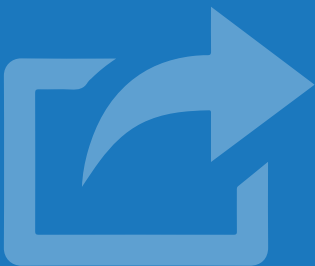

State of Cloud Adoption in Asia Pacific (APAC) 2017





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EXECUTIVE SUMMARY

Cloud computing has been marketed for years for its capacity to offer flexibility, cost efficiency, data availability, easy backup and recovery. As cloud computing has steadily been embraced as an integral component of many organizations, it is clear that cloud adoption holds an increasingly important role in the global economy.

Many countries are looking to adopt a “Smart Nation” strategy. As the enabler of Internet of Things (IoT) and data analytics, the incorporation of cloud computing is critical for the successful implementation of these leading-edge technologies. Countries and organizations moving towards Industry 4.0 are highly dependent on cloud computing, as it is the basis for this revolutionary transition. However, complications and confusion arising from regulations (or lack thereof) surrounding cloud usage hinders cloud adoption. The lack of clarity on cloud usage in regulated industries is slowly being addressed, but remains ambiguous most of the time. New policies and regulations can help drive change in demand of cloud usage. Singapore’s regulatory atmosphere is one such example, providing well-defined security requirements for the healthcare sector through the Multi-Tiered Cloud Security (MTCS) framework. As a result, organizations have been advised by relevant government agencies to adopt the framework.

Information Technology (IT) is becoming increasingly important in the execution of organizational strategies and the protection of virtual assets. This is creating a push for increased adoption of cloud usage, which replaces traditional on-premise IT and data centers. This change, supported by industry verticals and national strategies, is expected to drive down cloud costs. Consequently, economies of scale will likely lead to mass adoption of cloud services. Additionally, to support increased cloud-usage demand, more in-country cloud infrastructure will be built.

In the “State of Cloud Adoption in Asia Pacific (APAC) 2017”, adoption is evaluated through the examination of availability and affordability of cloud computing in 11 countries in the APAC region. Results suggest the rate of cloud computing adoption is directly related to the availability of mass, in-country cloud infrastructure. Report findings also seem to support the premise that countries are more likely to migrate from traditional IT to the cloud because of the availability of in-country support and the lowered total cost of ownership. This leads to affordability of cloud services and compliance with local regulatory requirements in regard to data sovereignty.

Key Findings Include:

- Japan ranks #1 in cloud adoption with in-country cloud infrastructure from established cloud providers, such as Amazon Web Services (AWS), Microsoft Azure, Google Cloud and International Business Machines Corporation (IBM) Cloud Services.
- Among the Association of Southeast Asian Nations (ASEAN), established cloud providers set up in-country cloud infrastructure in just one location: Singapore.
- All non-Chinese cloud service providers are required to deliver services through partners in China due to local regulatory restrictions.
- Hong Kong tops the affordability ranking, but the lack of Google and AWS in-country cloud infrastructure puts it at #6 in the overall adoption ranking.
- Although Taiwan has yet to attract other well-established cloud providers, Google has chosen it as the first APAC country to set up cloud infrastructure.
- India, Malaysia, New Zealand, Taiwan and Thailand are identified as countries where cloud computing has not been widely adopted.

DEFINITIONS

Asia Pacific (APAC) Countries

APAC countries refer to Australia, China, Hong Kong, India, Japan, South Korea, Malaysia, New Zealand, Singapore, Taiwan and Thailand only. More APAC countries will be included in future studies.

Cloud Adoption

Cloud adoption is derived from measuring the availability of in-country infrastructure and service affordability. Adoption is considered high when in-country cloud infrastructure is available and a cloud service is deemed affordable to organizations operating in the country.

Cloud Affordability

Cloud affordability refers to the cost of cloud service after cost-of-living adjustment (COLA). Cloud service is less affordable when the cloud service cost is high after adjustment.

Cloud Availability

Cloud availability refers to the availability of in-country cloud infrastructure.

Cloud Computing

Cloud computing refers to the paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources, with self-service provisioning and administration on-demand [1].

Cloud Service

A cloud service refers to one or more capabilities offered via cloud computing invoked using a defined interface [1].

Cloud Service Customer/Cloud Customer

A cloud service customer or a cloud customer refers to a party which is in a business relationship for the purpose of using cloud services [1].

Cloud Service Provider

A cloud service provider refers to a party which makes cloud service(s) available [1].

Data Residency/Data Sovereignty

Data residency or data sovereignty refers to the maintenance of control over a location where regulated data and documents physically reside.

