



Banking in the Clouds

Cloud computing has recently emerged as a major new trend in business technology based on its potential to significantly reduce information technology (IT) costs and vastly increase employee productivity for businesses both large and small. A recent study by the International Data Corporation (IDC) estimates that by 2015, cloud technology will increase worldwide business revenue by approximately US\$1.1 trillion.¹ Attracted by the potential for such gains, many Asian businesses, financial institutions, and governments are currently exploring how cloud technology can be implemented to improve their daily operations. The Chinese government, for example, has identified cloud computing as a ‘Strategic Emerging Industry’ and has included plans for its widespread adoption in the country’s 12th Five Year Plan. To support this initiative, in October 2011 China’s National Development and Reform Commission announced the establishment of an RMB 1.5 billion (USD 236 million)² fund to promote the development of a domestic cloud computing industry and to support research into the possible applications of clouds in several key industries including banking.^{3,4,5}

Cloud technology has significant potential but these gains are not without risk. As this still emerging technology has yet to be standardized, some Asian regulators are proceeding more cautiously before allowing clouds to be adopted in specific industries. Specifically in regards to financial services, the Monetary Authority of Singapore and the Hong Kong Monetary Authority have voiced concerns that cloud computing, in its current form, poses significant risks to the financial industry because of key issues with data security and consumer protection. These regulators have stated that only after rigorous industry standards and due diligence procedures are established will they allow cloud computing to be widely adopted by financial firms operating within their borders.⁶ This *Asia Focus* report will explore the opportunities and challenges cloud computing poses to Asian financial institutions and will summarize some methods in which Asian regulators are navigating its adoption.

What is cloud computing?

The term cloud computing is broadly applied to a variety of services and IT configurations. Although a standard^{7,8,9} definition has yet to be established, in its most general form, cloud computing refers to the provision of shared user access to applications, computations, databases,

platforms¹⁰, software, and storage (hereafter referred to collectively as “services”), regardless of geographic location via internet¹¹ technologies. The key concept behind this technology is that these services can be spread out over a group of servers¹² (which may be positioned throughout the world) without requiring the user to know where information is physically housed or how the server system is configured.

This architectural configuration creates a virtual computing “cloud” where users can access multiple resources at their discretion from any location they wish and at a cost based only on the resources used. Thus, a cloud is a style of computing that gives users the ability to dynamically configure computing services based on their current and future needs, via a system that has greater capacity than any individual computer or single business server.¹³ These features make cloud systems scalable, flexible, and potentially portable. As access to services occurs via the internet and resources are shared among users, clouds can lower business expenses via reduced capital expenditures on computer hardware and software, energy usage, IT and personnel, and other related costs. Cloud services and the IT infrastructure supporting these services can be configured in multiple ways depending on a firm’s needs and budget. In general, cloud systems are classified by the services provided and how the services are deployed. There are three main service models for clouds:

- *Software as a Service (SaaS)* – In this model, customers run finished software applications that are provided by the cloud vendor for use on the vendor’s system on a subscription basis.
- *Platform as a Service (PaaS)* – In this model, customers develop, test, and run applications on the vendor’s cloud using programming languages, services, and tools supported by the vendor’s platform.
- *Infrastructure as a Service (IaaS)* – In this model, customers lease servers, storage, database services, processing capacity and/or other fundamental computing resources from the cloud vendor on which customers can load and run their own software, operating systems, applications, and programs.

The cloud service model, supporting IT infrastructure, and deployment approach have important consequences for cost, data security, business continuity, and data ownership.

