communications Commission has released more spectrum and in bigger blocks for broadband use. In India, the Telecom Regulatory Authority is reshuffling allocations of 900 and 1,800 megahertz in cooperation with defense and other government users before its 2015 spectrum auction. It aims to create bigger chunks of contiguous spectrum that can serve higher data speeds.

Use 'white spaces' and unlicensed spectrum
Another option would help to ensure availability of spectrum for backhaul and Wi-Fi offloading, as well as the creative use of "white spaces" (unused spectrum) and unlicensed spectrum.

Spectrum suitable for point-to-point or point-to-multipoint use could be transferred from outdated government use to commercial backhaul. Doing so would help make spectrum more available for high-speed backhaul to support mobile cell sites.

Indonesia plans to use unlicensed spectrum (2.4 gigahertz, 5.1 gigahertz, 5.8 gigahertz, 26 gigahertz, and 60 gigahertz) to off-load traffic. However, the plans are nascent, and detailed guidance and timelines are yet to be announced.

Effective use of white spaces may also be worth pursuing. For instance, in 2010, the US Federal Communications Commission coined the term "super Wi-Fi" to describe the use of spare TV-broadcasting airwaves to deliver wireless broadband in areas where prior attempts didn't work (for example, places with too many buildings, trees, or bodies of water that block signals). The Philippines, Singapore, South Africa, and the United Kingdom are using this model, with governments and the private sector cooperating to employ white spaces to take wireless broadband to previously unserved areas.

Encourage infrastructure sharing across fixed and mobile networks
Infrastructure sharing helps to reduce the overall investment required to roll out networks and accelerates deployment speed. In many countries, mobile-telecom operators have shared passive infrastructure such as towers and active network equipment. Experience suggests sharing can reduce an operator's total network spending by about 30 percent, while significantly improving quality and coverage.[7]

In Indonesia, mobile operators have shared tower infrastructure selectively; analysts estimate that operators share 30 percent of towers.[8] Indonesia could consider measures to spur more tower sharing, for future roll-outs, to maximize the return on industry's investment budget and speed up the overall introduction of mobile broadband. If appropriately designed, this can encourage private investment while ensuring prior roll-out commitments are met. In addition, greater reliance

on the market to sort out sharing agreements might encourage, rather than penalize, operators that made early investments.

To reduce cost and accelerate deployment, the country might consider extending infrastructure-sharing arrangements among private operators to fixed-line assets such as fiber. This is happening in India; a new operator rolling out a pan-India 4G network has entered fiber-sharing arrangements with several incumbents. One of the sharing deals will cover nearly 500,000 fiber-pair kilometers across 300 cities and towns.[9]

Idea 3: Address the ICT digital divide between urban and rural areas with tailored policies and alternative supply models

Like most emerging markets, Indonesia has an uneven population distribution; urban areas comprise 53 percent of the population while the remaining 47 percent live in rural areas across the archipelago of more than 18,000 islands. While rural areas tend to have low population density and large land areas, cities like Jakarta and Surabaya are highly concentrated. For instance, 80 percent of 3G base stations are located in the top seven urbanized provinces; the remaining 20 percent are in the rest of the 25 provinces (Exhibit 4). This imbalance creates a substantial challenge for regulators, who would like to stimulate investment and ensure penetration not only in big cities but also in rural areas.

In 2005, Indonesia set up a USO fund to provide connectivity and Internet services to the rural areas where broadband service is lagging behind. Operators contribute 1.25 percent of their gross revenue to the fund and can access the fund to roll-out and operate communications services

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Exhibit 4 | **Rural mobile coverage lags significantly behind urban coverage.**