Personal Data

Personal data refers to any information relating to an identified or identifiable natural person ('data subject'). An identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identification number or to one or more factors specific to his physical, physiological, mental, economic, cultural or social identity [2].

Personally Identifiable Information (PII)

PII refers to any information that can be used to identify the PII principal to whom such information relates, or is or may be directly or indirectly linked to a PII principal [3].

Reputable Cloud Service Provider (RCSP)

An RCSP refers to a cloud service provider that has been identified by survey respondents based on their reputation. An RCSP, in this report, refers to Amazon Web Services (AWS), Microsoft Azure, Google Cloud and International Business Machines Corporation (IBM) Cloud Services.



1 INTRODUCTION

A recent cloud computing survey of more than 1,000 IT professionals worldwide reported that 79 percent of organizational workload is running in the cloud [4]. Nearly half (48 percent) of the survey's respondents represented enterprises with 1,000 or more employees. Enterprises and Small-Medium Businesses (SMBs) are running 75 percent and 83 percent of workload in the cloud, respectively. Organizations will continue to spend more on cloud services in 2017, and public cloud service spending is projected to grow to USD \$246.8 billion [5]. With high global adoption rate, it is necessary to review the adoption of cloud services in the Asia Pacific (APAC) region.

The most common perceived benefit for cloud service customers is lower up-front and/or ongoing costs [6], yet cost is seldom considered in research studies. In addition to cost consideration, availability of in-country cloud infrastructure is critical for increased cloud adoption. This is a result of data residency and sovereignty, personal data and Personally Identifiable Information (PII) being legally required to remain resident in most countries [7]. Existing research studies focus on determining cloud readiness and integration of cloud services [4,8,9]. This report seeks to understand the current state of cloud adoption in APAC through the evaluation of both cloud availability and affordability.

When cloud adoption has reached critical mass and the cost is driven down by economies of scale, cloud services become affordable. Taking cost-of-living expenses into consideration, the cost of cloud services is less affordable in some APAC countries compared to the cost of traditional infrastructure; therefore, organizations in these APAC countries are less likely to adopt cloud services.

Caveat: This report examines cloud adoption by using cloud availability and affordability measures only. Other factors—which may drive and impact cloud adoption—have been excluded.

2

FINDINGS

Through evaluation of both availability and affordability measures, cloud adoption rankings among the aforementioned APAC countries are reflected on next page (Graphic: Cloud Adoption Ranking).

Among all surveyed countries, Japan, Singapore and South Korea hold the Top 3 positions. Hong Kong ranks #6, although it is one of the key cities where regional multinational corporation (MNC) headquarters are located. Hong Kong's ranking is primarily affected by a lack of in-country infrastructure from Amazon Web Services (AWS) and Google Cloud. Some countries in APAC are still relatively slow in cloud adoption. These locations include India, Malaysia, New Zealand, Taiwan and Thailand. In order to keep up with the global pace of cloud adoption, this report has concluded that these countries should review their existing landscape to identify the barriers for cloud adoption.

Note 1:

This chapter solely focuses on the rankings; the methodology used to measure availability and affordability will be discussed in the next chapter.

Note 2:

In the country level analysis in the following pages, local cloud service providers listed are examples of Cloud Service Providers (CSPs) with in-country cloud infrastructure. The list is not meant to be exhaustive.

Adoption = **Availability** + **Affordability**



Cloud Adoption Ranking



#1 Japan

Availability #1 (1.000)
Affordability #4 (0.962)
Adoption #1 (1.962)



#2 Singapore

Availability #2 (0.750)
Affordability #2 (0.995)
Adoption #2 (1.745)



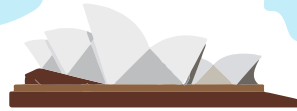
#3 South Korea

Availability #2 (0.750)
Affordability #3 (0.969)
Adoption #3 (1.719)



#4 China

Availability #2 (0.750)
Affordability #5 (0.958)
Adoption #4 (1.708)



#5 Australia

Availability #2 (0.750)
Affordability #7 (0.935)
Adoption #5 (1.685)



#6 Hong Kong

Availability #7 (0.500)
Affordability #1 (1.000)
Adoption #6 (1.500)



#7 India

Availability #2 (0.750)
Affordability #10 (0.727)
Adoption #7 (1.477)



#8 Taiwan

Availability #8 (0.250)
Affordability #6 (0.957)
Adoption #8 (1.207)



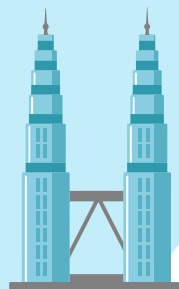
#9 Thailand

Availability #9 (0.000)
Affordability #8 (0.927)
Adoption #9 (0.927)



#10 New Zealand

Availability #9 (0.000)
Affordability #9 (0.909)
Adoption #10 (0.909)



#11 Malaysia

Availability #9 (0.000)
Affordability #11 (0.724)
Adoption #11 (0.724)

Japan

Adoption: #1

Japan is preferred by RCSPs¹. All four RCSPs have in-country cloud infrastructure in Japan [10,11,12,13].

