**asia
cloud
computing
association**

Cloud Readiness Index 2016

The Asia Cloud Computing Association's Cloud Readiness Index 2016

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I. Executive Summary

Since the last iteration of the Asia Cloud Computing Association's (ACCA) Cloud Readiness Index (CRI), we have seen cloud computing establishing itself firmly as a mainstream technology used by governments, large enterprises, small and medium enterprises (SMEs), and individuals. An increasing number of governments have built – or are in the process of building out – their national government clouds (gClouds), and implementing strategic plans to create a digital economy. Large corporations are moving into strategic areas of cloud deployment, building in cloud capabilities to leverage next-generation technologies for sensors, the Internet of Things (IoT), big data and analytics. SMEs and individuals continue to find new and creative ways to become more efficient with cloud computing applications, particularly through mobile devices and apps.

Changes in the top ranks…

The CRI 2016 sees some upsets in the rankings, with Hong Kong moving up four spots to claim the top position, toppling two-time leading country Japan, which dropped four spots to fifth place. Singapore also climbed two ranks to end up in 2nd place, while China fell by two spots to end up in 13th place. These larger movements in rankings suggest that there could be a virtuous technology cycle observed in Hong Kong and Singapore.

…as markets keep pace with each other.

Other movements in the CRI rankings were smaller, with the majority of economies moving one place up or down, suggesting that the region as a whole is moving ahead while keeping pace with each other. Improvers who climbed one spot were: Taiwan (6th place), Philippines (9th place), Indonesia (11th place), and India (12th place). Those who dropped one rank included New Zealand (3rd place), Australia (4th place), South Korea (7th place), and Thailand (10th place). Markets which did not change were Malaysia (8th place) and Vietnam (14th place).

Asia is leading the world in cloud computing readiness…

Based on feedback and requests received, this iteration of the CRI also features a new comparative portion, where we score a number of non-Asian economies against local markets. The top Asia Pacific economies outperform these global economies, coming out as global leaders in cloud computing readiness. Hypothetical rankings show the United Kingdom (UK) and Germany ranking 3rd, with the United States of America (USA) ranking 5th. Brazil, South Africa, and the United Arab Emirates (UAE) would rank around the 8th position.

Close examination of the results show that Asia Pacific outperforms these other markets on the basis of physical infrastructure, doing well in scores for international connectivity, broadband quality, green and sustainable policies, and data centre risk. This puts Asia in a strong position to lead the next wave of global innovation and leadership in technology. We expect that cloud readiness leaders in Asia will strengthen their lead in technology excellence and use, and emerging economies will continue to outperform as they leapfrog into the digital age.

…even as an intra-regional cloud readiness divide emerges.

A worrying trend observed in the CRI 2016 is the emergence of an intra-regional cloud computing readiness divide. The difference between most country scores average 2.6 points, but there is a large difference of 12.5 points between 8th-ranked Malaysia, and 9th-ranked Philippines. This shows a large gap between the cloud readiness of the top economies of Hong Kong, Singapore, New Zealand, Australia, Japan, Taiwan, South Korea, and Malaysia, and the second group of economies of the Philippines, Thailand, Indonesia, India, China and Vietnam – a gap which could easily widen, creating a cloud computing digital divide if not addressed quickly.

In fact, the top eight economies remain unchanged from the CRI 2014, suggesting that this cloud readiness divide may be becoming entrenched, even as the cloud computing becomes a mainstream technology across the region.

Reaping benefits of multi-year digitisation programmes…

One of the reasons behind a growing divide could be that many Asia Pacific economies are now reaping the benefits of having developed – and implemented – multi-year national digitisation plans, including plans for gCloud, broadband and other connectivity rollout. These plans form a virtuous cycle where success breeds success. In the CRI 2014 index, Hong Kong ranked 5th. Since then, Hong Kong has been implementing its Digital 21 strategy. Two years later, and the market reaps the fruit of its hard work, as Hong Kong climbs to the top of the CRI 2016. Singapore's successful implementation of its iN2015 Masterplan is also a possible factor in its climb up to 2nd place in this iteration of the CRI.

Cloud readiness laggards may struggle to play catch-up – but the good news is that many Asia Pacific markets have either just completed or are making plans for their next lap of ICT development, and the dividends that arise from focusing on infrastructure rollout are almost undoubtedly positive. Malaysia at 8th position, stands at the cusp of this virtuous technology cycle, having worked on implementing its Digital Malaysia 2020 plan. Indonesia, which moved up one spot this year to rank 11th, is in the process of rolling out the Indonesia Broadband Plan 2019. The Philippines, which climbs up the ranks again this year, has worked to define and refine their Data Privacy and Cybercrime Acts in preparation for the next lap of digital development. India too, is in the process of rolling out their Digital India policy, along with the "Make in India" export-oriented policy. Thailand is developing different aspects in their Digital Economy Strategy. China has released roadmaps and guidelines for Big Data and Cloud Computing in 2015, and Vietnam recently released a new law on Network Information Security that addresses security on the Internet. Successful implementation of these plans may see swift moves up the CRI rankings.

… while strategizing to enter the digital economy

The next phase of economic growth will be challenging, but the leading economies of the CRI 2016 are not resting on their laurels, and have started strategizing how they will enter this next phase of technology-enabled development. Cybersecurity, for example, is an issue which has strongly influenced discussions around cloud adoption, and this year's CRI includes a new parameter on cybersecurity, precisely to address this new aspect. Countries such as Australia, Malaysia, New Zealand, the Philippines, Singapore and Thailand have adjusted their legislation on cybercrime, and/or have put in place public sector agencies to look into cybersecurity, underscoring its importance to the digital economy.

Going beyond cybersecurity, a new wave of national plans have emerged in response to the needs of the next lap of digital development. New Zealand is preparing its public sector with its Government ICT Strategy 2017. Singapore has developed its Smart City Vision. Japan is working on rolling out its World's Most Advanced IT Nation plan, both in anticipation of the new technologies which will be used by citizens. Australia released its National Innovation and Science Agenda in Nov 2015, a plan aimed at capturing the economic growth which comes from innovation, driven by technology. South Korea, with the foresight that cloud computing would be a central digital pillar for the future, also released the world's first Cloud Computing Promotion Act in Mar 2015.

Conclusion

As data becomes the currency of the future digital economy, and cloud computing continues to mainstream as a technology, the seamless flow of data through cloud infrastructure becomes central to a country's cloud readiness. Countries must be aware of where they stand in preparation for this, and to this end, the CRI has been developed to provide perspectives which work to ensure that Asia Pacific economies do not lag behind global technology trends. 2015 saw a number of discussions around enabling cross border data flows emerge in regional trade agreements and partnership discussions, such as ASEAN Economic Community (AEC), the Asia Pacific Economic Cooperation (APEC), the Trans-Pacific Partnership (TPP), the Regional Comprehensive Economic Partnership (RCEP), and others.

The ACCA believes that enabling the seamless flow of data through cloud computing is key to economic growth. Public and private sectors must work towards solutions where information can be shared safely and securely across borders. As a vendor-neutral platform, we welcome requests to have discussions with governments, companies, and international organisations on the ever-changing shifts and demands of the market. We look forward to working together to better understand the implications that new cloud technologies will have on national, regional, and global growth.

II. Cloud Readiness Index 2016

Rank, Country	CRI#01 International Connectivity	CRI#02 Broadband Quality	CRI#03 Power Grid, Green Policy, and Sustainability	CRI#04 Data Centre Risk	CRI#05 Cybersecurity	CRI#06 Privacy	CRI#07 Government Regulatory Environment and Usage	CRI#08 Intellectual Property Protection	CRI#09 Business Sophistication	CRI#10 Freedom of Information	TOTAL CRI 2016 SCORE	Rank Change
#1 Hong Kong	8.1	9.1	6.7	8.0	6.2	9.5	7.2	8.6	7.4	7.2	**78.1**	**+4**
#2 Singapore	6.4	9.4	6.5	7.8	6.8	9.0	8.6	8.9	7.3	6.0	**76.7**	**+2**
#3 New Zealand	4.6	8.2	7.6	6.8	7.4	9.0	8.1	8.7	6.9	7.2	**74.4**	**-1**
#4 Australia	4.3	8.0	6.6	6.3	7.6	9.5	7.4	8.3	6.7	8.3	**73.2**	**-1**
#5 Japan	3.9	8.9	6.7	5.9	7.1	8.0	7.8	8.7	8.3	7.8	**73.0**	**-4**
#6 Taiwan	4.1	8.8	6.7	6.4	7.0	9.5	6.7	7.4	7.1	7.2	**71.1**	**+1**
#7 South Korea	3.8	9.0	6.3	6.2	7.1	9.0	7.0	6.0	6.9	6.7	**68.0**	**-1**
#8 Malaysia	3.3	7.6	5.4	5.9	7.6	8.0	7.4	7.7	7.6	5.8	**66.3**	**-**
#9 Philippines	3.3	5.5	6.0	3.5	3.5	7.5	5.5	5.6	6.1	7.3	**53.8**	**+1**
#10 Thailand	3.8	8.6	6.0	5.2	4.1	5.0	5.1	4.6	6.3	3.8	**52.6**	**-1**
#11 Indonesia	1.8	6.3	5.4	2.7	4.7	6.0	5.6	6.1	6.1	5.8	**50.6**	**+1**
#12 India	1.7	5.6	5.1	1.9	7.1	4.5	5.5	6.0	6.0	5.8	**49.1**	**+1**
#13 China	1.6	6.6	5.3	2.5	4.4	5.5	6.2	5.7	6.1	1.3	**45.4**	**-2**
#14 Vietnam	3.0	6.7	5.4	2.6	3.2	5.0	5.4	5.1	5.1	2.4	**44.0**	**-**

Comparison (and hypothetical rank)

Brazil (#8)	3.8	6.8	7.0	4.4	7.1	5.0	5.2	4.7	6.1	7.0	**57.1**	
Germany (#3)	5.0	8.4	7.1	6.9	7.1	8.0	7.3	8.1	8.1	8.3	**74.3**	
South Africa (#8)	5.0	6.0	5.8	2.7	3.8	3.5	6.0	7.7	6.3	7.4	**54.3**	
UAE (#8)	3.8	8.3	4.9	6.7	3.5	3.5	8.1	7.9	7.6	3.3	**57.5**	
UK (#3)	6.1	8.5	7.2	6.6	7.1	8.5	7.8	8.6	7.9	7.6	**75.7**	
USA (#5)	4.3	8.4	6.6	5.8	8.2	6.5	7.4	8.3	8.0	8.1	**71.6**	

All values to 1 decimal place

III. Index Parameters and Methodology

Ten parameters make up the CRI, which is a composite index score measuring how prepared countries are to adopt and roll-out cloud computing in their country. As the region continues to improve its cloud readiness, the CRI measures where countries are in relation to each other (rather than comparing absolute scores).

There are four parameters that measure "hard infrastructure" capacity – international connectivity; broadband quality; power grid, green policy and sustainability; and data centre risk. Six other policy-related "soft infrastructure" parameters make up the other portion of the CRI – cybersecurity, privacy, government regulatory environment and usage, intellectual property (IP) protection, business sophistication, and freedom of information.

Scores are taken or derived from publicly-sourced data and indexes, and sources and their URLs have been provided. We have also provided a methodology note for each parameter, explaining how figures were derived and normalised to get a comparative figure. In general, markets have been abbreviated using their country code top level domain names (ccTLDs).[1] Detailed methodology notes can be found in the Appendix.

There are other factors impacting the development of cloud in a country; these are qualitative measures taken by governments to improve regulatory aspects of cloud – e.g. amendments to privacy laws, data control measures etc. These developments are covered on an individual market basis in the country highlights section.

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[1] The country code top level domain (ccTLD) names for economies in the CRI 2016 are:
Hong Kong - HK
Singapore - SG
New Zealand - NZ
Australia - AU
Japan - JP
Taiwan - TW
South Korea - KR
Malaysia - MY
Philippines - PH
Thailand - TH
Indonesia - ID
India - IN
China - CN
Vietnam - VN
Brazil - BR
Germany - DE
South Africa - ZA
United Arab Emirates - AE
United Kingdom - UK
United States of America - US

CRI Parameter #01 International Connectivity

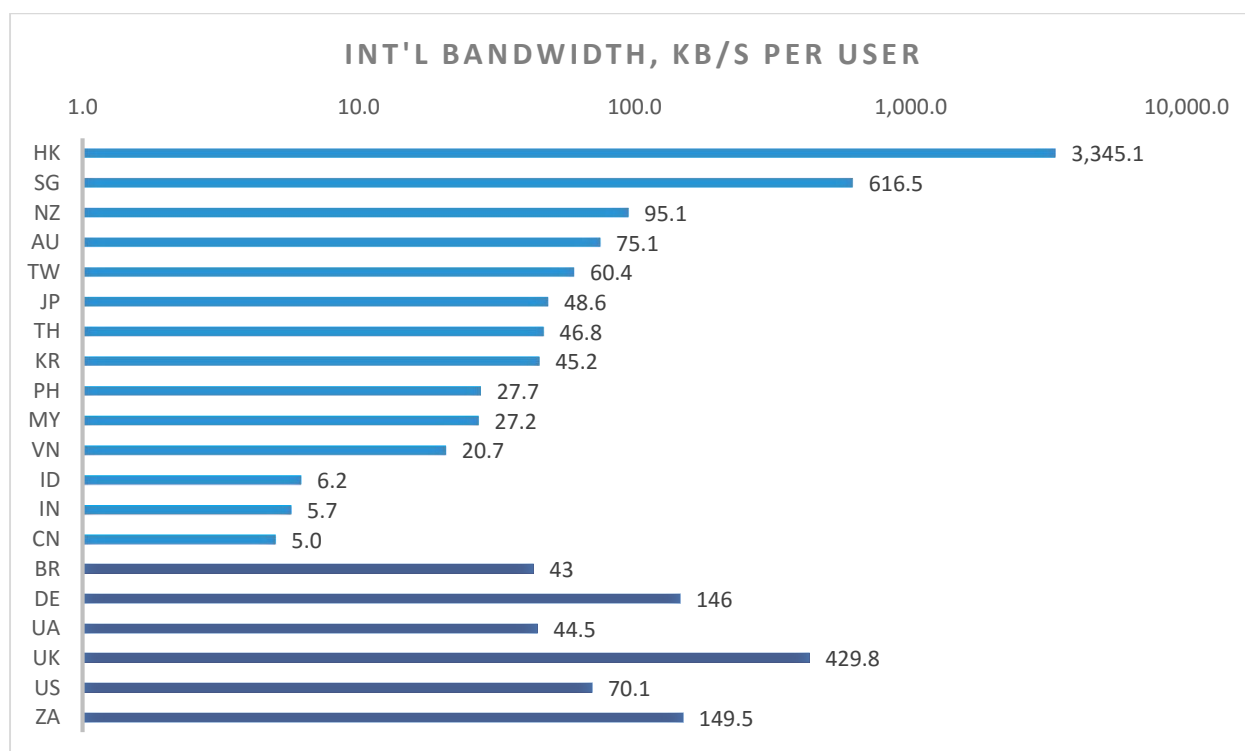|	AU	CN	HK	IN	ID	JP	MY	NZ	PH	SG	KR	TW	TH	VN
Rank 2016	4	14	1	13	12	6	=9	3	=9	2	=7	5	=7	11
Rank 2014	10	12	2	14	13	=5	4	9	7	1	=5	3	8	11
Score	4.3	1.6	8.1	1.7	1.8	3.9	3.3	4.6	3.3	6.4	3.8	4.1	3.8	3.0

Average score: 3.8

Growing cloud capacity versus growing cloud demand

International bandwidth is one of the prime components of the physical infrastructure needed both to develop competitive cloud services and to enable domestic cloud users to make use of international cloud services.