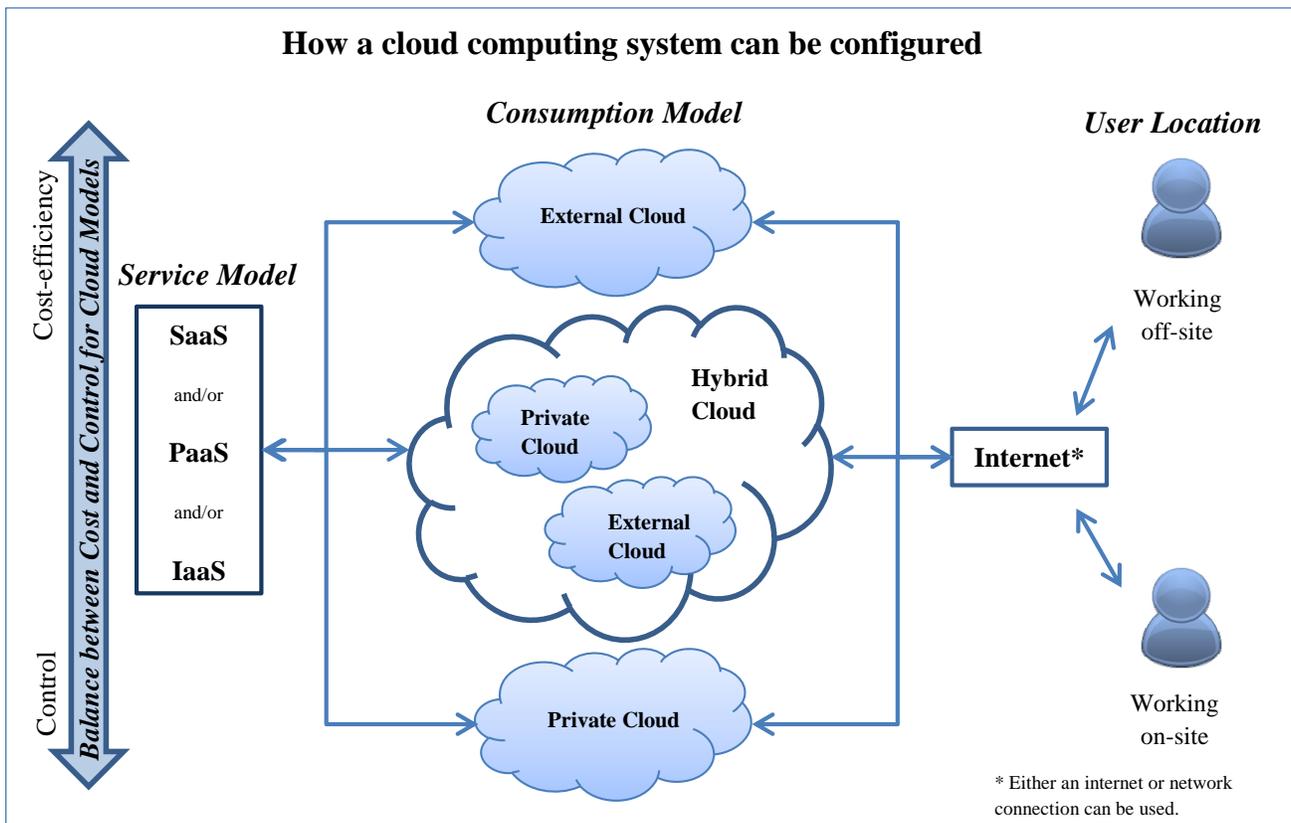
There are three generally agreed upon deployment models:

- *Internal/Private Cloud* – This cloud model and supporting IT infrastructure is owned by the customer and operated on the customer’s business site for access by multiple-users, either employees or business units. In this case, a company may either invest in the computer resources to manage the cloud internally or contract with an outside company to build, operate, and maintain an internal cloud on its behalf. While this deployment approach provides direct control to the customer over data security and applications, this type of cloud can be cost prohibitive because of the required initial investment in computer hardware, software, and IT resources. Nevertheless, firms may still achieve cost savings by utilizing the cloud for real time collaboration and by provisioning shared resources between divisions, units, and employees. Examples of users include Bank of Tokyo-Mitsubishi UFJ, Bank of China, Commonwealth Bank of Australia, and the government of the Hong Kong Special Administrative Region.¹⁴
- *External/Vendor/Public Cloud* – This cloud’s infrastructure is owned and operated by an off-site vendor for use by the public and/or multiple enterprises. The servers and systems used to provide cloud services are housed on the cloud provider’s owned or leased premises. Depending on the IT infrastructure used by the vendor, these servers and systems may be spread among multiple locations. Since customers rely on the cloud vendor to provide services and IT support, this outsourcing can significantly reduce a firm’s operating costs and capital expenditures. However, this type of cloud system raises potential data ownership and data security issues. One recent example of an Asian bank that has adopted an external cloud is Japan’s Sugamo Shinkin Bank, which

partnered with IBM to utilize IBM’s Smart Business Desktop Cloud. This cloud allows Sugamo Shinkin Bank to automatically configure and update computers at all of its 45 operating sites simultaneously and with ease. This system ensures employees have uniform access to computing tools, data, and software. Under its agreement with IBM, the bank maintains strict ownership of its data.¹⁵