Japan is ranked #1 in cloud availability with the recent establishment of Google Cloud zones in Tokyo [12]. Most of the RCSP cloud infrastructure resides in Tokyo. Only Microsoft Azure has cloud infrastructure in both Tokyo and Osaka. Cloud service customers from other regions may have a slightly higher cloud service latency due to the location of the cloud infrastructure in Japan. Japan’s cloud affordability is ranked #4, with a score only slightly behind South Korea. While the actual cost of cloud is high (fourth highest) in Japan, it is highly affordable after taking into account the cost of living.

Examples of Local Cloud Services Providers

- KDDI Corporation
- Nippon Telegraph and Telephone Communications
- SoftBank Group Corporation

Singapore

Adoption: #2

Singapore serves as a cloud hub for the region as the only ASEAN country with RCSP in-country infrastructure while ranking #1 in cloud readiness among ASEAN countries [9,10,11,12,13].

Neighboring countries which plan to use cloud services from the RCSPs may use the cloud infrastructure in Singapore. RCSPs may have placed in-country cloud infrastructure in Singapore as it houses many regional MNCs.

Singapore is ranked #2 in cloud availability with in-country infrastructure from AWS, Microsoft Azure and International Business Machines Corporation (IBM) Cloud Services. It also ranks #2 in cloud affordability. This high affordability ranking is due to high property rental expenses. Notably, Singapore’s rental cost is double the rental cost of the country that ranks next. This scenario puts Singapore in a better position in terms of cloud affordability because using cloud services is cheaper than renting a space to hold an IT infrastructure.

Google Cloud is planning its expansion to set up cloud infrastructure in

Availability: #1
Affordability: #4

Available RCSPs

- AWS ✓
- Microsoft Azure ✓
- Google Cloud ✓
- IBM Cloud Services ✓

Availability: #2
Affordability: #2

Available RCSPs

- AWS ✓
- Microsoft Azure ✓
- Google Cloud (Upcoming)
- IBM Cloud Services ✓

[1] See chapter DEFINITIONS for definition of reputable cloud service providers.

Singapore in 2017 [12]. Singapore will be ranked #1 in cloud availability and overtake Japan as #1 in overall cloud adoption if all other factors remain the same.

Examples of Local Cloud Services Providers

Clearmanage
Singapore Telecommunications Limited
StarHub Limited

South KoreaAdoption: #3

Cloud service is recognized by the government as a core part of Industry 4.0 in South Korea [14,15,16].

In-country cloud infrastructure is essential to provide reliable cloud services to support the Industry 4.0 Initiative. Three RCSPs provide in-country cloud infrastructure in South Korea [10,11,13]. Cloud services are relatively affordable compared to those from other APAC countries. As a result, South Korea is ranked #3 amongst the surveyed countries.

Examples of Local Cloud Services Providers

Korea Telecom
Sunkyoung Telecom
LG Uplus Corporation

ChinaAdoption: #4

RCSPs deliver their services differently in China due to local regulatory restrictions [17].

RCSPs are not allowed to deliver cloud services directly to cloud service customers: they must partner with local organizations to bring cloud service to Chinese customers [18]. For example, AWS partners with Sinnet, while IBM and Microsoft Azure partner with 21Vianet to deliver their services to the Chinese market [19,20,21]. Despite low cloud service costs, the cost-saving benefits of the cloud are not substantial for organizations in China.

Examples of Local Cloud Services Providers

Alibaba Group Holding Limited
Huawei Technologies Corporation Limited
Tencent Holdings Limited

Availability: #2
Affordability: #3

Available RCSPs

AWS	✓
Microsoft Azure	✓
Google Cloud	✗
IBM Cloud Services	✓

Availability: #2
Affordability: #5

Available RCSPs

AWS	✓
Microsoft Azure	✓
Google Cloud	✗
IBM Cloud Services	✓

Australia

Adoption: #5

RCSP in-country cloud infrastructure is only available in Eastern Australia [11,13, 22].