Cloud service providers in countries with high levels of international connectivity are better placed to serve cloud users internationally, and users in countries with more international bandwidth per user are able to use existing cloud services globally in an effective manner.

Overall international connectivity in the fourteen markets has increased 62% year-on-year, but the growth has not been equal in all markets. At the top end, New Zealand saw the highest growth in per-user speeds, at 109% year-on-year growth. Other mature markets, with relatively low growth in the total number of users, also experienced strong growth in per-user connectivity. Hong Kong and Japan experienced 90% and 61% growth in per-user speeds year-on-year. Hong Kong remains an outlier in international connectivity, with more than five times the per-user speeds of Singapore in second place.

Markets that have experienced high growth in cloud demand as the number of Internet users balloons struggle to develop cloud capacity and international connectivity at a high enough pace. As the user base grows, growth in international bandwidth must grow even faster to avoid reduced per-user connectivity speeds. This is typical for Philippines and Indonesia, which experienced -52% and -39% growth in per-user connectivity, respectively.

INT'L BANDWIDTH, KB/S PER USER

Market	Value
HK	3,345.1
SG	616.5
NZ	95.1
AU	75.1
TW	60.4
JP	48.6
TH	46.8
KR	45.2
PH	27.7
MY	27.2
VN	20.7
ID	6.2
IN	5.7
CN	5.0
BR	43
DE	146
UA	44.5
UK	429.8
US	70.1
ZA	149.5

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[2] World Economic Forum's Global Competitiveness Report 2015-2016, http://www.weforum.org/reports/global-competitiveness-report-2015-2016

CRI Parameter #02 Broadband Quality

	AU	CN	HK	IN	ID	JP	MY	NZ	PH	SG	KR	TW	TH	VN
Rank 2016	8	11	2	13	12	4	9	7	14	1	3	5	6	10
Rank 2014	=6	10	2	13	14	3	9	8	12	4	1	5	=6	11
Score	8.0	6.6	9.1	5.6	6.3	8.9	7.6	8.2	5.5	9.4	9.0	8.8	8.6	6.7

Average score: 7.7

Stable and reliable cloud access is a prerequisite to ameliorate emerging digital divides

Average peak connection speeds and the percentage of users whose connection is faster than 4Mbps shows the countries' readiness to provide fast and reliable access to the cloud. The average peak connection speeds across the 14 countries was 55.8 Mbps, in line with average speeds in the USA and the UK (57.3 and 54.2 Mbps, respectively) and well above the global average of 32.2 Mbps.

The increase in broadband speeds continues the positive trend from CRI 2014. Average speeds across the 14 countries grew 31% year-on-year. Singaporean, Vietnamese and Taiwanese user speeds grew the fastest, at 63%, 54% and 41%, respectively. Thailand has the highest proportion of users with 4Mbps or faster connection, at 93%. Philippines has the worst broadband quality in the region, with the third-lowest average peak connection speed at 23.5Mbps and the lowest percentage of users with 4Mbps or faster connection (10%).

Cloud services and internet access – including mobile – are fundamental to the digital economy. With the development of digital economies, more and more users need to be able to access cloud services via different devices. There is a real danger that markets such as the Philippines, Indonesia and India, where few users outside the developed metropoles have fast and reliable internet access, are developing an entrenched digital divide. A digital divide will create a gap in the economic opportunities of a digital economy between users in areas with good connectivity and those in areas with poor connectivity.

BROADBAND QUALITY

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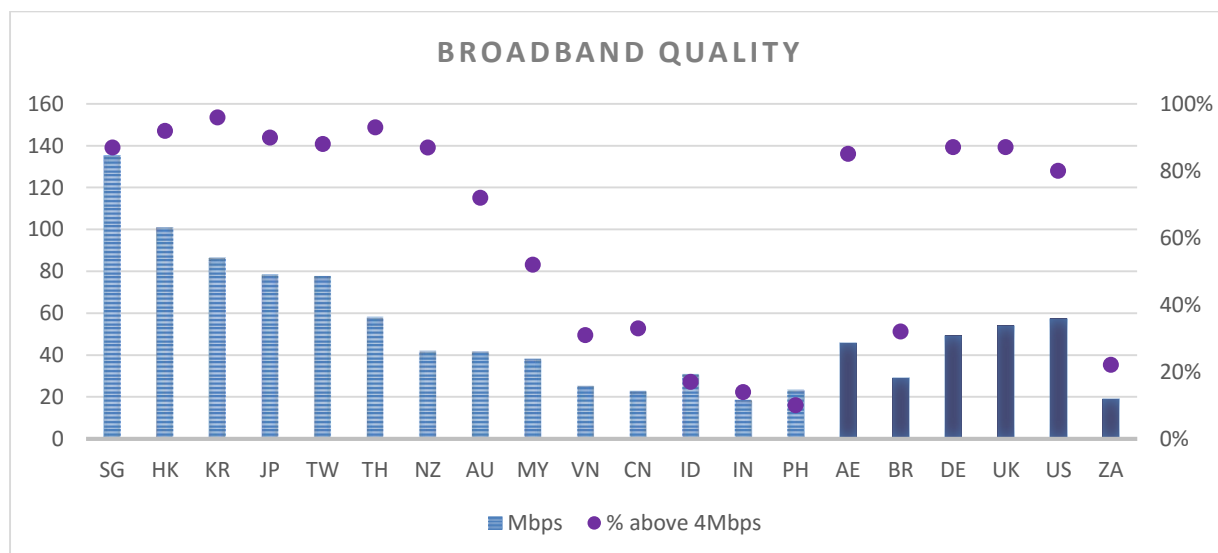
[3] Akamai: "State of the Internet: Q2 2015 Report". Available at: https://www.stateoftheinternet.com/resources-connectivity-2015-q3-state-of-the-internet-report.html

CRI Parameter #03 Power Grid, Green Policy, and Sustainability

Rank 2016	5	13	=2	14	=10	=2	=10	1	=8	6	7	=2	=8	=10
Rank 2014	2	14	9	11	8	3	12	1	10	7	5	4	6	13
	AU	**CN**	**HK**	**IN**	**ID**	**JP**	**MY**	**NZ**	**PH**	**SG**	**KR**	**TW**	**TH**	**VN**
Score	6.6	5.3	6.7	5.1	5.4	6.7	5.4	7.6	6.0	6.5	6.3	6.7	6.0	5.4

Average score: 6.1

Sustainable Data Clouds

Cloud computing is now an integral part of national ICT plans, and ensuring the long-term access and security of cloud services is important for the continued sustainable growth of increasingly digital economies. This parameter measures the sustainability of a country's cloud services, involving factors such as power, water, infrastructure stability, and "green cloud" sustainability. These qualities reflect the long-term ability of a country to supply cloud computing services.

The results show that most countries in Asia Pacific are above par when it comes to cloud sustainability, with New Zealand continuing to take top place in this factor. Hong Kong, in equal second place with Taiwan, made the largest jump, up 7 places in this ranking. Taiwan itself moved up three places, an improvement from its last ranking.

Other countries which improved in their rankings were Singapore (+1), Philippines (+2), Malaysia (+2), Vietnam (+3) and China (+1). Ranking falls were seen in Indonesia (-2), India (-3), Thailand (-2), Australia (-3), South Korea (-2), and Japan (-1).

POWER GRID, GREEN POLICY AND SUSTAINABILITY

Country	Score
NZ	7.6
HK, TW, JP	6.7
AU	6.6
SG	6.5
KR	6.3
PH, TH	6.0
ID, MY, VN	5.4
CN	5.3
IN	5.1
AE	4.9
BR	7.0
DE	7.1
UK	7.2
US	6.6
ZA	5.8

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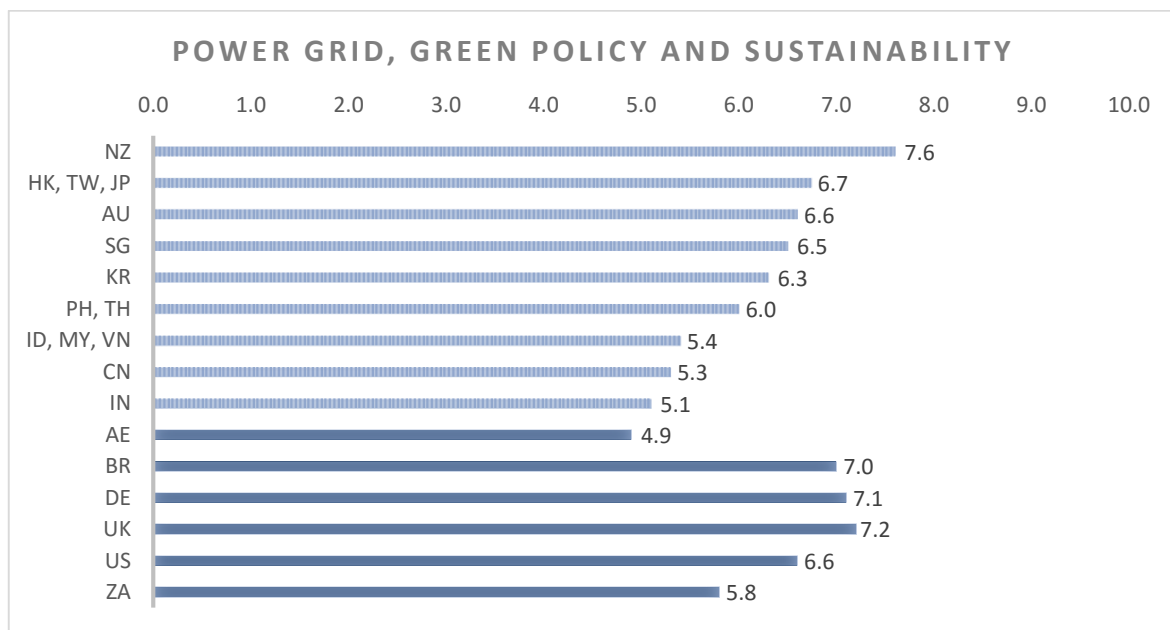
[4] World Economic Forum's Global Energy Architecture Performance Index Report 2015, http://www.weforum.org/reports/global-energy-architecture-performance-index-report-2015

CRI Parameter #04 Data Centre Risk

	AU	CN	HK	IN	ID	JP	MY	NZ	PH	SG	KR	TW	TH	VN
Rank 2016	5	13	1	14	11	=7	=7	3	10	2	6	4	9	12
Rank 2014	1	10	=6	14	=11	9	3	4	13	=6	2	8	5	=11
Score	6.3	2.5	8.0	1.9	2.7	5.9	5.9	6.8	3.5	7.8	6.2	6.4	5.2	2.6

Average score: 5.1

Cloud Demand Driving Data Centre Builds

Data centres are core to cloud development, and building them involves a substantial amount of investment. The data centre risk parameter looks at a number of factors involved in assessing the risks to investment, including factors such as corporate tax, labour cost, inflation, water availability, and vulnerability to natural disasters.

The results show that most countries in Asia Pacific are fairly well-placed in their Data Centre risk, with Hong Kong, Singapore, New Zealand, Taiwan, Australia, South Korea, Japan, Malaysia and Thailand all scoring above par, even as they improve or drop in their rankings. This bodes well for foreign direct investment into data centres in the region, as companies seek to expand and build global cloud infrastructure.

Countries where data centre risk is higher may be an opportunity for innovative methods for risk mitigation – companies looking for these green fields could look towards countries which are performing below par – such as Philippines, Vietnam, Indonesia, China and India – which are also countries where acceleration in cloud computing could take off rapidly once the basics are put in place.