Number of 3G base transceiver stations by province and operator, thousands
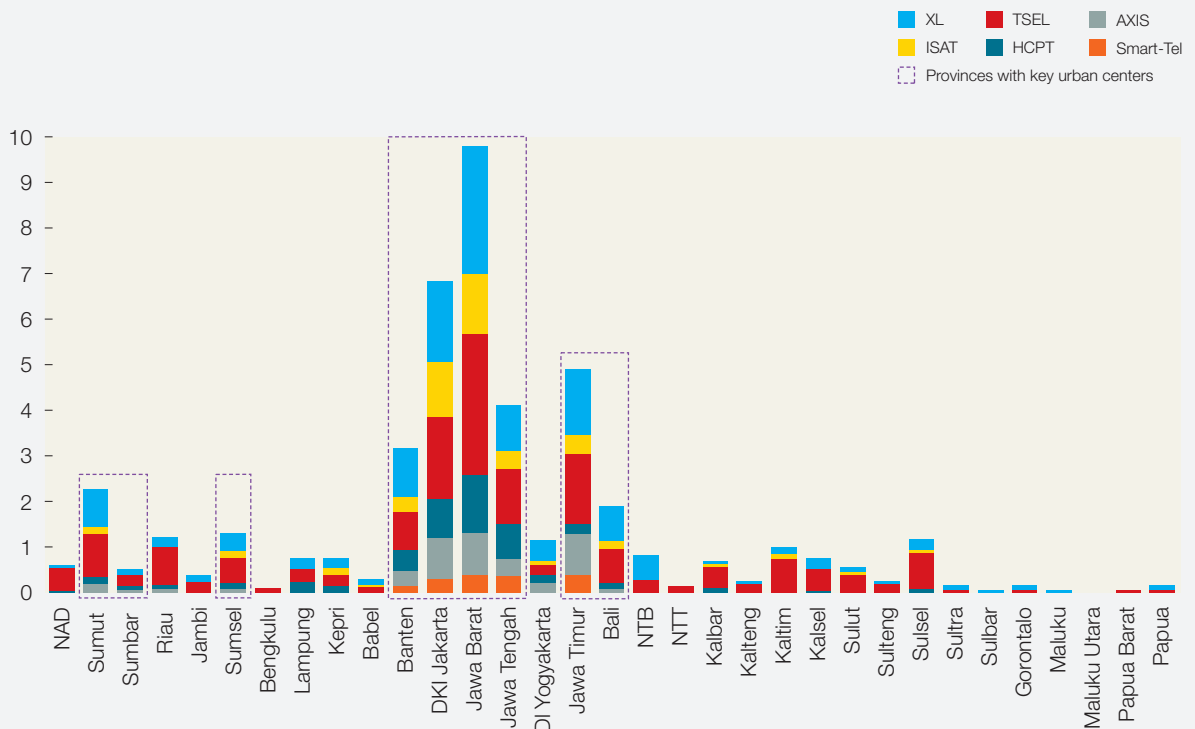
Source: *Statistical Data of Resources and Equipment of Post and Information Technology Sector*, Directorate General of Resources and Equipment of Post and Information Technology and Ministry of Communication and Information Technology, Indonesia, Semester 1, 2013

in remote areas via open tenders. However, the model has faced some significant challenges, including lack of electricity, poor maintenance, and difficulties in monitoring and evaluation. Some local governments are unaware of the USO fund, lack information on how it operates and how to take advantage of it, and face coordination issues with the USO implementing agency.[10]

Other countries have used different methods to achieve the same objectives. For example, in China, the government has legally mandated rural-network-rollout requirements for all operators. By 2013, China achieved 90 percent broadband coverage in villages with an administrative presence and 20 percent household broadband penetration in rural areas, with speeds up to four megabits per second.

Some countries have encouraged microfinance organizations, private entrepreneurs, or community organizations to help improve rural connectivity. Others have contributed government funding in whole or in part (public-private partnerships) to accelerate rural infrastructure deployment.

Another option is introducing differential spectrum pricing to help lower the cost of rural deployment, and potentially use public-supply models in remote areas that are less attractive to private investment. Finally, regulators could extend this thinking to fixed services, where Indonesia could have a different wholesale regime for rural and urban areas.