Organizations based in Melbourne and Sydney enjoy better cloud service quality compared to those in Western Australia. The current, multiple-zones setup may not be as beneficial to cities such as Perth or Darwin [11,13] because RCSP cloud infrastructure is not available in these parts of the country. Australian cloud service expenses are relatively high compared to other APAC countries. Furthermore, when compared to the cost of traditional IT infrastructure, cloud service is considered less affordable in Australia.

Examples of Local Cloud Services Providers

- CloudCentral
- Singtel Optus Pty Limited
- Telstra Corporation Limited

Hong Kong

Adoption: #6

Although it is one of the major fintech hubs in APAC, not all RCSPs have in-country cloud infrastructure in Hong Kong to support their cloud services [10,11,12,13,23].

AWS and Google Cloud do not have in-country infrastructure in Hong Kong [11,12]. High rental costs and limited usable land area may be the underlying factors. Cloud service customers who wish to use RCSP cloud services are recommended to have data hosted in other nearby countries, such as China, Japan, South Korea and Taiwan, where RCSP in-country infrastructure is present. Cloud service customers within heavily regulated industries such as FSI may not be able to use cloud services from AWS and Google Cloud due to data residency issues.

Cloud service cost is very high in Hong Kong (second highest), and its utilities and rental cost are much higher than other APAC countries. Cloud service is relatively cheap compared to implementing on-premise infrastructure.

Examples of Local Cloud Services Providers

- Hong Kong Broadband Network Limited
- Hutchison Global Communications Limited
- Pacific Century CyberWorks Limited

Availability: #2
Affordability: #7

Available RCSPs

- AWS ✓
- Microsoft Azure ✓
- Google Cloud (Upcoming)
- IBM Cloud Services ✓

Availability: #7
Affordability: #1

Available RCSPs

- AWS ✗
- Microsoft Azure ✓
- Google Cloud ✗
- IBM Cloud Services ✓

India

Adoption: #7

RCSPs have in-country infrastructure in India, indicating a potential in the Indian market [10,11,13]. However, cloud service is not yet affordable; this may be due to a low uptake in the country.

Digitization and cloud infrastructure development are top priorities for the Indian government, and the presence of in-country cloud infrastructure is critical to the success of the “Digital India Initiative”, which was launched by the Indian government in 2015 [24]. Three of the four RCSPs have cloud facilities located in the country [10,11,13]. Additionally, Google Cloud announced it would be setting up its cloud facilities in Mumbai in 2017 [12]. However, cloud services are very costly for Indian firms. Although cost-of-living expenses in India are the lowest among all surveyed countries, cost of cloud services remain high. In fact, it has been observed that Indian firms do not incorporate cloud services due to its low-cost effectiveness [25]. This indicates that cloud computing is still not mature in India, and that cloud education and awareness need to be enforced.

Examples of Local Cloud Services Providers

Net4

Netmagic Solutions

Tata Communications

Taiwan

Adoption: #8

Taiwan is the first (and one of only two APAC countries surveyed) that has Google Cloud infrastructure in-country [12].

Organizations in Taiwan may need to use cloud services from neighboring countries such as Japan and Hong Kong if they wish to use other RCSP services. With initiatives such as “Computing Applications and Industrial Development Programs”, Cloud Security Alliance hopes to see more RCSPs establish operations in Taiwan [26]. The cost of Taiwanese cloud services was average among surveyed countries, but cloud services are not exactly affordable for Taiwanese organizations.

Examples of Local Cloud Services Providers

Chunghwa Telecom

FarEasTone Telecommunications

Taiwan Mobile

Availability: #2

Affordability: #10

Available RCSPs

AWS	✓
Microsoft Azure	✓
Google Cloud	(Upcoming)
IBM Cloud Services	✓

Availability: #8

Affordability: #6

Available RCSPs

AWS	×
Microsoft Azure	×
Google Cloud	✓
IBM Cloud Services	×

Thailand

Adoption: #9

Thailand does not have any RCSP infrastructure in the country [10,11,12,13].

Cloud customers based in Thailand must leverage cloud infrastructure in other countries, such as Singapore, if they wish to use services from RCSPs. Although AWS partners with in-country CSPs such as trueIDC, this relationship only indicates that the local CSP partners are either hosted on or integrated with the AWS platform [27,28]. Although Thai cloud service costs less than average when compared with other APAC locations, adopting cloud service is not as affordable as adopting traditional IT infrastructure due to the country’s low cost of living.

Examples of Local Cloud Services Providers

- Krypt
- TrueIDC
- Total Access Communication Public Company Limited

New Zealand

Adoption: #10

New Zealand has no in-country cloud infrastructure from the RCSPs [10,11,12,13].