DATA CENTRE RISK SCORE

Country	Score
HK	8.0
SG	7.8
NZ	6.8
TW	6.4
AU	6.3
KR	6.2
JP, MY	5.9
TH	5.2
PH	3.5
ID	2.7
VN	2.6
CN	2.5
IN	1.9
BR	4.4
DE	6.9
AE	6.7
UK	6.6
US	5.9
ZA	2.7

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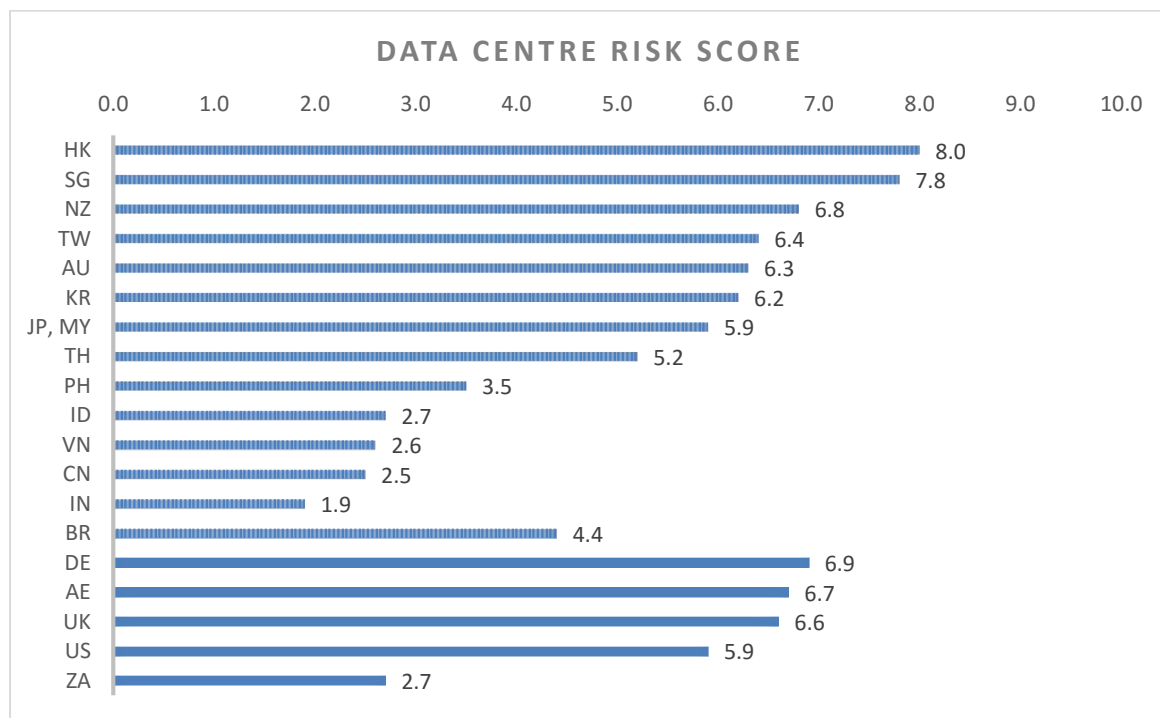
[5] Data Centre Risk Index 2013 by 2013 Data Centre Risk Index by Source8, HurleyPalmerFlatt, and Cushman & Wakefield, http://global.cushmanwakefield.com/en/research-and-insight/2013/data-centre-risk-index-2013/

CRI Parameter #05 Cybersecurity

Rank 2016	=1	11	9	14	10	=4	=1	3	13	8	=4	7	12	14
	AU	**CN**	**HK**	**IN**	**ID**	**JP**	**MY**	**NZ**	**PH**	**SG**	**KR**	**TW**	**TH**	**VN**
Score	7.6	4.4	6.2	7.1	4.7	7.1	7.6	7.4	3.5	6.8	7.1	7.0	4.1	3.2

Average score: 6.0

Holistic approaches to robust and secure clouds

Cybersecurity is paramount for cloud readiness. Within industry verticals and government, the perception of cybersecurity, or lack thereof, is one of the key barriers to cloud adoption. Good cybersecurity requires legal instruments to deal with issues such as cybercrime and data protection; technical standards, frameworks and initiatives for infrastructure, ICT use and education; and overarching organisational structures for national ICT and cybersecurity strategies. In addition, countries can bolster their cybersecurity by through R&D, technical committees and capacity building on e.g. information security, network monitoring and encryption; as well as enhancing cooperation across borders.

There is a clear gap between the top nine countries and the bottom five, consisting of Vietnam, Philippines, Thailand, China and Indonesia. The bottom five lack the technical support and capacity building efforts of their higher-scoring peers. Philippines stand out by having little-to-no international cooperation efforts in place to combat cybersecurity, while China and Vietnam lack the organisational set-up to effectively combat cybercrime. Malaysia and Australia stand out by having some of the most robust technical and organisational cybersecurity measures in place globally.

Governments must implement holistic efforts to bolster of cybersecurity in order to lay the institutional foundation for robust, secure access to trusted cloud services. Singapore, which ranks 8th in cybersecurity due to lower levels of technical support and international cooperation than their higher-ranked peers, has recently focused significant efforts on bolstering cybersecurity. Singapore established the Cyber Security Agency (CSA) in April 2015, to bridge the efforts of government agencies, such as the Ministry of Home Affairs, and private cybersecurity firms.

CYBERSECURITY SCORE

Country	Score
AU, MY	7.6
NZ	7.4
IN, JP, KR	7.1
TW	7.0
SG	6.8
HK	6.2
ID	4.7
CN	4.4
TH	4.1
PH	3.5
VN	3.2
AE	3.5
DE, UK	7.1
US	8.2
ZA	3.8

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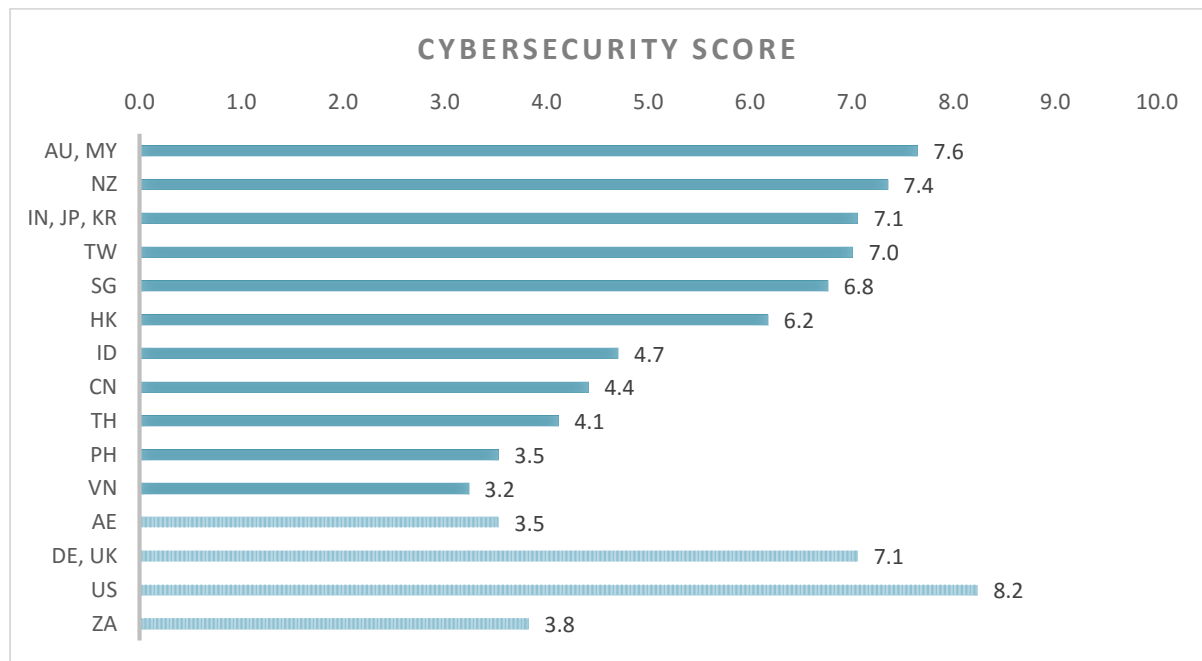
[6] International Telecommunications Union (ITU) and ABI Research, Global Cybersecurity Index 2014, http://www.itu.int/en/ITU-D/Cybersecurity/Pages/GCI.aspx

CRI Parameter #06 Privacy

	AU	CN	HK	IN	ID	JP	MY	NZ	PH	SG	KR	TW	TH	VN
Rank 2016	=1	11	=1	14	10	=7	=7	=4	9	=4	=4	=1	=12	=12
Rank 2014	=3	7	5	=10	12	2	=8	=3	=8	6	1	=10	13	14
Score	9.5	5.5	9.5	4.5	6.0	8.0	8.0	9.0	7.5	9.0	9.0	9.5	5.0	5.0

Average score: 7.5

Cloud Privacy, Data Control, and Law Enforcement

Cloud services need secure and reliable data flows across borders, networks and providers. Data transfer data privacy restrictions imposed with a view to enhance national security nations may inhibit the development and efficient use of cloud services. Users will only adopt cloud if their information is secure and held private without unexpected access by third parties. Regulations and effective oversight and enforcement of data privacy rules are therefore important aspects of cloud readiness.

Philippines exhibits the strongest institutional safeguards for privacy online, with laws regulating the collection and use of personal information, a compulsory data breach notification law, and a national agency for enforcement of privacy laws. In addition, Filipino data controllers and cross border data transfers are free from registration requirements, limiting government surveillance and ensuring anonymity. Taiwan, Australia, Hong Kong, New Zealand, Singapore, and South Korea also exhibit great levels of data privacy.

PRIVACY

Country	Score
AU, TW, HK	9.5
NZ, SG, KR	9
JP, MY	8
PH	7.5
ID	6
CN	5.5
TH, VN	5
IN	4.5
AE	3.5
DE	8
UK	8.5
US	6.5
ZA	3.5
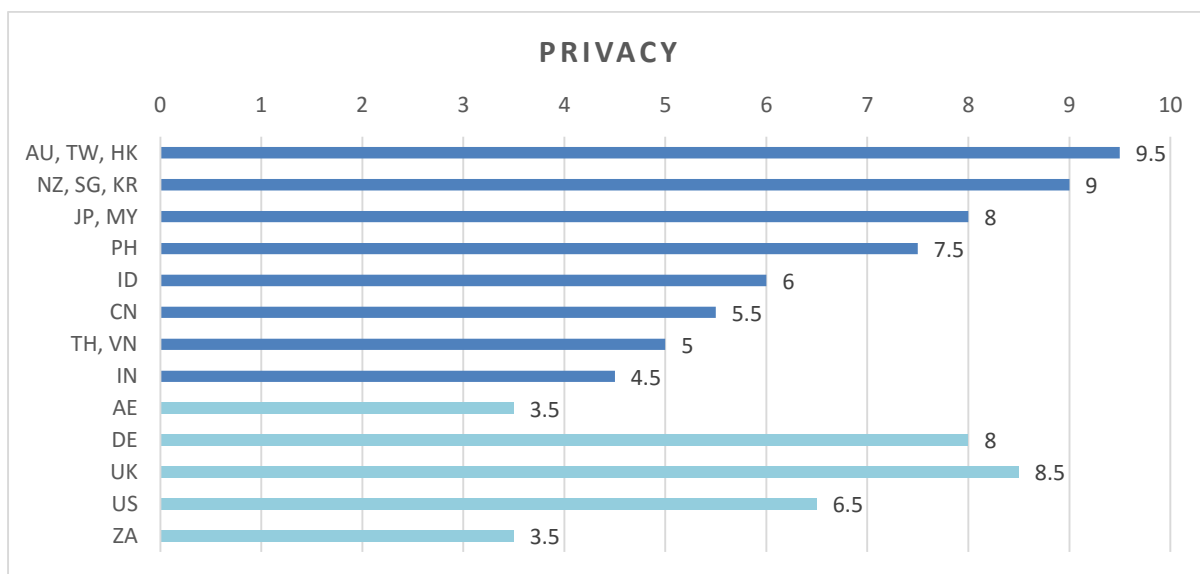
CRI Parameter #07 Government Regulatory Environment and Usage

Rank 2016	=4	9	6	=11	10	3	=4	2	=11	1	7	8	14	13
Rank 2014	3	9	=5	10	11	=7	4	2	=13	1	=5	=7	=13	12
	AU	**CN**	**HK**	**IN**	**ID**	**JP**	**MY**	**NZ**	**PH**	**SG**	**KR**	**TW**	**TH**	**VN**
Score	7.4	6.2	7.2	5.5	5.6	7.8	7.4	8.1	5.5	8.6	7.0	6.7	5.1	5.4

Average score: 6.7
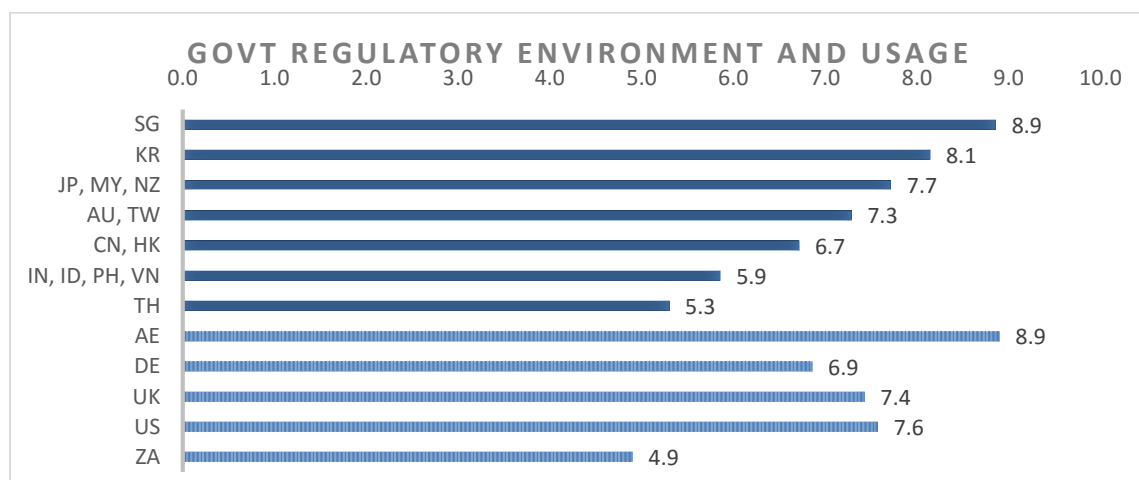
Government Support and Promotion of Cloud

Government support and use of technology is key to the success of national cloud uptake. The results show that governments which have done well in this parameter have put in place strong e-Government plans which promote the use of technology within the public sector. Singapore, South Korea, Japan, Malaysia and New Zealand have strong leads in this regard.

China, Hong Kong, India, Indonesia, Philippines, Vietnam, and Thailand have been slower to develop, although over the last two years we have seen an increasing accommodation and alignment of government policy to private sector cloud offerings. For example, in order to shorten the time for public sector procurement of cloud services, Australia, Singapore and India have released (or are exploring) accreditation standards for cloud vendors to be pre-certified as public sector approved vendors. Approved vendors can directly service public agencies through the government cloud.

In addition, some countries such as Singapore and Hong Kong have started to release or update technology outsourcing guidelines to pave the way for cloud use for specific industries, such as the financial services, healthcare, and education sectors. In a landmark move, South Korea has released the world's first Cloud Computing Act, a legislation which aims to enhance the country's competitiveness by supporting public sector use and adoption of cloud services.

An important shift has also emerged over the last few years, where governments have increasingly shifted their focus from merely deploying "e-government" and delivery of online services, towards fostering and creating of a sustainable digital economy. This includes Thailand's slew of "Digital Economy" bills, India's "Digital India" plan, Australia's "National Innovation and Science Agenda", and Singapore's "Infocomm Media Masterplan 2025." These plans drive a holistic approach towards technology and cloud use in the public sector.