Idea 4: Ensure the regulatory environment can address effectively a constantly changing ICT sector

In addition to helping create jobs, ICT also helps foster competition and improves productivity for businesses of all sizes. One of the prerequisites of ICT success is a favorable business environment, supported by an effective institutional and regulatory environment. The following steps could help speed the creation of these circumstances:

- **Establish a convergent regulator.** The convergence of broadcasting, telecommunication, and information technology has blurred the lines among industries. In addition, traditional regulation that deals with each industry as a distinct entity adds to the challenge of attracting investment, stimulating competition, fostering innovation, settling disputes, and coordinating among policy makers and regulators. As a result, some countries, including Brunei, Malaysia, Singapore, and Thailand, have created a convergent regulator responsible for ICT, merging two or three departments into one. Indonesia, with its multiple regulators for telecommunications, broadcasting, and information technology, as well as a separate competition commission, could consider moving in a similar direction.

- **Strengthen intellectual property (IP) policies to create a favorable business environment.** IP can have a big impact on a nation's ability to innovate and hence its socioeconomic development. Regulators could consider taking steps to strengthen IP rights, including effective enforcement of IP violations, and making sure copyright and patent laws serve innovators and inventors. Much of the impact will depend on policy choices that shape the national IP system, starting with the legal framework.

- **Reinforce regulations concerning cybersecurity, data security, and a safer Internet.** Indonesia ranked tenth in Symantec Corporation's list of countries with the most cybercriminal activity in 2011, accounting for 2.4 percent of the world's cybercrimes. To address this situation, policy makers could define a national cybersecurity strategy and strengthen support for a safer Internet to deal with online risks, specifically for children. Another approach is to enact laws to combat cybercrime (see sidebar "Risk and responsibilities in a hyperconnected world").

Using ICT to foster accelerated, equitable economic growth

Risk and responsibilities in a hyperconnected world

Global awareness is growing among business, civil society, and government leaders about the importance of developing systems to mitigate the risk of cyberattacks. In the 2014 report *Risk and responsibility in a hyperconnected world*, the World Economic Forum and McKinsey & Company assessed action areas and studied the impact of cyberattacks and response and readiness to them, based on consultation with more than 500 executives, experts, and policy makers.[1]

The report argues that it is crucial to develop a clear set of action areas that global leaders from the private, public, and civil-society sectors can collectively explore to increase cyberresilience.

With regard to the role of public and international policy, the report argued that the public sector has a responsibility to address the threat by ensuring policies such as a national cyberstrategy and an end-to-end criminal justice system are in place. The report recommended that:

- Each nation connected to the Internet develops a comprehensive and transparent cyberstrategy.

- Whatever strategies are developed should take account of the private and civil sectors and use economic and security issues as a lever to promote the adoption of initiatives.

- Countries should create an institution responsible for implementation and rollout of the national strategy.

In addition, the report also emphasized the importance of a criminal-justice system that includes not only policies and institutions but also a law-enforcement mechanism with the capabilities and resources to pursue and prosecute cybercrime offenders. Finally, the report reiterated the importance of a multistakeholder approach in responding to cyber risk.

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[1] *Risk and responsibility in a hyperconnected world*, World Economic Forum and McKinsey & Company, January 2014, weforum.org.

Idea 5: Develop upstream and downstream ICT industries

Strengthening strategic sectors of the economy is a priority for the new Indonesian government. ICT could play an important role in achieving this goal and, in the process, help the agriculture, banking, and energy industries become more competitive. Indonesia could consider encouraging multinational corporations (MNCs) to invest in local

manufacturing and to train workers. Supporting the development of technology clusters in locations where MNCs invest, and creating software-incubation centers near leading engineering schools, could encourage software start-ups to share ICT resources and learn from each other. The government could also consider:

- **Building technology hubs.** As mobile-broadband services proliferate, the government

Germany's Rhine-Main region

The cluster in Germany's Rhine-Main region receives financial grants and incentives through the federal government's Leading-Edge Cluster competition. Launched in 2007, the competition

promotes the identification of cutting-edge technology clusters and provides support and funding for one to five years to spur growth, job creation, and innovation.

could offer incentives to encourage the growth of domestic manufacturing industries. One option would be to create hardware-manufacturing cluster parks or special economic zones and upgrade local infrastructure to support large-volume contract manufacturing (see sidebar "Germany's Rhine–Main region").