To provide a better cloud experience to New Zealander cloud customers, AWS in Sydney, Australia partners with Datacom to offer a faster and more stable connection [29]. However, data sovereignty is a significant issue for New Zealand-based organizations, as none of the RCSPs reside in the country. Organizations must use alternative local CSPs if they wish to incorporate cloud technology. High cost is another barrier for New Zealand firms that wish to utilize cloud services. Cloud affordability is low because cost of living in New Zealand is low, but cloud service costs do not scale down, indicating that cloud adoption is not mature in the country.

Examples of Local Cloud Services Providers

- Catalyst
- Layer3
- theCloud

Availability: #9
Affordability: #8

Available RCSPs

- | | |
|--------------------|---|
| AWS | × |
| Microsoft Azure | × |
| Google Cloud | × |
| IBM Cloud Services | × |

Availability: #9
Affordability: #9

Available RCSPs

- | | |
|--------------------|---|
| AWS | × |
| Microsoft Azure | × |
| Google Cloud | × |
| IBM Cloud Services | × |

Malaysia

Adoption: #11

Malaysia has no in-country cloud infrastructure from the RCSPs [10,11,12,13].

If Malaysian cloud service customers wish to use cloud services from the RCSPs, their cloud data must reside in a neighboring country, such as Singapore, which has in-country cloud infrastructure from AWS, Microsoft Azure and IBM [10,12,13]. Alternatively, cloud service customers can purchase cloud services from local CSPs such as Exabytes, Ipserverone and Shinjiru. Cloud services are very expensive when cost-of-living factors are taken into account. This can be a significant barrier for organizations in Malaysia when considering whether to adopt cloud services.

Examples of Local Cloud Services Providers

- Exabytes
- Ipserverone
- Shinjiru

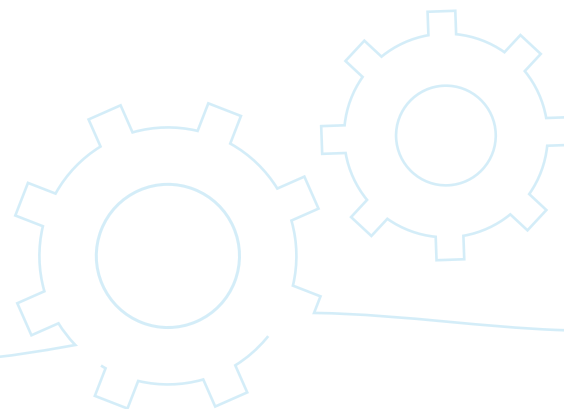
Availability: #9
Affordability: #11

Available RCSPs

AWS	×
Microsoft Azure	×
Google Cloud	×
IBM Cloud Services	×

3

METHODOLOGY



3.1 Availability

Cloud service is everywhere. Across all surveyed countries, individuals or organizations can access the cloud as long as there is an Internet connection. Availability of in-country cloud infrastructure is essential for better cloud services because this scenario offers lower latency, better connectivity and the ability to meet regulatory compliance.

An online questionnaire/survey was administered to 370 APAC participants during a 10-month period. Survey results indicated that reputation was the third-most important factor affecting decisions on choosing CSPs, trailing just cost and the service-level agreement. In addition, cloud service customers tend to reject a cloud service when the provider is not trusted [6]. Having RCSPs available in the country can encourage local organizations to adopt cloud services.

Availability of Reputable CSP = Better Cloud Adoption

3.1.1 RCSPs

When survey respondents were asked to name five CSPs that they were familiar with in their respective countries, four service providers were mentioned due to their reputation:

58% Amazon Web Services

53% Microsoft Azure

30% Google Cloud

25% IBM Cloud Services

**Reputable CSP =
Amazon Web Services, Microsoft Azure,
Google Cloud and IBM Cloud**

Why are they not entering the market?

No RCSP was mentioned by respondents in Malaysia, New Zealand and Thailand, likely due to a lack of RCSP presence in these countries. (See next section for more details about the in-country cloud infrastructure of the RCSPs.) The reasons for not entering or not being able to enter these countries should be considered. For instance, are there any legal restrictions for overseas CSPs to move into the country? Is the price of setting up in-country data centers too high to attract CSPs?

3.1.2 In-Country Cloud Infrastructure

CSPs have their own cloud service delivery models and products, and these can be hosted in multiple geographic locations [10,11,12,13]. However, not all products are available in all service areas. Therefore, it is important to understand CSP service capacity more before determining availability in the APAC countries. The following is an overview of how RCSPs deliver cloud services to customers and how their presence in surveyed countries was defined.