Unfortunately, a key "cloud blocker" trend over the last two years has been the increasing call by regulators for data localisation, as governments demand that local content – particularly local personal data – is stored on local servers. This has had the impact of slowing innovation-led growth as companies shy away from adopting cloud services for fear of running afoul of these rules. The ACCA strongly calls for such cloud blockers to be removed and welcomes government engagement on this subject.

GOVT REGULATORY ENVIRONMENT AND USAGE

Country	Score
SG	8.9
KR	8.1
JP, MY, NZ	7.7
AU, TW	7.3
CN, HK	6.7
IN, ID, PH, VN	5.9
TH	5.3
AE	8.9
DE	6.9
UK	7.4
US	7.6
ZA	4.9

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[7] World Economic Forum's Global Information Technology Report 2015, http://reports.weforum.org/global-information-technology-report-2015/

CRI Parameter #08 Intellectual Property Protection

	AU	CN	HK	IN	ID	JP	MY	NZ	PH	SG	KR	TW	TH	VN
Rank 2016	5	11	4	=9	8	=2	6	=2	12	1	=9	7	14	13
Rank 2014	5	=9	=3	11	=9	=3	7	2	12	1	8	6	13	14
Score	8.3	5.7	8.6	6.0	6.1	8.7	7.7	8.7	5.6	8.6	7.0	6.7	5.1	5.1

Average score: 7.0

Source: WEF Global Competitive-ness Report 2015-2016, Intellectual property (IP) protection score (Indicator 1.02).[8]

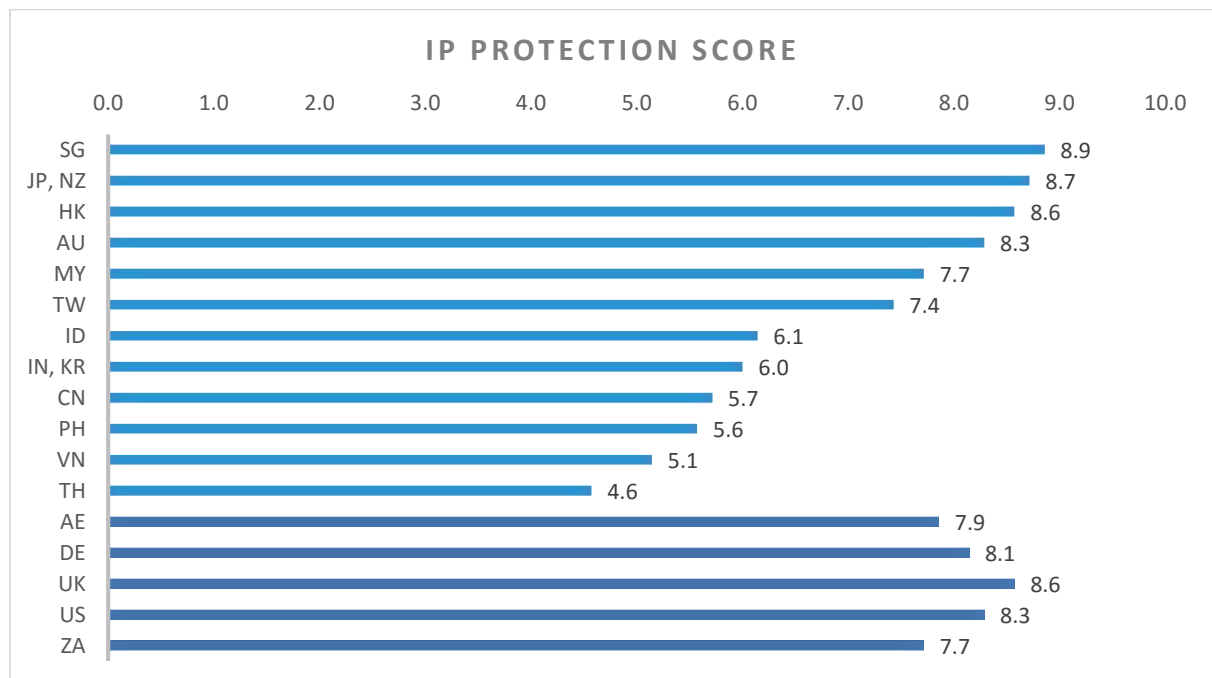**Methodology**: The IP protection score was converted to a ten-point scale for comparative purposes.

Global scores:
Brazil 4.7
Germany 8.1
South Africa 7.7
UAE 7.9
UK 8.6
USA 8.3

Protecting and promoting innovation in increasingly knowledge-based economies

Robust protections and enforcement of intellectual property rights are seen as protecting both consumer and corporation interests and an institutional prerequisite to foster the confidence that underpins thriving markets. The data traffic on cloud services enables knowledge-based transactions, and the value of these transactions relies on IP protection.

Without effective enforcement of these protections, cloud services will struggle to create the confidence needed for its users. Consumers need to be ensured that their content is subjected to adequate safeguards, and cloud service providers need reassurance that their information is protected against misappropriation and misuse.

All the 14 countries show improvements in their IP protection score as the economies in the region become increasingly knowledge-based. There is, however, a gap in the IP protection score between the top seven and bottom seven countries. Singapore, Japan, New Zealand, Hong Kong, Australia, Malaysia and Taiwan have significantly stronger IP protection measures in place than the remaining seven countries. Interestingly, South Korea – a highly innovative and mature economy – is ranked ninth overall, indicating that South Korean stakeholders are not as confident that their IP rights are protected as their peers are.

IP PROTECTION SCORE

Country	Score
SG	8.9
JP, NZ	8.7
HK	8.6
AU	8.3
MY	7.7
TW	7.4
ID	6.1
IN, KR	6.0
CN	5.7
PH	5.6
VN	5.1
TH	4.6
AE	7.9
DE	8.1
UK	8.6
US	8.3
ZA	7.7

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[8] World Economic Forum, Global Competitiveness Report 2015-2016, http://www.weforum.org/reports/global-competitiveness-report-2015-2016

CRI Parameter #09 Business Sophistication

	AU	CN	HK	IN	ID	JP	MY	NZ	PH	SG	KR	TW	TH	VN
Rank 2016	8	=10	3	13	=10	1	2	=6	=10	4	=6	5	9	14
Rank 2014	8	12	2	=9	=9	1	5	7	13	4	6	3	=9	14
Score	6.7	6.1	7.4	6.0	6.4	8.3	7.6	6.9	6.4	7.3	6.9	7.1	6.3	5.1

Average score: 6.7

Source: WEF Global Competitiveness Report 2015-2016, Business sophisti-cation (Pillar 11).[9]

Methodology: This score reflects the quantity and quality local suppliers, industry cluster development, the nature of the country's competitive advantage, breadth of the value chain, production process sophistication, extent of marketing, and the willingness to delegate authority within the organisations. The score is converted to a ten-point scale for comparison.
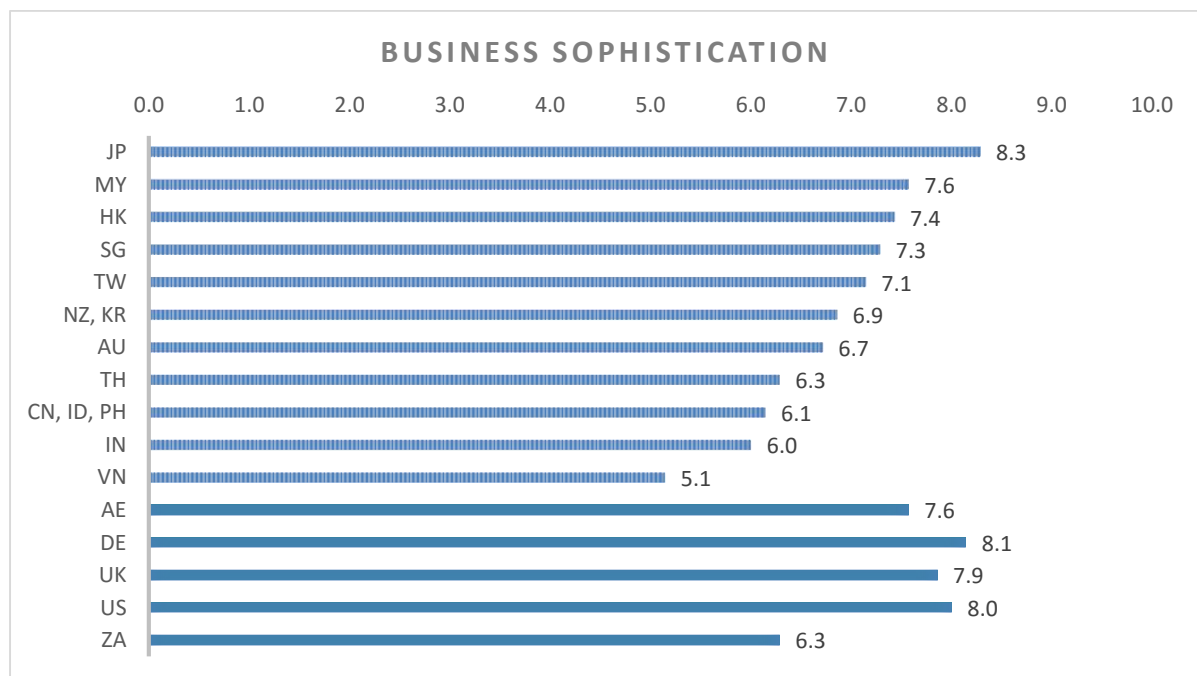
Global scores:
Brazil 6.1
Germany 8.1
South Africa 6.3
UAE 7.6
UK 7.9
USA 8.0

Business Cloud Adoption

Once a critical mass of businesses in a country have moved towards managing their resources via computers and cloud technology, the network effects of an interconnected business ecosystem can begin to manifest, and efficiencies will be gained exponentially within a network of peers, processes, supplier and customers. The business sophistication score is a marker for the ability of a country's businesses to adopt and take advantage of the efficiencies from cloud technology, which is important to the rollout of a nation's digital economy.

Most country scores have remained unchanged from the CRI 2014. The biggest increases are seen in Malaysia and the Philippines, who each rose three ranks, and New Zealand, who rose one rank, suggesting that more businesses in these countries have moved towards a greater understanding and usage of technology.

The biggest drop was seen in India, which fell 4 spots to end up in 13th place. Taiwan also dropped two spots to rank 5th, and Hong Kong and Indonesia dropped 3 spots each. A possible reason behind India's drop could be that although technology use in the country has been prolific, widespread adoption of sophisticated technology-based business solutions – such as email, accounting systems, customer relationship management systems – have not yet replaced analogue methods of record-keeping and communications.

BUSINESS SOPHISTICATION

Country	Score
JP	8.3
MY	7.6
HK	7.4
SG	7.3
TW	7.1
NZ, KR	6.9
AU	6.7
TH	6.3
CN, ID, PH	6.1
IN	6.0
VN	5.1
AE	7.6
DE	8.1
UK	7.9
US	8.0
ZA	6.3

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[9] World Economic Forum, Global Competitiveness Report 2015-2016, http://www.weforum.org/reports/global-competitiveness-report-2015-2016

CRI Parameter #10 Freedom of Information

	AU	CN	HK	IN	ID	JP	MY	NZ	PH	SG	KR	TW	TH	VN
Rank 2016	1	14	=4	=9	=9	2	=9	=4	3	8	7	=4	12	13
Rank 2014	=2	13	=2	12	10	1	9	4	5	=6	=6	=6	11	14
Score	8.3	1.3	7.2	5.8	5.8	7.8	5.8	7.2	7.3	6.0	6.7	7.2	3.8	2.4

Average score: 5.9

Accessing Information and Data and Cross Border Data Flows

The freedom to access all information online has been stymied in recent years with many countries imposing limitations on content distribution and access through various legal proceedings. Allowing information to flow freely is a key component for cloud computing, ensuring that there is no block to data transfers across borders.

By and large, the access to information scores did not change much in Asia Pacific, with the majority of countries moving up or down one position in the rankings. Moving up one rank were Australia, Indonesia, and Vietnam, while China, Japan, South Korea and Thailand moved down one spot each. India saw the largest gain of three ranks, followed by the Philippines (3rd) and Taiwan (equal 4th with Hong Kong) improving by two ranks each. Hong Kong (4th) and Singapore (8th) both fell by two spots each.

FREEDOM OF INFORMATION

Country	Score
AU	8.3
JP	7.8
PH	7.3
HK, NZ, TW	7.2
KR	6.7
SG	6.0
IN, ID, MY	5.8
TH	3.8
VN	2.4
CN	1.3
AE	3.3
DE	8.3
UK	7.6
US	8.1
ZA	7.4

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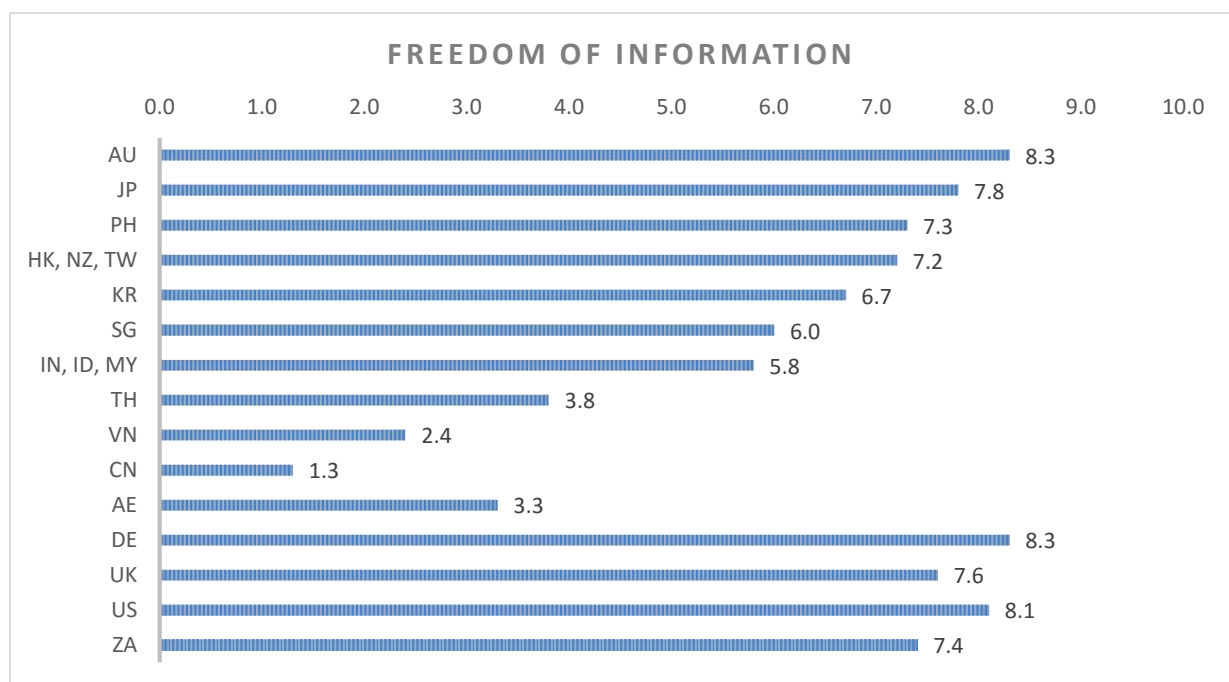
[10] Freedom House, Freedom on the Net 2014, https://freedomhouse.org/report/freedom-net/freedom-net-2014#.VnKMPvl96M8

IV. Country Highlights

Australia #4 (-1)
Falls from CRI 2014's 3ʳᵈ ranking

Cloud mainstreamed; attention on driving innovation and science

Australia drops one place into fourth for CRI 2016, having climbed from seventh place in 2012 into third place in 2014. Overall, there are no big changes to Australia's cloud readiness from CRI 2014 to CRI 2016. Economic stability and reliable physical infrastructure continue to make Australia a low-risk and efficient country to run data centres. Only Hong Kong, Singapore and New Zealand have better international connectivity. Soft infrastructure is also robust; privacy controls are world class, behind only Philippines, and IP protections are seen as reliable among business leaders.