- **Fostering creative industries.** Support for creative industries like media, e-services, and digital applications could multiply their economic and social contributions. Indonesia has had some growth in innovative, high-technology industries, such as those based on the Internet. However, the country faces challenges caused by limited market-access information, scarce seed capital, and the impact of disruptive technology innovations on local players (see sidebar "Dubai's media hub").

Idea 6: Increase supply of skilled ICT workforce
Indonesia faces a shortfall of about nine million skilled and semiskilled ICT workers between now and 2030.[11] The country also trails its regional peers in graduating science and engineering students. Every year, only 44,000 of Indonesia's more than 800,000 university graduates take science degrees, compared with more than 227,000 of the Philippines' 550,000 college graduates; 722,000 of India's 3.8 million graduates; and 21,500 of Malaysia's 180,000 graduates. In addition, only 16 percent of Indonesia's annual college graduates have engineering degrees, compared with 33 percent in Malaysia and 24 percent in Vietnam.

There is a variety of different approaches to address this deficit:

- Raise awareness of ICT careers from primary school onward to cultivate early interest and attract talent.

- Introduce more ICT courses in high schools and universities to increase the opportunity for students to study science and engineering.

- Increase research budgets in universities and colleges to encourage development of ICT talent.

- Introduce funding for on-the-job ICT training and regular skills improvement.

- Invest in ICT vocational education for sectors (such as at smartphone assembly plants or involving the 3-D visualization of oil wells).

- Foster collaboration between universities, vocational institutes, polytechnics, and relevant industries to design diplomas or certifications, including guaranteed internships and placements.

Idea 7: Encourage ICT adoption by small and medium-size businesses
In 2012, Indonesia had over 55 million small and medium-size enterprises (SMEs), providing employment to about 108 million people and contributing roughly 60 percent of the country's total GDP.[12] SMEs account for more than 95 percent of all firms in Indonesia and are its largest employers. However, SMEs tend to be less productive than large

Dubai's media hub

Dubai has transformed itself into one of the Middle East's most important media hubs. To attract foreign investors, Dubai developed state-of-the-art infrastructure, including high-quality real estate and fiber and 4G telecom infrastructure. Dubai offered incentives such as 100 percent foreign ownership, ability to

repatriate 100 percent of capital and profits, and corporate and wage-tax exemptions guaranteed for 50 years. It also sponsors industry-supporting initiatives such as the Dubai International Film Festival, a dedicated media-production area, and copyright laws to protect intellectual property.

Hong Kong's and Singapore's SME approaches

Hong Kong launched two programs that created incentives for SMEs to adopt ICT. The first, launched in 2004, promoted ICT use in specific industries such as travel, healthcare, and logistics. It introduced and provided support for companies to develop ICT tools that increase efficiency, including systems implementation, portals, applications, and websites. The second program, which began in 2009, focused on the creation of training modules that would help SMEs assimilate the technology. Specific modules included Internet marketing, client-management tools, improved search tools, and better websites.

In February 2014, Singapore announced its ICT for Productivity and Growth program, allocating $394 million over three years to speed the adoption of ICT approaches among SMEs and boost their productivity and growth. The program aims to scale up use of proven ICT practices, pilot emerging technologies, and enable high-speed connectivity among businesses. Qualifying SMEs receive subsidies of up to 70 percent of the cost of their applicable ICT productivity approach. SMEs are also encouraged to pilot emerging technology practices such as use of sensors, data analytics, or robotics through subsidies of up to 80 percent of project cost and up to $788,000 per SME. Finally, the program promotes high-speed connectivity for SMEs by subsidizing 50 percent of the monthly recurring cost of their fiber subscription plan of at least 100 megabytes per second and 50 percent of the cost of setting up Wi-Fi connectivity in their public-facing business premises.