Amazon Web Services

AWS has 35 different locations globally [11,30]. AWS delivers its cloud services through its “Origin” and “Edge” infrastructure system. Origin infrastructure provides most AWS services, such as Amazon Elastic Compute Cloud (Amazon EC2) and Amazon DynamoDB. Edge infrastructure only provides services such as Amazon CloudFront, Amazon Route 53, and AWS WAF. If a country only has AWS Edge infrastructure but not AWS Origin Infrastructure, CSA makes the determination that AWS is not available in that country.

Microsoft Azure

Microsoft Azure is available in 34 different locations globally [10]. Each data location provides various cloud services to customers. These services include virtual machines, content delivery networks and storage. Among the surveyed countries, CSA determined that Microsoft Azure cloud infrastructure is available in Australia, China, Hong Kong, Singapore, India, Japan and South Korea.

Google Cloud

Google Cloud is available in 18 different locations worldwide, and provides services such as Compute Engine and Cloud Storage [12]. Although Google Cloud was mentioned by 30 percent of the APAC respondents, the service maintains cloud infrastructure in just Japan and Taiwan. Therefore, it is recommended that APAC customers choose a data center in Japan or Taiwan to reduce latency and improve service reliability.

International Business Machines Corporation Cloud Services

IBM Cloud has 22 different locations worldwide [22]. IBM Cloud Services provide various cloud services, from IaaS, PaaS and SaaS to cloud data storage. IBM Bluemix Public and IBM Bluemix Dedicated are two key products from IBM Cloud Services. These products are delivered to customers via Softlayer, an IBM company [13]. Notably, the selection of data-hosting locations offering IBM Bluemix Public is very limited. Among the APAC countries surveyed, cloud data can only be hosted in Australia for IBM Bluemix Public. Customers must purchase IBM Bluemix Dedicated to host cloud data in other SoftLayer APAC data centers. This allows customers to host data in China, Hong Kong, India, Japan, South Korea and Singapore. CSA determines that IBM Cloud Services is available if SoftLayer’s infrastructure is present in the country for the use of either IBM Bluemix Public or IBM Bluemix Dedicated.

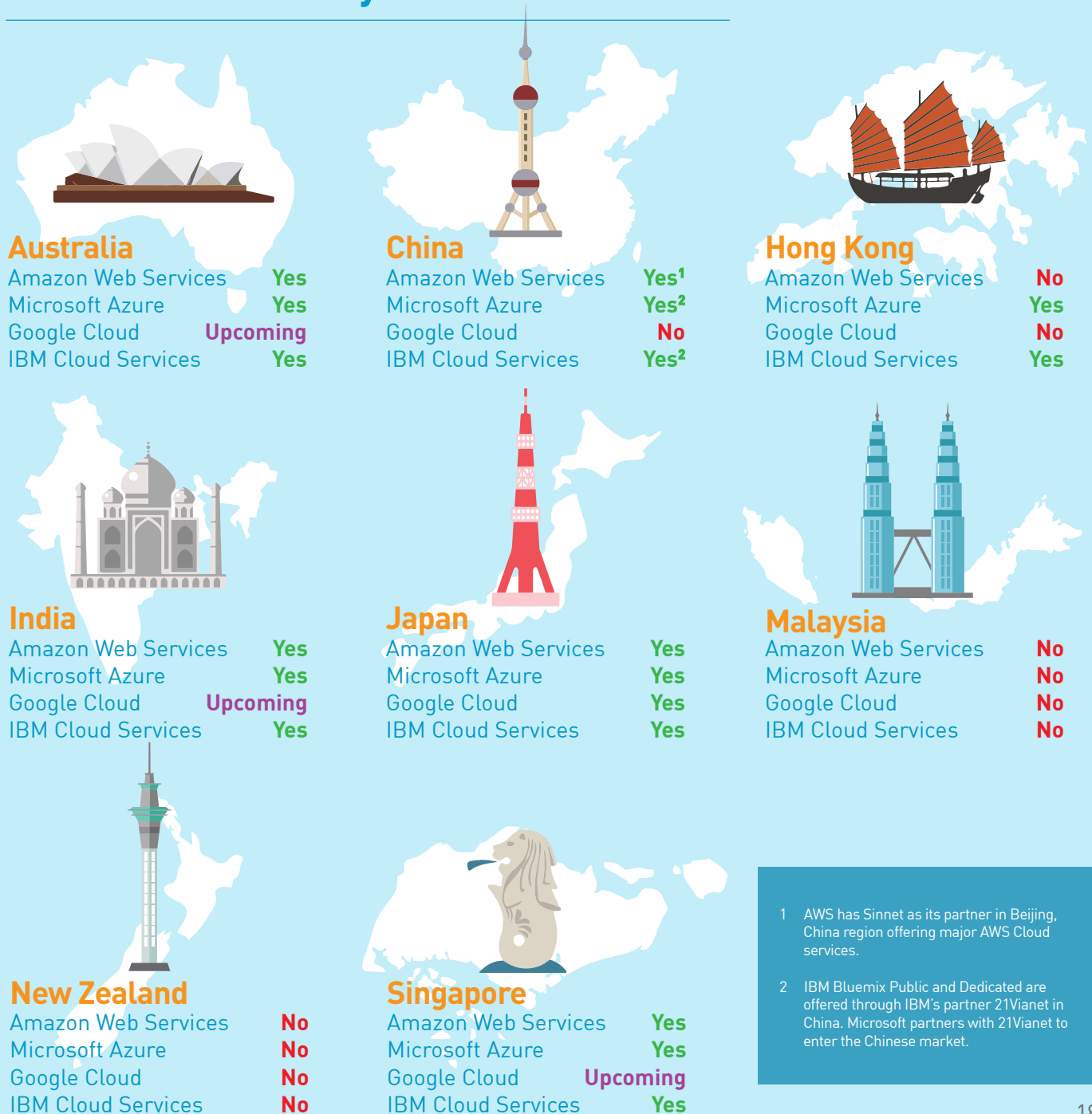
RCSPs provide cloud services to almost every cloud-enabled country. However, CSA does not recognize these RCSPs as “available” in all APAC countries due to challenges such as data