High corporate tax rates, labour costs, and less environmentally sustainable energy supply than its peers, means Australia has been overtaken by Hong Kong, Singapore, Taiwan and New Zealand in terms of data centre risk. Australia's government regulatory environment and use has also dropped three places into sixth, behind Singapore and New Zealand – who have been at the forefront since 2014 – as well as fast-improving South Korea, Japan, and Malaysia.

Recommendation

Of particular concern are new data retention laws and changes in the regulation of data localisation and website blocking. These may have the effect of forcing growth in local data centres while on the other hand making Australia less prepared to develop and make use of global cloud services. The Turnbull administration, having prior experience with digital convergence issues through Turnbull's previous appointment as Communications Minister, has made positive changes through a more holistic government focus on technology and innovation, specifically with the new National Science and Innovation Agenda policy launched in December 2015. The effects of the new government and policy changes have yet to manifest themselves and not have been captured by the CRI 2016.

Recent Government Legislation and gCloud/gICT Developments

- **National Innovation and Science Agenda:** This new agenda includes 24 innovation measures. With an AUD1.1b (USD796m) budget, it aims to usher an era of innovation-led growth for the country.
- **Mandatory Data Retention Law:** The law on mandatory data retention requires telcos and ISPs to store their customers' metadata and web-browsing history for two years.
- **Internet Blocking Legislation:** In July 2015, the parliament passed Internet blocking legislation, enabling copyrights holders to force ISPs to block websites. This could be a de facto Internet filter by enabling rights holders to get injunctions from the Federal Court to force ISPs to block websites located outside Australia.
- **New whole-of-government cloud services panel:** Government agencies can procure cloud services on the new services panel, bypassing the complications of a full market approach.
- **Single identity framework for online services**: The federal government wants state and local governments to use the myGov portal for online identity verification.
- **Australian Taxation Office (ATO) retired its legacy e-tax digital tax filing system:** The newer myTax system enables citizens to use their myGov account to link to the ATO.
- **MyHealth Record:** The Personally Controlled Electronic Health Record (PCEHR) project will be rebooted as the myHealth Record. Less than one in 10 Australian has signed up to PCEHR since its 2012 debut.

China #13 (-2)

Falls from CRI 2014's 11th ranking

Government cloud guidelines strengthens national management of cyberspace

China continues its downward trend, dropping into second-last place. Government cloud guidelines and the thirteenth five-year plan for 2016-2020, including a focus on integrating big data, IoT, and mobile with manufacturing processes and e-commerce under the umbrella of the "Internet plus" programme introduced in March 2015, should bolster cloud adoption. However, more robust leadership is needed to improve China's international connectivity and to overcome challenges related to data centre risk. Freedom of information must also be improved if Chinese cloud providers are to become competitive in the international arena.

China ranks bottom in international connectivity and freedom of information, and second last in power grid, green policy and sustainability as well as data centre risk. The latter is a result of vulnerability to natural disasters and poor access to water for cooling as well as continued demand for expansion of physical infrastructure. On the other hand, China has also taken measures to shore up cybersecurity, particularly with its new five-year cyber security plan announced in June 2015. Business sophistication has also improved, with China climbing two places into tenth, as the quality local suppliers improves and industry cluster and the breadth of the cloud value chain improves. Growth is driven by strong demand from both SMEs and government cloud adoption, with the Alibaba group's Aliyun cloud subsidiary at the forefront with the broadest range of public cloud services.

Recommendation

Basic infrastructure rollout throughout China will be needed to bolster domestic demand and use of cloud technology. Strong assurances to improve data centre risk, and a commitment to ensuring the safe and free flow of data through China will be needed for it to become a leader in cloud readiness.

Recent Government Legislation and gCloud/gICT Developments

- **Government cloud guidelines:** The Cyberspace Administration of China has released requirements for government cloud services, including security management responsibility, data ownership, security management standards, and sensitive information. The circular outlines which agencies can migrate to the cloud based on the level of their data sensitivity and business priority.
- **Internet Plus Action Plan:** The National Development and Reform Commission (NDRC) announced the "Internet Plus" action plan to integrate mobile, cloud, big data and IoT with existing industries.
- **Big Data guidelines:** The State Council released Big Data guidelines including building trans-departmental data sharing capability by the end of 2017 and a unified platform for government data by the end of 2018.
- **Government backdoor to foreign and local telcos:** China has drafted an anti-terror law that requires foreign and local telcos and ISPs to submit encryption codes. It also requires companies to store Chinese users' data on servers in the Chinese mainland. Initial rules will only apply to banking technology.
- **Five-year cybersecurity plan:** China has a new five-year cyber security plan to protect state secrets and data through improved security software for government departments, state-owned enterprises and financial institutions. The government also released a draft national security law that mentions "sovereignty" in cyber space and includes powers dealing with "harmful moral standards".
- **Improving fibre infrastructure:** The government has budgeted CNY1.1t (USD177b) over the next two years to upgrade broadband and 4G network coverage to all counties and developed towns.

Hong Kong #1 (+4)

Climbs from CRI 2014's 5ᵗʰ ranking

Dedicated focus on developing both hard and soft infrastructure for cloud and technology use

Hong Kong climbs to the top of this year's rankings, after ranking third and fifth in CRI 2012 and CRI 2014, respectively. Under the strong industry leadership of the Office of the Government CIO (OGCIO), Hong Kong is continuing its tradition of robust future planning and a strong tech industry by focusing on ensuring Hong Kong's infrastructure is primed for fast, reliable and secure cloud offerings targeting the entire region. In particular, Hong Kong is an outlier on international connectivity, with a 90% year-on-year growth and more than five times the capacity of second-ranked Singapore.

Hong Kong ranks first on international connectivity and data centre risk, and second on broadband quality (behind Singapore), power grid, green policy and sustainability (behind New Zealand), and privacy (behind Philippines).

"Hong Kong's strong international links will continue to stand it in good stead as we strategize for the next wave of the innovation-driven economy."

– Hon. Charles Mok, Legislative Councillor, Hong Kong

Recommendation

Hong Kong ranks sixth on government regulatory environment and usage, and ninth on cybersecurity, indicating potential for improvement on government adoption and legal, technical and organisational measures to improve data security.

Recent Government Legislation and gCloud/gICT Developments

- **Digitising public information:** The Government Chief Information Officer (GCIO) revamped its public information portal, Data.gov.hk, to fulfil its promise to start releasing public information in digital formats. More public sector information (PSI) will be available in digital format. PSI datasets have been available since 2011, and over 70 mobile applications and services have been developed using them.
- **Public sector cloud services for government bureaus:** OGCIO announced that all potential Government Public Cloud Service (GCPS) providers can apply to have their services used by bureau and departments. 26 agencies have used public cloud services such as e-conferencing, email/web hosting, and webcasts.
- **Hong Kong Legislative Council approved two major computerisation projects:** (1) Development of computerised provision of post-dispatch advice for the Hong Kong Fire Services Department, and (2) Development of a smart identity card for the Immigration Department

India #12 (+1)

Climbs from CRI 2014's 13th ranking

Visionary initiatives Digital India, MeghRaj, and Smart Cities Mission

India's pro-cloud initiatives and government leadership to develop an innovative tech industry are paying off, and their soft infrastructure is starting to come into focus. Specifically, improvements in cybersecurity, IP protection and freedom of information sees India climb one position this year. However, India struggles with some of the worst physical cloud infrastructure in the region. India ranks second-last on international connectivity and broad band quality, and last on power grid, green policy and sustainability, data centre risk, and business sophistication.

Recommendation

There are clear challenges to overcome both in building the physical infrastructure to support a larger proportion of the population coming online and in securing reliable access to cloud services in the long term. Opportunities to capitalise are India's entrepreneural spirit, and a strong IT-savvy population which is actively nurturing its programmers and computer coders.

Recent Government Legislation and gCloud/gICT Developments

- **Digital India and the MeghRaj deployment continues**: India continues to deploy its gCloud project, which will provide public sector cloud facilities for all provinces, connected to a national-level cloud infrastructure.

- **Proposed Provisional Accreditation of Cloud Service Offerings of Private Service Providers (CSPs)** - India's Dept of IT Electronics (DeitY) has requested feedback on the proposed provisional accreditation process for CSPs to provide services on their "GI Cloud" (Govt of India Cloud) project, also known as MeghRaj ("King of Clouds".)

- **Data monitoring regulations:** The Department of Telecom is working with the Home Ministry on a new regulations for lawful monitoring and interception of messages and telephone calls while protecting the privacy of users.

- **Consultation on net neutrality by the Telecom Regulatory Authority of India (TRAI):** Views on net neutrality were requested by the TRAI, and a consultation Paper on Differential Pricing for Data Services was released.

- **Government data sharing initiative**: DeitY is proposing to require all central government and state government organisations to develop open APIs for software interoperability between all e-governance apps and systems. The National Data Sharing and Accessibility Policy aims to make all information and data of a government organisation available through open APIs.

> *"We have made great strides in the regulatory environment, including government adoption of cloud, and industry consultations on new technology such as over-the-top (OTT) services. We will build on these achievements and continue to develop cloud infrastructure in India to bring all citizens online."*
>
> *- Mr Anurag Singh Thakur, Member of Parliament, Lok Sabha, and the Chairman of the Parliamentary Standing Committee on IT*

Indonesia #11 (+1)

Climbs from CRI 2014's 12th ranking

Data residency and protectionism stymie cloud adoption

Improvements in many parameters sees Indonesia climb back up to 11th place after dropping to 12th place in 2014. In fact, Indonesia is a consistent scorer in this year's CRI, ranking between 8th and 12th place in every parameter of CRI 2016. The improvements seen in cloud readiness and adoption are led by private sector innovation, as a growing online population continues to demand more robust digital services. Currently, only 15.8% of the population is using the Internet. As this grows through the use of mobile devices, an increasing number of Indonesians will access cloud services and participate in the digital economy.

However, the CRI indicates insufficient efforts to overcome the challenges of developing sufficient broadband infrastructure as the proportion of Indonesians online increases. Data centre risk and regulatory environment and use scores drop this year, and per-user international connectivity has deteriorated year-on-year. Cloud service localisation and the expansion of physical cloud infrastructure, and in particular mobile Internet access to the more remote areas of the country, are big hurdles facing Indonesia.

Recommendation

A coordinated plan to tackle the needs of the digital economy would aid Indonesia's cloud readiness plans. Responsibility for coordinating across organisations when drafting regulations that converge across ministry silos – such as the new e-commerce framework, which spans the trade and ICT ministries, and also involves the private sector – should be clearly delineated to reduce business uncertainty.

"Our young, mobile-first millennials are readily making use of cloud services. The challenges for us in Indonesia are to develop a sufficient capacity throughout the archipelago to support the aspirations of the next generation for a high speed and meaningful Internet services."

- Mr Eddy Thoyib, Executive Director, MASTEL Indonesia, Indonesia ICT Society

Recent Government Legislation and gCloud/gICT Developments

- **E-Commerce Framework:** A new bill proposing an E-Commerce Framework will be released in Feb 2016.
- **Government opens e-commerce to investment:** KOMINFO is in discussion with the Investment Coordination Board (BKPM) to open up e-commerce to foreign investment. Under the current law, e-commerce businesses need to be wholly owned by local players and foreign funding can only come in as loans and not equity.
- **Protection of Personal Data:** KOMINFO released a draft of a proposed law on the protection of personal data in electronic systems.
- **Law on Cybersecurity expected:** A cybersecurity law and a new cybersecurity agency are being planned.
- **E-Sabak for e-education:** This programme will equip all teachers and students with tablets for education.

Japan #5 (-4)

Falls from CRI 2014's 1st ranking

Lack of urgency and adaptability in policymaking

Japan continues its strong scoring from previous years, despite Hong Kong and Singapore climbing into the top places. Japan is a technology-savvy market, with 86.3% of the population using the Internet, and ranks high on both physical and soft cloud infrastructure. Its robust institutional framework supports a sophisticated cloud and tech business environment in the region, but it has fallen from its top place due to the higher pace of physical infrastructure development, innovation and cloud adoption elsewhere.

Japan retains its position as one of the leaders in the region by having the second highest freedom of information and IP protection scores, behind Australia and Singapore, respectively. Japan's physical infrastructure is also well developed, with power grid, green policy and sustainability, broadband quality, and international connectivity ranked second, fourth and sixth, respectively.

Recommendation

The main challenges in Japan relate to implementation of measures to enhance innovation and adopt cloud services. Measures to nurture innovation must accelerate, and increased cross-border data trade should be encouraged, particularly as Japan faces a rapidly ageing population which may negatively impact domestic consumption of new technologies.