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enterprises. According to a study by the Organisation for Economic Co-operation and Development (OECD), the average GDP contribution of an SME employee is $139 compared with $3,514 per employee for a large company.[13] We believe using ICT can significantly improve SME productivity and competitiveness.

Incentives to SMEs to use ICT to modernize basic business systems (including accounting, payroll, and supply-chain management) could assist with this. Special ICT development zones and funds to encourage the development of innovative technology applications for Indonesian SMEs could also increase productivity (see sidebar "Hong Kong's and Singapore's SME approaches").

Idea 8: Use ICT to support priority sectors
ICT can contribute to the productivity, competitiveness, and growth of nationally important strategic sectors. For example, ICT could improve the competitiveness of Indonesia's transport sector, and farmers could raise their productivity by using ICT to sell directly to consumers in a move similar to what has occurred in India's agribusiness industry.

India's e-Choupal project

In 2000, the agribusiness division of one of India's conglomerates created e-Choupal, an Internet-based supply-chain system. The system enables farmers to sell their crops directly to producers, without paying fees to traders or commissions to agents. The initiative has reached more than four million farmers in over 40,000 villages through 6,500 kiosks across ten states. There is anecdotal evidence that farmers have doubled their incomes in certain parts of India.[1] The system could be extended to precision farming, where the provision of localized information can guide decisions to increase efficiency and yield.

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[1] "e-Choupal," ITC, 2015, itcportal.com.

ICT use in mining and petroleum

In heavy industries such as mining or petroleum, ICT can enable end-to-end automation of the production process, from instrumentation and field-data capture to data management and integration, advanced analytics, and forecasting and visualization. For example, a leading European multinational oil company monitors and operates its 40 North Sea offshore platforms from a single remote operations center (ROC), permitting it to use its concentrated expertise at any site.

An Australian mining company's ROC allows it to run fields in the Australian outback that otherwise might not be economically viable. Saudi Arabia's national energy company relies heavily on ICT for 3-D visualization and monitoring of its oil wells. Pertamina, Indonesia's largest state-owned enterprise and a leading regional oil-and-gas company, is using ICT to improve access to new resources, lower capital spending, increase production, and decrease operational cost.

The oil-and-gas industry could employ ICT tools like 3-D visualization and monitoring for wells to raise productivity (see sidebars "India's e-Choupal project" and "ICT use in mining and petroleum").

Using ICT to enable sustainable social development

Idea 9: Use ICT to improve citizen services
The ICT revolution can improve citizens' lives in many ways. As a first step, however, Indonesia would need to consider increasing Internet access among lower-income populations. Then Indonesia could harness ICT to more cheaply provide higher-quality education, healthcare, public safety, public transport, and financial and farming services.

Promoting inclusive growth for all
While Internet usage is increasing rapidly in Indonesia, penetration remains low. A considerable digital divide exists, particularly between large cities and rural villages. To help close the gap, the government might consider ways to spur demand for ICT. For example, it could provide low-interest loans to individuals, requiring minimal paperwork, for the purchase of personal computers or smartphones and tablets, perhaps in collaboration with telecommunications operators or technology companies. It could also offer funding for the purchase of similar devices for teachers and schools. One model could be Malaysia's 1Malaysia netbook program, which plans to distribute around

2.5 million computers to students. It also introduced a $60 rebate for people buying smartphones.[14] Brazil launched an initiative called PC Connectado, aimed at helping low-income families buy their first computers and connect to the Internet. The government made personal computers more affordable by providing low-interest consumer financing options and giving vendors tax incentives to encourage lower prices.[15]

Using ICT to facilitate financial inclusion
ICT can promote financial inclusion through access to banking. Only 20 percent of Indonesia's population over the age of 14 has accounts at formal financial institutions.[16] Experience in developing countries such as Kenya and the Philippines shows that approaches like electronic- and mobile-banking services are popular. For example, in the Philippines, both leading telecommunications companies offer financial services that allow consumers to transfer money and pay bills with a mobile phone. They have more than eight million users between them. While banking and mobile operators in Indonesia have launched mobile payments and banking products, they have yet to reach scale and broader adoption among users.