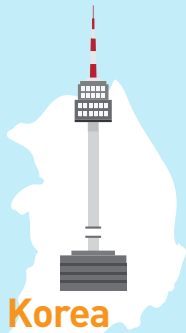
sovereignty and connection quality. Without having in-country cloud infrastructure, cloud service customers may not be willing or allowed to use cloud services.

Available = Presence of In-Country Cloud Infrastructure

$$\text{Cloud Availability Score} = \frac{\text{Number of RCSP In-Country Cloud Infrastructure}}{4}$$

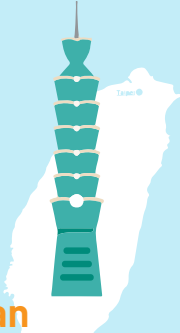
RCSPs Availability in APAC





South Korea

Amazon Web Services	Yes
Microsoft Azure	Yes
Google Cloud	No
IBM Cloud Services	Yes



Taiwan

Amazon Web Services	No
Microsoft Azure	No
Google Cloud	Yes
IBM Cloud Services	No



Thailand

Amazon Web Services	No
Microsoft Azure	No
Google Cloud	No
IBM Cloud Services	No

3.2 Affordability

Cost is one of the key considerations when organizations evaluate the potential adoption of new technology. With lower monetary investment, organizations are more open to adopting new technology. This is also applicable to cloud services. Although cloud service prices have dropped significantly in the past year, it is still considered unaffordable in some APAC countries [31].

Cloud affordability can be calculated by normalizing the cost of cloud services with economic environment factors. Below is a summary of cloud service expenses in all surveyed countries after Cost-Of-Living Adjustments (COLA) are applied; affordability is then ranked. Internet, rental and basic utility costs are used to represent cost-of-living expenses during calculation.

$$\text{Cloud Service Cost After Cost-of-Living Adjustment (COLA)} = \text{Cloud Service Cost (Internet Cost + Basic Utilities Cost + Rental Cost)}$$

$$\text{Cloud Affordability Index}^1 = 1 - \text{Cloud Service Cost After COLA}$$

$$\text{Cloud Affordability Score}^2 = \frac{\text{Cloud Affordability Index}}{\text{Highest Cloud Affordability Index}}$$

- 1 Cloud affordability index is used to represent how affordable cloud services are in each country. The lower the cloud service cost after COLA is, the higher the cloud affordability index.
- 2 Cloud affordability score is normalized with the highest cloud affordability index among the APAC countries. Cloud affordability score is scaled up to 1 being the highest score.