> *"We are getting ready for the rapid scaling up of cloud by IoT in Public and Private sectors. These sectors are also entering the cloud with "The Social Security and Tax Number System" ("the My Number System") rolling out since 2015."*
>
> *- Mr Toru Nakamura, Chief Operating Officer, ASP-SaaS-Cloud Consortium (ASPIC)*

Recent Government Legislation and gCloud/gICT Developments

- **Improved privacy laws:** The government amended "The Act on the Protection of Personal Information" (APPI) to include an expanded definition of "personal information", including biometric data and identifying numbers. The amended APPI establishes the Personal Information Protection Committee, and sets out how to handle anonymised information and sensitive data, how to transfer personal data to third parties and across borders, criminal sanctions for the misuse of personal data, and opt-out policies for personal data transfers.

- **New IoT council:** Ministry of Internal Affairs and Communications established an IoT council, asking 100 companies and organizations to provide representation. The council will focus on improving IoT infrastructure and security.

- **National ID and data sharing roll-out:** The My Number system started rolling out in October 2015. The system will enable sharing of information among authorities from January 2017 (national level) and July 2017 (local authorities). The Specific Personal Information Protection Commission has been established to oversee the My Number system.

- **Healthcare big data centre:** The Pharmaceuticals and Medical Devices Agency (PMDA) plans to establish a regulatory science centre to collect and analyse medical Big Data, including electronic data in the Clinical Data Interchange Standards Consortium (CDISC). PMDA hopes to create new guidelines for pharma companies developing new drugs.

Malaysia #8 (-)

Retains CRI 2014's 8ᵗʰ ranking

Holding its own, on the cusp of a choice – sink or soar

Malaysia is on the cusp of becoming part of global elite in terms of cloud readiness. Malaysia's robust institutional frameworks and soft infrastructure is on par with the top-ranked countries. In particular, Malaysia is ranked as having the best cybersecurity measures in the region and the second-most sophisticated business environment. However, relatively lacking physical infrastructure means Malaysia retains its eighth position from CRI 2012 and CRI 2014. Malaysia drops six positions in terms of international connectivity and five positions on data centre risk.

Recommendation

Continued focus on soft infrastructure combined with significant improvements to physical infrastructure would translate into a holistic strategy for cloud readiness. Failing to improve broadband access and international connectivity would lead to Malaysia slipping back into being the leader of the laggards rather than among the top destinations for cloud services development in Asia Pacific.

> *"We are building the backbone to support Malaysia's digital future, driven by high speed broadband infrastructure, new disruptive cloud platforms and software with a local and international focus."*
>
> *Dato' Mohd Ali Hanafiah Mohd Yunus*
> *Chief Officer Digital Ecosystem*
> *Malaysian Communications and Multimedia Commission (MCMC)*

Recent Government Legislation and gCloud/gICT Developments

- **Targets for broadband expansion and improved cloud infrastructure.** Prime Minister Najib launched the 11th Malaysia Plan (11MP), which outlines infrastructure initiatives for 2016-2020. The plan targets 95% broadband coverage in populated areas, and initiatives such as High-Speed Broadband 2 (HSBB 2), Suburban Broadband (SUBB) and Digital Terrestrial Television (DTT) will be rolled out during this period, along with policies to improve access pricing and consumer protection frameworks.
- **New open data strategy.** The Multimedia Development Corporation (MDeC), Malaysian Administrative Modernization and Management Planning Unit (MAMPU), and the UK's Open Data Institute will develop an open data strategy to encourage ministries, agencies, and the public to use the data to innovate and create new solutions. The National Open Data Champions initiative involves a group of select individuals from ministries and agencies to advise and support government agencies on open data implementation and execution.
- **Increased health cloud adoption.** Sunway Medical Centre group, Penang Adventist Hospital group and Tung Shin Hospital's Western Medicine and Traditional Chinese Medicine wings in Malaysia have deployed Telstra Health's CloudMed Arcus Hospital Information System (Arcus).
- **New subsea cable.** TM joins Symphony Communications (Thailand), and Telcotech (Cambodia) to build the 1,300km Malaysia-Cambodia-Thailand (MCT) subsea cable which will have a design capacity of 30Tbps, and is expected to be ready by late 2016.
- **Cloud exchange and data centre in Iskandar.** Huawei has opened its Asia-Pacific Digital Cloud Exchange in Iskandar. TM has signed an agreement with Nusajaya Tech Park to build a data centre in Iskandar. The DC will be built in three phases, with phase 1 expected to be ready in H2 of 2016.

New Zealand #3 (-1)

Falls from CRI 2014 2nd place ranking

Cloud leader at risk

New Zealand falls one spot this year to 3rd place, but continues to hold a strong lead in the region as a cloud leader. In hard infrastructure, New Zealand has improved in their international connectivity rankings tremendously (from 9th to 3rd place), as well as domestic broadband quality (from 8th to 7th place). It continues to hold the top spot for power grid, green policy and sustainability of cloud computing, and have also improved its data centre risk scores from 4th to 3rd. The strength of New Zeland's cybersecurity also ranks 3rd overall in the region.

In soft infrastructure, New Zealand has either held steady in its rankings, or fallen slightly – they have held their positions precariously in IP protection (2nd to equal 2nd), and freedom of information (4th to equal 4th), but have fallen in its privacy ranking (from equal 3rd to equal 5th), as well as government regulatory environment and usage (from 2nd to equal 3rd.) Business sophistication has somewhat improved from 7th place to equal 6th, suggesting that businesses are becoming more technology and cloud-savvy.

Recommendations

While still a regional leader, New Zealand has to take note of the areas where it has slid in the rankings, most notably the slip in the softer aspects of cloud readiness.

Recent Government Legislation and gCloud/gICT Developments

- **The Government ICT Strategy 2017** aims to achieve ICT-enabled transformation in public service. The plan is a "cloud first" policy, and was initially approved in 2013, and later updated in 2015. The government CTO says its 4-year ICT strategy and action plan has achieved NZD60m (USD40m) in operating savings to date. The plan targets savings of NZD100m (USD66m) over four years.
- **New Telecoms Interception Capability and Security Act (TICSA)** requires network operators must notify security agencies of network changes or be fined up to NZD500,000 (USD377,000) a day. The law has forced initiatives such as the Google-backed Software Designed Networking (SDN), which includes Victoria University in Wellington and REANNZ, to relocate to Australia.
- **RealMe digital identity.** The government identity verification service RealMe is used by 61 government services for login, with more than 2m logins in use.
- **The Rural Broadband Initiative and Ultra-Fast Broadband initiative** continues its rollout. The plans aim to cover 80% of NZ by 2022, connecting 97.8% of New Zealanders by end-2019. As of end-June 2015, the project was 54% complete and had made its first 106,000 connections.
- **The trans-Pacific Hawaiki Cable** gains private support from New Zealand-based SIL Long Term Holdings to build the USD300m submarine cable by end 2017. This will improve connectivity between Australia, New Zealand and the US.

> "*The government is making a $2 billion investment into the Ultra-Fast Broadband (UFB) and Rural Broadband Initiatives (RBI) to bring fast broadband to more New Zealanders. It has also commissioned a review of the ICT regulatory framework. Ubiquitous broadband will create a platform for service competition and facilitating further liberalisation of the sector and new cloud initiatives.*"
>
> *Hon. David Butcher, Principal of DBA Consultants, New Zealand*

Philippines #9 (+1)

Climbs from CRI 2014's 10th ranking

Consistent improver; emerging leader of emerging economies

Philippines has been making consistent progress up the CRI rankings. The country ranks 9th, up 1 spot from the CRI 2014. While it fell two ranks each for international connectivity (from 7th to equal 9th) and broadband quality (from 12th to 14th), it rose two ranks for power grid and green policy (from 10th to equal 8th), and three spots in data centre risk (from 13th to 10th). The Philippines also improved other "soft" aspects of cloud readiness, including government regulatory environment and usage (from equal 13th to equal 10th), business sophistication (13th to equal 10th), and freedom of information (from 5th to 3rd).

Recommendations

The Philippines should continue to climb in the rankings by improving on all aspects of their cloud readiness. The drop in international connectivity may reflect the struggle to expand international bandwidth rapidly enough to keep up with the tremendous growth in the number of users. As the number of users continues to grow from the 37% of the population currently using the Internet, significant efforts will be needed to both develop domestic broadband quality and international connectivity.

> *"While the main challenge remains improving broadband and mobile quality and access to the Internet, the Philippines has been slowly but surely making inroads in the other aspects of cloud readiness."*
>
> *- Mr Louis Casambre, Executive Director of the ICT Office of the Department of Science and Technology (DOST)*

Recent Government Legislation and gCloud/gICT Developments

- **Administrative Order (AO) for gCloud.** Department of Science and Technology (DOST) released a proposed AO which set forth a new "cloud first" policy for government agencies. It stated that the public sector was to use cloud computing where possible, but limited to offerings available on GovCloud. The Senate Committee on Trade, Commerce and Entrepreneurship aims to simplify the process for Internet infrastructure permits. Currently, a telco needs up to six months, involving 16 steps, six to seven national government agencies, and a local government permits to construct any infrastructure. The proposed one-stop-shop will simplify the process and save time, thus encouraging further build-out of cell towers and improve ease of doing business for local telcos.

- **District ICT Hubs Proposal.** Bill 2698 institutes guidelines and formulate a comprehensive policy to enable the establishment of an ICT Centre hub or centre in every legislative district in the country.

- **Online Business Registration.** The Quezon City government launched an online registration system for businesses to simplify services and increase the ease of doing business.

- **ICT for Health for Remote Islands.** The DOST are testing an app to deliver health systems quickly and efficiently to users on remote islands. It allows health officers in remote parts of the nation to upload medical records of the patient which can be viewed by authorized doctors and nurses across the country.

- Construction on the **South-East Asia-United States (SEA-US)** undersea cable consortium has started. When completed in Q4 2016, the cable will add 20tbps capacity, connecting the Philippines to the US with 100Gbps technology. PLDT is looking to invest USD100m on a second Asia-America Gateway (AAG) submarine cable system with a consortium of telecom operators.

- **Peering for faster Internet speeds.** PLDT and Globe are discussing IP peering to allow faster exchange of information and improved Internet speeds. PLDT earlier signed an agreement with DOST to provide fiber optic facilities that link PLDT to DOST's Philippine Open Internet Exchange (PHOpenIX).

Singapore #2 (+2)

Climbs from CRI 2014's 4th ranking

Masterplans and changes galore

Singapore moved up two spots due to improvements in most of the country's parameter rankings. The country improved in broadband quality, (moving from 4th to 1st), power grid, green policy and sustainability (from 7th to 6th), data centre risk from equal 6th to 2nd, privacy from 6th to equal 5th. It retained its scores for government regulatory environment and usage, and IP protection (1st spot in both), and fell in international connectivity (1st to 2nd), and freedom of information, where it dropped from equal 6th to 8th place.

A number of masterplans and strategies have been announced, as well as the announcement that the telco regulator – the InfoComm Development Authority of Singapore (IDA), and the content regulator, the Media Development Authority of Singapore (MDA) would merge to form a new entity, the Info-communications Media Development Authority of Singapore (IMDA). This is on top of the establishment of the Cyber Security Agency (CSA), a new agency tasked with cybersecurity for the country, the Smart Nation Programme Office tasked with developing Singapore's capacity as a smart city, as well as the finalisation and implementations of the Infocomm Media Masterplan 2025, and the National Cybersecurity Masterplan 2018.

Recommendations

While the country has moved up the CRI, it has also put in place big institutional changes for how the country manages new technologies and cloud deployments for the public sector. Implementation of these plans should be closely watched, as Singapore runs the risk of making too many changes at once – but the payoff could be huge.

> *"Singapore's Smart Nation journey requires the support of a vibrant and diverse cloud ecosystem. We're encouraged by our improved results in the Asia Cloud Computing Association Cloud Readiness Index, as testament to our substantial cloud advancements and efforts in collaboration with the industry, such as the Multi-Tier Cloud Security Standard."*
>
> *- Mr Khoong Hock Yun, Assistant Chief Executive, Infocomm Development Authority of Singapore*

Recent Government Legislation and gCloud/gICT Developments

- **IDA and MDA merge to form IMDA.** The telco regulator – the InfoComm Development Authority of Singapore (IDA), and the content regulator, the Media Development Authority of Singapore (MDA) will merge to form a new entity, the Info-communications Media Development Authority of Singapore (IMDA). The IMDA will implement the new **Infocomm Media Masterplan 2025**, which sets out the direction for capitalizing on new technologies for better quality of life.
- **The Smart Nation Programme Office (SNPO)**, a department under the Prime Minister's Office (PMO) was also established in 2015, and is tasked with developing Singapore's capacity as a smart city.
- **A new Cyber Security Agency (CSA)** was established in 2015, tasked with developing national cybersecurity policies. Implementation of the **National Cybersecurity Masterplan 2018** also continues.
- **2FA for national digital identity, SingPass.** An enhanced two-factor authentication for SingPass was launched, along with a new Corporate Pass (Corppass) for companies, which allows citizens to access multiple government e-services and mobile services.
- The Minister for the Municipal Services Office (MSO) launched the **Oneservice** app for the public to report any issues they encounter to all government agencies.
- The Monetary Authority of Singapore (MAS) established the **FinTech & Innovation Group (FTIG)** to guide policies and strategies in the use of IT to better manage risks and efficiency.
- The Government will issue around SGD2.2b (USD1.6b) in public-sector infocomm tenders during 2015, up from SGD1.95b (USD1.4b) for 2014. 20% of the budget will be spent in-house to develop infocomm skills.

South Korea #7 (-1)

Drops from CRI 2014's 6ᵗʰ ranking

Bold initiatives, looking forward to implementation

Although falling one spot, South Korea retains its place as a country with some of the strongest government support of cloud and technology in the region. This can be seen in their strong showing in the government regulatory environment and usage parameter, where it moved from equal 5ᵗʰ to 2ⁿᵈ place. In addition, the Korean National Assembly passed the world's first Cloud Computing Promotion Act in 2015. Unfortunately, despite these efforts, the CRI 2016 shows it has not done enough to retain its position as a competitive cloud market, as it has slipped in nearly all other parameters – international connectivity (drop from equal 5ᵗʰ to equal 7ᵗʰ), broadband quality (1ˢᵗ to 3ʳᵈ), power grid and green policy (5ᵗʰ to 7ᵗʰ), data centre risk (2ⁿᵈ to 6ᵗʰ), privacy (1ˢᵗ to equal 5ᵗʰ), IP protection (8ᵗʰ to equal 9ᵗʰ) and freedom of information from equal 6ᵗʰ to 7ᵗʰ place.