Mobile operators can help increase financial inclusion by using their networks to offer mobile money or online services such as remittances, bill payments, microcredit, and microinsurance. However, maximizing impact depends on creating an ecosystem of players including banks and other

financial institutions, telecommunication operators, system providers, and application developers. The government of Indonesia can play an important role in enabling this collaboration to ensure benefits for the public and fair value creation for the parties involved. A legal framework that would allow mobile operators to use their existing networks, massive informal physical-distribution networks, and money-collection and payment systems could also support the target of bringing half of the population into the formal banking system by 2018.

Using ICT to improve primary and secondary education

Government partnership with local businesses and multinational companies can advance the use of technology in the classroom. One successful program employing this model is the Jordan Education Initiative (JEI), a partnership between the government and local and global private-sector organizations. In 2003, JEI supplied 100 "discovery schools" around the country with equipment, computer labs, and broadband Internet. It also helped to create e-learning curricula for 80,000 pupils and IT training plans for 3,200 teachers. The performance of students in reading, math, and science as measured by the Programme for International Student Assessment was about 7 to 10 percent higher in the discovery schools compared with other schools.[17]

Using ICT to transform healthcare delivery

ICT could have a significant impact on Indonesia's healthcare system, promoting more collaboration among institutions, helping to upgrade the public-health information system, and improving access to health services.

Apollo Hospitals in India worked with a leading telecommunications company to provide medical services such as basic diagnostics and checkups through mobile devices. The project could help India offer affordable and accessible healthcare to millions of people in remote parts of the country.[18] South Africa has numerous mobile-health initiatives that focus on diseases such as HIV/AIDS and tuberculosis. They use ICT to provide treatment reminders and disclose information about diseases,

among other initiatives. Requests for information about HIV/AIDS have topped one million a day, and the percentage of patients who have completed the course of treatment for tuberculosis increased from 20 to 60 percent during 2009.

An electronic health strategy could use ICT to create a national medical-record database that citizens and service providers could share to cut costs and increase efficiency. And rural areas in need of medical services could benefit from telemedicine. Indeed, ICT could support the recently announced Indonesia Sehat (Healthy Indonesia) program, which aims to improve public-health services. The National Health Care plan, introduced in January 2014, could also take advantage of greater ICT use. The plan aims to provide health insurance to the country's 247 million citizens by 2019.[19]

Finally, ICT could aid the government's plan to use RFID technology for its electronic ID system. The program, called e-KTP, intends to integrate demographic data (such as biographic information, biometrics, signature, and photograph) with data-security and card-management features. In this way, the e-ID would be useful not only for the public healthcare system but also for electronic payments, voter registration, tax services, and passport issuance.[20]

Using ICT to improve public safety

Indonesia faces severe workforce limitations in law enforcement. Knowledge and skills remain uncodified, leaving the profession largely reliant on human judgment. The country could supplement the human element with ICT-based historical data and predictive models to estimate when and where crimes will occur.

PredPol (Predictive Policing), a tool developed by researchers at UCLA and Santa Clara University in cooperation with crime analysts and police officers, has been used to reduce the robbery rate in Santa Cruz, California, by 27 percent from 2011 to 2012. Other US police departments have adopted the technology and have had annual double-digit percentage declines in crime.[21]

Using ICT to improve the quality of public transport

The growing speed and scale of urbanization in Indonesia increases the country's need for well-functioning public-transport systems. Analysts estimate the direct cost of congestion in Jakarta alone at $3 billion a year[22] and expect that figure to increase. To battle congestion, ICT could provide forecasts of traffic jams using real-time data on vehicle positions and destinations as they become available. It could also offer individualized congestion warnings and rerouting options.