Cloud service cost after COLA



#1 Hong Kong

Cloud cost after COLA \$0.0212

Cloud service cost	\$ 535.68
Internet cost	\$ 27.62
Basic utilities cost	\$ 182.57
Rental cost	\$ 25081.06



#2 Singapore

Cloud cost after COLA \$0.0264

Cloud service cost	\$476.16
Internet cost	\$29.71
Basic utilities cost	\$111.33
Rental cost	\$17,878.37



#3 South Korea

Cloud cost after COLA \$0.0517

Cloud service cost	\$404.37
Internet cost	\$22.43
Basic utilities cost	\$149.31
Rental cost	\$7,643.07



#4 Japan

Cloud cost after COLA \$0.0583

Cloud service cost	\$491.04
Internet cost	\$36.22
Basic utilities cost	\$177.78
Rental cost	\$8,214.53



#5 China

Cloud cost after COLA \$0.0626

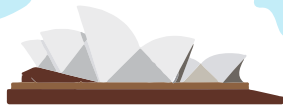
Cloud service cost	\$368.96
Internet cost	\$14.70
Basic utilities cost	\$49.33
Rental cost	\$5,832.04



#6 Taiwan*

Cloud cost after COLA \$0.0628

Cloud service cost	\$400.75
Internet cost	\$24.33
Basic utilities cost	\$58.99
Rental cost	\$6,293.50



#7 Australia

Cloud cost after COLA \$0.0844

Cloud service cost	\$519.31
Internet cost	\$53.74
Basic utilities cost	\$144.25
Rental cost	\$5,952.04



#8 Thailand*

Cloud cost after COLA \$0.0930

Cloud service cost	\$240.00
Internet cost	\$17.83
Basic utilities cost	\$61.55
Rental cost	\$2,501.40



#9 New Zealand*

Cloud cost after COLA \$0.1099

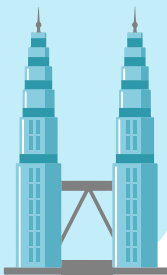
Cloud service cost	\$480.00
Internet cost	\$58.86
Basic utilities cost	\$125.80
Rental cost	\$4,182.35



#10 India

Cloud cost after COLA \$0.2881

Cloud service cost	\$431.15
Internet cost	\$18.56
Basic utilities cost	\$32.47
Rental cost	\$1,445.51



#11 Malaysia*

Cloud cost after COLA \$0.2917

Cloud service cost	\$564.17
Internet cost	\$36.21
Basic utilities cost	\$41.56
Rental cost	\$1,856.16

* Cloud services provided by other CSPs, with similar specifications to Microsoft Azure Virtual, are used as RCSPs, and do not have local cloud infrastructure in the country. Malaysia: Exabytes Cloud Servers; New Zealand: Catalyst Cloud; Taiwan: Google Cloud (with cost adjustment); and Thailand: Krypt Cloud.

3.2.1 Selection of Cloud Service

Microsoft Azure Virtual Machine is used in this report as the benchmark for comparison because it has better coverage than other RCSPs in APAC countries.

Cloud service cost is based on the cost of Microsoft Azure Virtual Machines¹ with the following specifications:

Instance Size (A6)

- 4 Cores
- 28 GB RAM
- 285 GB Disk
- 1 Virtual Machine
- 744 Hours / Month

Since Microsoft Azure Virtual Machines do not have in-country cloud infrastructure in all APAC countries, cloud service costs for Malaysia, New Zealand, Taiwan and Thailand are calculated from non-Azure cloud services. These services have similar specifications to Azure, and are supported by in-country cloud infrastructure¹. As such, the accuracy of this comparison may be slightly affected.

3.2.2 Tabulation of Cost of Living

Internet and basic utilities costs were extracted from the Numbeo database² on March 20, 2017. The specification for Internet is 10Mbps speed without any data cap, and the connection type can either be cable or ADSL. The basic utilities cost was calculated and based on an 85-square-meter apartment that included electricity, heating, water and garbage collection.

The price per-square-meter to purchase an apartment in the city center was also factored when calculating the cloud service cost after COLA. This was an estimation of the cost of renting a space to host the physical components of IT infrastructure.

Through a comparison of cloud services, Internet and basic utilities costs, Hong Kong was identified as the most cost-effective country for utilizing cloud services, followed by Singapore. The cost of human resources have been excluded from this calculation due to cost-allocation complexities.

[1] Cloud services provided by CSPs with similar specifications as Microsoft Azure Virtual are used in calculations because RCSPs do not have local cloud infrastructure in the following countries: Malaysia: Exabytes Cloud Servers; New Zealand: Catalyst Cloud; Thailand: Krypt Cloud; and Taiwan: Google Cloud (with cost adjustment).

[2] Numbeo is the world's largest database of user contributed data about cities and countries worldwide. Numbeo provides current and timely information on world-living conditions, including cost-of-living data, housing indicators, health care, traffic, crime and pollution.
<https://www.numbeo.com/cost-of-living>

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