Recommendations

The scoring reflects the fact that South Korea has been moving slowly in the development of its infrastructure for cloud service in the past few years as compared to its nearest competing economies Hong Kong, Singapore, Japan and Taiwan. While government initiatives have gone some way to reverse this trend, significant efforts are needed to develop a healthy cloud ecosystem. The Cloud Computing Promotion Act is a step in the right direction, and we expect to see this reflected in an upswing for Korea's ranking in the next CRI.

> *Our infrastructure remains world class. We saw big changes in industrial promotion and user protection through enactment and implementation of the Cloud Computing Promotion Act in 2015. We hope these changes will foster increased cloud adoption in industry verticals like healthcare and finance.*
>
> *- Mr Young-ki Min, Executive Director, Korea Association of Cloud Industry (KACI)*

Recent Government Legislation and gCloud/gICT Developments

- **World's first Cloud Computing Promotion Act.** The National Assembly passed this law in Mar 2015, which allows the public sector to adopt cloud services, which was previously prohibited due to security concerns. The law also contains provisions that would support R&D, pilot projects, SME and human capacity building in cloud computing.

- **Standards of Personal Information Security Measures amended.** The new standards require data handlers to actively supervise, manage and monitor outsourcing providers. "Mobile devices" were added to the definition of personal information processing systems, and data handlers must ensure that all mobile devices are equipped with appropriate security measures, including the encryption of any personal information stored on them.

- **The Government Integrated Data Centre (GIDC)** announced it will incorporate cloud computing into 143 e-govt systems. In 2014, a total of 260 e-govt systems have adopted cloud, which is expected to increase to 403 by the end of 2015 and 740 by 2017, achieving 40% of cost savings in OPEX. A project which they launched is nSIMS, a Big Data-based log analysis system, which monitors over 100,000 suspicious IPs, with over 30TB of log data produced daily. GIDC deals with over 300m security instances and nSIMS will reduce the time to log data analysis to mere seconds from a previous 3-4 hrs.

- **Major government investment planned for ICT industry.** The Ministry of Science ICT and Future Planning (MSIP) will invest KRW9t (USD8.1b) in the ICT industry over the next five years with a view to reach KRW240t (USD217.9b) in industry output and USD210b in exports by 2020. KRW2.1t (USD1.b) will be spent on major ICT convergence programs in the education, medical, tourism, city management, energy, and transportation sectors by 2019. Investment will focus on nine industries: software, IoT, cloud computing, information security, 5G telecom, Ultra-High Definition (UHD), digital content, smart devices, and Big Data.

Taiwan #6 (+1)

Climbs from CRI 2014's 7th ranking

Quiet improver with strong basics

Taiwan has been quietly improving across the board over the last few years, improving in the parameters of broadband quality; power grid, green policy and sustainability; data centre risk; privacy; government regulatory usage; and freedom of information. Most of these improvements were by a few ranks, but two major improvements bear highlighting – data centre risk ranking improved for Taiwan from 8th to 4th, and for privacy, Taiwan improved from equal 10th to equal 2nd. Elsewhere, it dropped in rankings for international connectivity; IP protection; and business sophistication.

Recommendations

Taiwan may want to consider a national approach towards cloud use in the public sector in the first instance. It should encourage Taiwanese brands to grow internationally, capitalising on the existing brand recognition for some global technology brands. This will increase Taiwan's competitiveness and readiness in the area of cloud technologies and new services.

Recent Government Legislation and gCloud/gICT Developments

- **National Security Bureau (NSB) seeks collaboration from private sector:** The NSB wants to collaborate with foreign experts to learn from their experience and expertise. Taiwan was ranked third behind South Korea and Hong Kong on the volume of advanced persistent threat (APT) activities in Asia Pacific, according to FireEye.

- **The National Development Council (NDC) HeadStart Taiwan Project:** This project will invest USD83m across four venture capital funds, and aims to bolster the startup ecosystem through deregulation, access to early-stage capital, and developing a startup cluster in Taipei Expo Park.

- **National ID, Citizen Digital Certificate, e-Wallet System:** The Ministry of Interior is planning to equip the chip-embedded national identification card and Citizen Digital Certificate with an optional e-wallet function. The integrated ID-citizen certificate card is being developed with an investment of TWD8.1b (USD248m), and is scheduled to begin circulating in 2017. The card is expected to provide access to 3,000 services, such as filing taxes online, paying motorist fees, and many more.

- **National Development Council (NDC) launches Taiwan Open Data Centre:** The government aims to increase collaboration between the public and private sector through the use of open data on the platform to create innovative solutions to help both citizens and the government.

- **Big Data Alliance:** The Taipei Computer Association formed the Big Data Alliance to facilitate information and resource sharing across different industries among the government, enterprises and academics to drive the use of Big Data in Taiwan.

Thailand #10 (-1)

Falls from CRI 2014's 9th ranking

Digital economy plans mooted but struggling to gain traction

Thailand's slips one rank despite improvements in two parameters – international connectivity (moving from 8th to equal 7th place), and privacy, where it moved from 13th to equal 12th place. It held steady in two parameters – broadband quality (6th), and business sophistication (9th). It dropped in its rankings for all other parameters – in power grid, green policy and sustainability dropping from 6th to equal 8th, data centre risk dropping from 5th to 9th, government regulatory usage and IP protection both fell from equal 13th to 14th spot, and freedom of information from 11th to 12th spot.

While the government mooted a number of Digital Economy Bills in 2015 to accelerate the development of Thailand into a digital economy, progress has been slow and at times, confusing as similar bills are merged. In addition, a controversial Single Internet Gateway plan was floated as a possible method of improving cybersecurity, resulting in a strong backlash from Thai citizens who saw the plan as a veiled attempt to censor the Internet.

Recommendations

Accelerating the finalisation and implementation of the Digital Economy Bills will go a long way in helping to reduce the level of legislative and regulatory uncertainty for cloud and technology users.

Recent Government Legislation and gCloud/gICT Developments

- **Digital Economy Strategic Plan.** The Digital Economy Plan deals with five main domain missions - hard infrastructure, soft infrastructure, service infrastructure, digital economy promotion, and digital society. A number of bills have been tabled to establish agencies and commissions and their funds. Some other bills are: the **Electronics Transaction Bill, the Personal Data Protection Bill, the National Cyber Security Bill, and the Computer Crime Bill.**

- **Single Internet Gateway**. This was proposed by the government for national security, and as an efficiency measure. Thai citizens viewed it as a thinly-veiled attempt for the government to control the flow of information from overseas via the Internet and censor undesirable websites.

- **National Data Centre Project.** Thailand has announced a National ID data centre project to be built as part of the country's Digital Economy plans. CAT Telecom was appointed temporary national data centre. All other state agencies have been ordered to stop developing their own agencies, as CAT will expand its data centres to serve all state agencies on a two year temporary basis, as a single national centre is developed.

- **Tax incentives for data centre builds**. Announcement No. Sor 2/2553: Promotion of Data Centre includes tax incentives to encourage local and international businesses to establish in Thailand. The Software Industry Promotion Agency (SIPA) has also allocated THB200m (USD5.5m) for ICT infrastructure projects, to build a smarter ICT management system under a smart city project; create a website for tourism; implement an integrated digital marketing channels SMEs; and develop digital content and innovation.

- **The Government Service Information app** was launched in Jul 2015, consolidating information from 21 agencies to the public, to help local players provide outsourcing services to the public sector. The app is managed by the Electronic Government Agency (EGA). The Thai PM's Office also launched a mobile app for public sector complaints.

Vietnam #14 (-)

No change from CRI 2014's 14th ranking

Ambitious plans slowed by weak fundamentals

Vietnam's ranking belies the potential of its market, and the ambitions of its plans. It has been called a "free wi-fi paradise" because many cafes and shops offer Internet access without charges[11], and it is home to over 20m computer gamers.[12] And yet while Vietnam has made improvements in its rankings for broadband quality, power grid and green policy, privacy, government regulatory environment, IP protection and freedom of information, its improvements have only allowed it to keep pace with the region, scoring marginally less than China, which ranked at #13 in the CRI 2016. It ranks the lowest on cybersecurity and business sophistication, which strongly impact both the adoption of cloud products, as well as customer confidence in technology.

New laws governing Internet Services, as well as a new law on Online Information Security (passed in Nov 2015) have been announced by the country, as well as plans to continue building out Smart Cities such as with Danang, and technology parks such as Saigon's Hi-Tech Park. These developments show that that Vietnam's rank is not due to a lack of ambition.

"Vietnam's ranking hides a young and energetic programming community, which is powering our entrepreneurial spirit. The Vietnamese government is also very encouraging of IT development, and is working hard to attract investment in this area. The challenge is to match infrastructural development with our personal aspirations, and turn that into digital opportunities."

- Mr Lương Hữu Tuấn, co-founder of Vietstack

Recommendations

Vietnam's piecemeal approach towards building out smart cities and high-tech parks has created a pastiche of competitive approaches by provinces. Efficiencies may be gained by sharing of information between these cities, and possibly a national plan for allocating areas to be developed as tech parks and smart cities, to reduce duplication of efforts. The foundational work on strengthening access infrastructure and cybersecurity will be needed for Vietnam to break through.

Recent Government Legislation and gCloud/gICT Developments

- **Law on Internet Information Security.** Passed in Nov 2015, this tackles information security on three levels: cyber information violations, cyber information conflicts, and cyber warfare.
- **MIC "Decree 72" on the Management, Provision and Use of Internet Services and Online Information, and additional Draft Circular on Cross-Border Provision of Public Management.** Amongst other things, this circular proposed both server localisation, and for companies providing infrastructure services to have a legal representative in Vietnam.
- **Public Telco Service Rollout**. A rollout plan 2015-2020 was approved to deliver telco infrastructure to underserved and rural communities.
- **DPM Vu Duc Dam highlights government commitment to use IT applications.** According to the MIC, over the next five years, Vietnam will focus on increasing the number of people using online public services and the percentages of personal files that are kept online. **Danang also launches its gCloud,** with more than 20 government agencies hosted under its cloud data centre solution.
- **Central Bank's New Central Data System.** The State Bank of Vietnam (SBV) signed an agreement with IBM Vietnam for a new central data system for the bank. This is part of the Financial Sector Modernization and Information Management System (FSMIMS) project, funded by the World Bank.

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[11] VietnamNet Bridge, 21 Dec 2015, Vietnam – Free Wi-Fi Paradise, http://english.vietnamnet.vn/fms/science-it/148843/vietnam---free-wi-fi-paradise.html
[12] OneSky Blog, 11 Aug 2015, What No One Tells You About Vietnam's Mobile Games Market, http://www.oneskyapp.com/blog/vietnam-mobile-game/

V. Conclusions and Looking Ahead

In the same way that access to the Internet moved from initially being a novelty to an essential service today, cloud computing is on its way to firmly ensconcing itself as a mainstream technology. Governments around the world have taken note of this change, and have put in place various government cloud initiatives to ensure their public sector does not lag behind this change.

More gCloud accreditation

More advanced cloud economies have moved into the next phase of public sector cloud adoption, which is to pre-qualify cloud vendors in a government cloud marketplace. Singapore has done this with bulk tenders for vendors who have qualified under their Multi-Tiered Cloud Security (MTCS) standard, the Australia Signals Directorate has a Certified Cloud Services list of cloud companies which can contract with the Australian government, and India has proposed a "Provisional Accreditation of Cloud Service Offerings of Private Service Providers (CSPs)" under their MeghRaj Cloud Initiative.

We see this trend of accreditation continuing, and urge governments to share information on certification, assessments and audits, to reduce fragmentation of accreditation schemes, and duplication of efforts. More importantly, this will help to reduce the cost of local compliance for CSPs, which face a situation where they may need to pre-qualify each service they offer with every country government on a national or even federal level.

Cybersecurity and privacy concerns are here to stay

Given the revelations around clandestine government surveillance, and the breakdown of the "Safe Harbour" agreement between the EU and USA, privacy and cybersecurity issues have taken centre stage in international forums. When coupled with the phenomenal increase in personal mobile device usage and smartphone penetration, concerns around personal data and privacy issues look to be a mainstay in discussions around cloud computing and technology.

Digital international trade

Looking ahead, we expect to see an increase in discussions around the collection, protection and permissions around data use, as well as harmonisation around security standards for encryption. This will be particularly important as trade agreements such as the ASEAN Economic Community (AEC) and Trans-Pacific Partnership (TPP) agreement come into effect. The digital trade aspect of these agreements will need enabling strong data sharing and protection legislation to ensure user data is protected in cyberspace. In response to these development, the CRI now includes this aspect of cloud readiness as a new parameter measuring cybersecurity.

The challenge of regulating next-generation technologies

The next generation of technologies enabled by cloud computing has emerged, and we now see countries putting in plans to develop and roll out Smart Cities capacities with sensors and big data and analytics tools. Regulating these new technologies and stimulating innovation will be a core regulatory focus for governments, and we applaud the efforts of countries making plans to step ahead of the technology curve today.

To enable excellence in policymaking as we work towards a conducive environment for cloud usage and adoption across Asia Pacific, we welcome discussions with government agencies, the private sector, and other associations and organisations. Do contact us at info@asiacloudcomputing.org, or visit http://www.asiacloudcomputing.org. We look forward to having conversations with you.

Appendix: Methodology and Data Sources

The ten parameters of the Cloud Readiness Index are sourced from publicly-available indices, which have been referenced and credited in the footnotes.

a) Normalisation

As indicators used had different units and scales, any indicator that did not use a 10-point scale was normalised to make the indicator values comparable, as well as to construct aggregate scores for each economy. For example, some indicators already used a percentage, or 100-point scale, such as the Global Cybersecurity Index, so these did not need to be normalized, and were simply adjusted to reflect a 10-point scale. Indicators not based on a 100-point scale, such as the results from the Intellectual Property Protection (Indicator 1.02) from the WEF Global Competitiveness Report, which gave a rating of 1 to 7 for each economy, were normalized.

b) Minimum-Maximum Method

For indicator values that required normalization, such as the Average Mobile Connection Speed (Mbps) in Akamai's State of The Internet Report, minimum and maximum values were set in order to transform the indicators expressed in different units into indices between 0 and 10 using the following formula:

$$Normalised\ value = \left(\frac{actual\ value - minimum\ value}{maximum\ value - minimum\ value}\right) \times 10$$

c) Treatment of Missing Values

Some indicators contained missing values for economies. It was necessary to estimate the missing value(s) because missing values would have led to a bias in calculating this Index and limited the ability to make comparisons across economies.