Another idea is to introduce tolls that adapt dynamically to traffic volume, and collect fees through automatic billing on GPS devices rather than relying on a manual system. The government is applying ICT in electronic toll cards and is experimenting with an electronic payment system to manage traffic flow around Jakarta as well as with the use of live closed-circuit television traffic streaming in big cities like Jakarta, Semarang, and Surabaya.[23]

Idea 10: Improve the quality and efficiency of public services

The government is one of the biggest users of ICT and as such is in a position to stimulate wider ICT use. Indonesia could consider articulating a national e-government strategy that lays out targets and timelines at both a national- and local-government level. For example, Malaysia, Singapore and Saudi Arabia are some of the countries that use e-government in their planning and delivery.

Breakthroughs in e-government have allowed countries to deliver better and more efficient public services. In many nations, more than 70 percent of taxpayers file electronically, and citizens can conduct a range of other transactions online, from renewing drivers' licenses to

E-government in Estonia, Georgia, and Kenya

Estonia, one of the smallest nations in Europe, aggressively invested in technology to bring its government services online. In 2003, it launched the first version of its e-government portal, which offered secure online access to a handful of government services. Today, Estonia's 1.3 million residents can use electronic ID cards to vote, pay taxes, and access more than 160 services online, ranging from employment benefits to property registration. In the private sector, businesses such as banks and telecom companies, offer services through the state portal and thus have an incentive to invest in maintaining the infrastructure's backbone. More than 90 percent of the country's people have an electronic ID card and about 10,000 users visit the government portal daily.[1]

After a change in power in 2003, Georgia's new government needed to increase revenues and improve the quality and delivery of its services.

To achieve these goals, the government created customer-oriented, high-tech one-stop shops offering individuals and businesses a range of services, including customs clearance, new-business licenses, land deeds, and automobile licenses.

Kenya is another example of a country that is using ICT to increase civic participation, support distributed innovation, and make development more transparent. In 2011, Kenya became the first African country to launch an open data portal providing access to previously difficult-to-find government information on education, energy, health, population, poverty, and sanitation.[2]

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managing government benefits. Consequently, the public has much easier and faster access to services. However, maximizing impact requires extensive coordination between many government agencies.

Currently, many local governments in Indonesia lack resources and infrastructure. Improving inter-agency and regional cooperation, for instance through centralization of IT governance, infrastructure, services, and procurement could help minimize regional disparities in resources and infrastructure.

To increase interagency efficiency, Indonesia could apply a standardized, mandatory set of systems across e-government portals to ensure that new digital services center on the user's experience. In Singapore, citizens can obtain replacement ID cards online by using digital passport photos and scans of old ID cards. In addition, when people change their addresses, they simply need to submit one report, and the system automatically notifies all government agencies, educational institutions, and selected private businesses (see sidebar "E-government in Estonia, Georgia, and Kenya").

Indonesia could also mandate that government portals include specific information to improve transparency. The Canadian government's portal has an area that allows citizens to locate and examine government expenses and contracts, among other information. Additionally, by employing ICT-enabled process automation, Indonesia could improve the speed and efficiency of large-volume administrative processes. Another idea is to provide incentives for government agencies to use cloud computing to reduce the storage cost of its databases, which agency employees and the public could then access on demand. This is in line with the government's goal of making the government and its services to the people clean, effective, reliable, and democratic in reality and perception.

■ ■ ■

Indonesia is reimagining its place in the world, and ICT can play a major role in supporting this transformation. The ten ideas discussed in this report outline how ICT can improve people's lives, increase the country's competitiveness, create a more business-friendly environment, and provide citizens with the transparency and access to government information and services they demand. Indonesia's future depends on technological innovations that connect, inform, educate, and support the lives of citizens while lifting the performance of local businesses. By embracing these ideas, the government could assume a central, guiding role in this process, providing new levels of connectivity for the common good. ■

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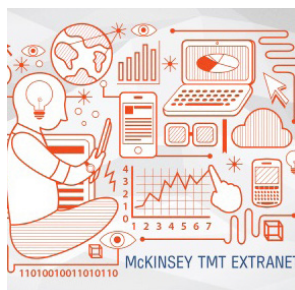
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