To estimate the missing values, a clustering technique was used. Economies were grouped by the World Bank's income classification[13], and for a particular indicator with missing value, the average of the data for each income group was calculated to estimate the missing values.

World Bank's income classification used to group the economies is as follows:

- High-income economies (GDP per capita of USD 12,746 or more): Australia, Hong Kong, Japan, South Korea, Singapore.
- Upper-middle-income economies (GDP per capita of USD 4,126 to USD 12,745): China, Malaysia, Thailand.
- Lower-middle-income economies (GDP per capita of USD 1,046 to USD 4,125): Indonesia, India

For example, to estimate the missing value for Hong Kong in the UN E-Government Survey 2014 index, an average of the normalised data for the high-income economies, that is Australia, Japan, South Korea, and Singapore, was used.

d) Data Centre Risk Parameter Scores

These scores were an update of the 2013 Data Centre Risk Index by Source8, HurleyPalmerFlatt, and Cushman & Wakefield http://www.cushmanwakefield.co.uk/en-gb/research-and-insight/2013/data-centre-risk-index-2013. This index identified the top risks likely to impact data centre operations, and ranked countries along an index in 2013, with three tiers of weighted parameters: Tier 1 (60%), Tier 2 (35%), and Tier 3 (5%). As the

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[13] World Bank, (n.d.), Country and Lending Groups, http://data.worldbank.org/about/country-and-lending-groups

results have not been updated since the ACCA has updated their index using publicly-accessible indices as follows:

Tier 1 (30%) comprised:

- 33% - Energy Cost – derived from the Cost of electricity (% of income per capita) from the World Bank Group's Doing Business 2015 http://www.doingbusiness.org/reports/global-reports/doing-business-2015, against GDP per capita from the World Bank Databank http://data.worldbank.com. These were then normalised using the minimum-maximum method (see methodology) and inverted, as cheaper energy is better.)
- 33% - International bandwidth – taken from the World Economic Forum's Global Competitiveness Report, 2015-2016, International Internet bandwidth kb/s per user (Indicator 9.06), http://reports.weforum.org/global-competitiveness-report-2015-2016/
- 33% - Ease of Doing Business – taken from World Bank Group's Doing Business 2015: Going Beyond Efficiency, 2015, Overall distance to frontier (DTF) score (0-100), http://www.doingbusiness.org/reports/global-reports/doing-business-2015

Tier 2 (35%) comprised:

- 12% - Corporate tax – taken from Deloitte, 2015, Corporate Tax Rates (National rate), http://www2.deloitte.com/content/dam/Deloitte/global/Documents/Tax/dttl-tax-corporate-tax-rates-2015.pdf
- 8% - Cost of labour – taken from World Economic Forum's Global Competitiveness Report, 2015-2016, Labor market efficiency: Pay and productivity (Indicator 7.06), http://reports.weforum.org/global-competitiveness-report-2015-2016/
- 20% - Political stability - Cornell, INSEAD, and WIPO's Global Innovation Index, 2015, Political Stability (Indicator 1.1.1), https://www.globalinnovationindex.org. Estimated values for missing value for Taiwan was used; i.e. the average of six countries in the same World Bank country and lending group which had values in this dataset (AU, HK, JP, NZ, SG, KR.)
- 10% - Sustainability - energy from alternatives. Taken from the World Economic Forum's Global Energy Architecture Performance Index Report, 2015, Environmental sustainability score, http://www.weforum.org/reports/global-energy-architecture-performance-index-report-2015. Estimated values for Hong Kong and Taiwan were used; i.e. the average of five countries in the same World Bank country and lending group which had values in this dataset (AU, JP, NZ, SG, KR.)
- 25% - Natural disasters – taken from Inform's Index for Risk Management, 2015, Natural risks score, http://www.inform-index.org
- 10% - Population education level – taken from Cornell, INSEAD, and WIPO's Global Innovation Index, 2015, Education (Indicator 2.1), https://www.globalinnovationindex.org. Estimated values for missing value for Taiwan was used; i.e. the average of six countries in the same World Bank country and lending group which had values in this dataset (AU, HK, JP, NZ, SG, KR.)
- 15% - Energy security – taken from World Economic Forum's Global Energy Architecture Performance Index Report, 2015, Energy access and security score, http://www.weforum.org/reports/global-energy-architecture-performance-index-report-2015. Estimated values for Hong Kong and Taiwan were used; i.e. the average of five countries in the same World Bank country and lending group which had values in this dataset (AU, JP, NZ, SG, KR.)

Tier 3 (5%) comprised:

- 25% - GDP per capita – taken from the World Bank Databank, 2014, GDP per capita, PPP (current international $), http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD. Taiwan data from IndexMundi, 2013, Taiwan GDP - per capita (PPP), http://www.indexmundi.com/taiwan/gdp_per_capita_(ppp).html
- 25% - Inflation – taken from the World Economic Forum's Global Competitiveness Report, 2015-2016, Inflation annual % change, http://reports.weforum.org/global-competitiveness-report-2015-2016/

- 50% - Water availability per capita – taken from Food and Agriculture Organisation of the United Nations (FAO)'s AQUASTAT, 2013-2017, Total renewable resources per capita (m3 per inhabitant per yr) '000, http://www.fao.org/nr/water/aquastat/main/index.stm. Estimated values for Hong Kong and Taiwan were used; i.e. the average of five countries in the same World Bank country and lending group which had values in this dataset (AU, JP, NZ, SG, KR.)

ACCA Data Centre Risk Score (2016 Update)

COUNTRY	Energy Cost#	Intl bandwidth	Ease of Doing Business*	TIER 1 SUBTOTAL (max = 10)	Corporate Tax#	Labour Efficiency*	Political Stability*	Sustainability#	Natural Disasters (Risk)*	Population Education Level*	Energy Security*	TIER 2 SUBTOTAL (max = 10)	GDP per capita*	Inflation#	Water (availability per capita)*	Tier 3 Subtotal (max = 10)	Data Centre Risk Score - Tier 1 60% + Tier 2 35% + Tier 3 5%
Calculation Details	33% of Tier 1	33% of Tier 1	33% of Tier 1		12% of Tier 2	8% of Tier 2	20% of Tier 2	10% of Tier 2	25% of Tier 2	10% of Tier 2	15% of Tier 2		25% of Tier 3	25% of Tier 3	50% of Tier 3		
AU	9.5	4.3	7.8	7.2	0.0	0.0	8.4	1.4	5.2	6.7	9.0	5.1	5.0	7.2	2.9	4.5	**6.3**
CN	2.5	1.6	2.5	2.2	3.7	3.6	2.8	0.0	1.4	10.0	3.4	3.2	1.0	8.1	0.3	2.4	**2.5**
HK	9.9	8.1	9.0	9.0	10.0	10.0	8.0	4.8	4.8	4.8	8.0	7.0	6.4	3.7	2.7	3.9	**8.0**
IN	6.5	1.7	0.0	2.8	0.0	0.7	0.5	0.5	1.1	1.1	0.0	0.6	0.0	0.7	0.2	0.3	**1.9**
ID	5.4	1.8	1.5	2.9	3.7	2.9	3.0	3.8	1.8	2.3	1.0	2.5	0.6	0.0	1.1	0.7	**2.7**
JP	10.0	3.9	6.1	6.7	3.3	5.0	8.3	5.4	0.9	6.1	7.6	5.0	4.0	6.9	0.5	2.9	**5.9**
MY	8.6	3.3	7.2	6.4	3.7	9.3	4.9	1.4	6.0	4.2	7.6	5.4	2.5	6.1	2.7	3.5	**5.9**
NZ	6.6	4.6	9.6	6.9	1.5	5.0	10.0	10.0	2.5	8.2	10.0	6.5	3.8	9.6	10.0	8.4	**6.8**
PH	9.2	3.3	2.4	5.0	0.0	3.6	0.9	5.4	0.0	0.0	1.4	1.2	0.2	4.1	0.7	1.4	**3.5**
SG	7.3	6.4	10.0	7.9	9.6	9.3	9.6	4.3	10.0	3.7	6.2	8.1	10.0	10.0	0.0	5.0	**7.8**
KR	8.2	3.8	8.6	6.9	5.9	3.6	5.6	3.0	5.4	6.6	7.2	5.5	3.7	9.4	0.2	3.4	**6.2**
TW	7.8	4.1	7.2	6.4	9.6	6.4	8.3	4.8	4.8	4.8	8.0	6.7	4.4	9.6	2.7	4.9	**6.4**
TH	8.8	3.8	6.2	6.3	7.4	0.7	0.0	3.2	3.6	6.0	5.9	3.6	1.2	8.3	0.9	2.8	**5.2**
VN	0.0	3.0	3.0	2.0	5.9	1.4	5.6	3.2	1.6	5.5	2.4	3.6	0.0	4.3	1.3	1.7	**2.6**
AE	8.0	3.8	6.7	6.2	22.2	7.9	8.1	-5.1	6.8	10.0	6.6	8.1	7.8	7.6	0.0	3.8	**6.7**
BR	9.4	3.8	1.2	4.8	-3.0	-5.7	5.2	8.4	5.6	5.9	7.2	4.1	1.3	0.4	3.9	2.4	**4.4**
DE	7.5	5.0	7.5	6.7	11.1	5.0	8.1	6.8	7.0	6.5	9.0	7.8	5.2	10.4	0.2	4.0	**6.9**
UK	5.6	6.1	7.9	6.5	6.7	3.6	6.5	7.0	7.7	7.1	9.7	7.2	4.3	9.1	0.3	3.5	**6.6**
US	8.3	4.3	8.2	6.9	-3.7	7.1	7.0	3.0	1.7	6.2	9.7	4.3	6.4	8.9	1.3	4.5	**5.9**
ZA	-1.8	5.0	5.0	2.7	1.5	-6.4	4.6	3.0	6.3	4.2	1.4	3.1	1.0	0.6	0.1	0.4	**2.7**

\# - normalised using max-min method, and inverted; max = 10
* – normalised using max-min method; max = 10
^ - normalised by log(e) of value

e) Privacy Parameter

The privacy parameter of the CRI 2016 updated the "Privacy" factor in the Business Software Alliance's (BSA)'s 2013 Global Cloud Computing Scorecard. The BSA scored countries along five questions with a maximum of 10 marks. The ACCA used those questions to update the scores for all countries, as well as score countries which were not originally covered. We incorporated changes we observed in other markets, to arrive at our scores. The BSA's scoring mechanism was based on five questions, with the following values:

- Q1: Are there laws or regulations governing the collection, use or other processing of personal information? 30% of privacy score (max value = 3)
- Q6: Is there an effective agency (or regulator) tasked with the enforcement of privacy laws? 25% of privacy score (max value = 2.5)
- Q8: Are data controllers free from registration requirements? 20% of privacy score (max value = 2)
- Q9: Are cross-border transfers free from registration requirements? 15% of privacy score (max value = 1.5)
- Q10: Is there a breach notification law? 10% of privacy score (max value = 1)

ACCA Data Privacy Score (2016 Update)

COUNTRY	30% of privacy score (max value = 3) Q1: Are there laws or regulations governing the collection, use or other processing of personal information?	25% of privacy score (max value = 2.5) Q6: Is there an effective agency (or regulator) tasked with the enforcement of privacy laws?	20% of privacy score (max value = 2) Q8: Are data controllers free from registration requirements?	15% of privacy score (max value = 1.5) Q9: Are cross-border transfers free from registration requirements?	10% of privacy score (max value = 1) Q10: Is there a breach notification law?	DATA PRIVACY SCORE
AU	Yes 3	Yes, NR 2.5	Yes 2	Yes 1.5	Partially 0.5	**9.5**
CN	Partially 1.5	None 0	Yes 2	Yes 1.5	Partially 0.5	**5.5**
HK	Yes 3	Yes, NR 2.5	Yes 2	Yes 1.5	Partially 0.5	**9.5**
IN	Partially 1.5	None 0	Yes 2	Partially 1	No 0	**4.5**
ID	Partially 1.5	None 0	Yes 2	Yes 1.5	Yes, compulsory 1	**6**
JP	Yes 3	Yes, SR 1	Yes 2	Yes 1.5	Partially 0.5	**8**
MY	Yes 3	Yes, NR 2.5	Partially 1	Yes 1.5	No 0	**8**
NZ	Yes 3	Yes, NR 2.5	Yes 2	Yes 1.5	No 0	**9**
PH	Yes 3	None 0	Yes 2	Yes 1.5	Yes, compulsory 1	**7.5**
SG	Yes 3	Yes, NR 2.5	Yes 2	Yes 1.5	No 0	**9**
KR	Yes 3	Yes, NR 2.5	Partially 1	Yes 1.5	Yes, compulsory 1	**9**
TW	Yes 3	Yes, NR 2.5	Yes 2	Yes 1.5	Partially 0.5	**9.5**
TH	Partially 1.5	None 0	Yes 2	Yes 1.5	No 0	**5**
VN	Partially 1.5	None 0	Yes 2	Yes 1.5	No 0	**5**
AE	No 0	None 0	Yes 2	Yes 1.5	No 0	**3.5**
BR	Partially 1.5	None 0	Yes 2	Yes 1.5	No 0	**5**
DE	Yes 3	Yes, SR 1	Yes 2	Yes 1.5	Partially 0.5	**8**
UK	Yes 3	Yes, NR 2.5	No 1	Yes 1.5	Partially 0.5	**8.5**
US	Partially 1.5	Yes, SR 1	Yes 2	Partially 1	Yes, compulsory 1	**6.5**
ZA	No 0	None 0	Yes 2	Yes 1.5	No 0	**3.5**

Scoring
Q1: Yes = 3, Partially = 1.5, No = 0
Q6: Yes, NR (National Regulator) = 2.5, Yes, SR (Sectoral Regulator) = 1, None = 0
Q8: No = 0, Partially = 1, Yes = 2
Q9: No = 0, Partially = 1, Yes = 1.5
Q10: Yes, compulsory = 1, Partially - no law, but recommendations orguidelines issued = 0.5, No - no law, and no mention of breach notification = 0

The ACCA is a leading industry association comprising the stakeholders of the cloud computing ecosystem in Asia. The ACCA works to ensure that the interests of the cloud computing community are effectively represented in the public policy debate. Our primary mission is to accelerate the growth of the cloud market in Asia, where we promote the growth and development of cloud computing in Asia Pacific through dialogue, training, and public education. Through regular meetings, we also provide a platform for members to discuss implementation and growth strategies, share ideas, and establish policies and best practices relating to the cloud computing ecosystem.

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