- *Hybrid cloud* – This cloud model utilizes a mix of the internal and external cloud infrastructures. A hybrid system might split a project’s workload over an organization’s internal servers and the external servers of a cloud provider to increase computational speed and worker efficiency. For example, a computationally intensive report could be sent to an external cloud for calculation, leaving the firm’s internal computing resources free for use on smaller or more sensitive data projects. This type of cloud configuration seeks to balance the need for the “power” of cloud services while resolving issues of data security. The Commonwealth Bank of Australia, Australia’s largest bank, is current using its own private cloud and Amazon.com’s cloud service to test new web applications before they are approved for customer use.¹⁶

Although each cloud configuration offers unique advantages and disadvantages, common to all is the opportunity for employees to simultaneously access software, computing resources, data, and documents. This not only reduces software licensing and hardware acquisition costs, but also provides employees with uniform resources and the opportunity for real-time collaboration. Determining which cloud is best for a firm or project depends on several issues, including the sensitivity of data involved and the firm’s financial ability. The diagram below summarizes how a cloud system can be configured.



How is cloud technology being used by financial institutions in Asia?

The highly competitive nature of the Asian banking industry provides continual pressure for financial institutions to optimize business functions and to offer services that appeal to the needs of their customers. The following section highlights some of the innovative ways in which Asian banks are utilizing clouds to accomplish these goals.

One groundbreaking use of cloud technology has allowed firms to reach the unbanked. In India, financial institutions are utilizing cloud applications to offer banking services in rural areas where branch banking is not viable. Under this branchless system, the account holder is given a smartcard¹⁷ or debit card that contains his or her personal and bank account information. Agents for the bank travel in the region with a biometric¹⁸ handheld device which transacts with the card and then transmits the adjusted bank account information wirelessly through the cloud platform to the bank's data servers. Agents relay cash and check transactions between the customer and the nearest branch, recording these events on both the customer's card and bank's system. While banks in other regions of Asia have expressed interest in this new banking model, they have opted not to utilize it yet because of concerns over security and operational costs.¹⁹

The primary method in which Asian financial institutions are using cloud technology is in the improvement of their web-based applications and mobile banking services. As clouds are internet-based systems, they provide sound testing ground for web applications including online customer interfaces and web portals. These interfaces seek to provide faster access to up-to-date account information over existing systems. Following the example of several Australian banks, including the Commonwealth Bank of Australia, banks in China, Hong Kong, South Korea, and Japan are exploring whether cloud-enabled, web-banking can be implemented under the current banking security regulations in their respective countries of operation. In addition, banks in China, South Korea, and Japan are considering whether clouds can be used to deploy mobile banking applications, which are increasingly in demand in Asia. To further appeal to the needs of their customer base, banks are using clouds to offer web-based customer help desks and to facilitate transactions between customers and business partners of the bank. An important step in providing these web based services, is the secure, accurate and timely transfer of banking data between customers and internal bank networks. Research firms such as Tata Consulting in India are heavily contributing to the evaluation of clouds for this transmission.²⁰

The second most prevalent use of cloud technology for Asian financial institutions is in contingency planning. Many firms are considering clouds as storage systems for customer information that can be accessed remotely in the case of a natural disaster or other bank service disruption. Cloud vendor Salesforce.com has already implemented this service for several banks in Japan, including Hokuto Bank.²¹ Westpac New Zealand (Westpac) has contracted with Gen-i, a subsidiary of Telecom New Zealand, to build a backup data center for exactly this purpose.²² The Commonwealth Bank of Australia is going even further by allowing its online banking

clients to store important documents on their cloud system, NetBank Vault, which acts as a virtual safety deposit box.²³ Customers can store scanned copies of passports, driver's licenses, mortgage papers, receipts, and other important documents using their online bank account. These documents are encrypted and transmitted using the same security protocols as the bank's online banking services. In all, these additional efforts to provide data security and recoverability could save both banks and their customers time and money in the case of an emergency.

Another significant area in which financial institutions are considering cloud systems is in the support of payment systems. While several firms in South Korea, Hong Kong, and Japan are considering this use, Westpac is pushing the boundaries of cloud technology with a new hybrid system. Utilizing its partnership with Gen-i, Westpac has built a hybrid computer system, similar to a cloud computing environment, which can process, store payment information, and perform real-time, fraud detection for credit card transactions.²⁴ When a merchant submits a transaction for the bank's approval, the cloud system checks whether the payment is authentic and issues an alert if the payment fits an observed fraud pattern. This cloud-based fraud detection system is able to process transactions at a much faster rate than traditional payment system methods. Following Westpac's lead, Commonwealth Bank of Australia is developing a hybrid cloud to facilitate payment transactions between its customers and business partners.^{25,26}

This section has highlighted only some of the cloud applications currently being explored by financial institutions in Asia. While some applications are only in their conceptual stages, demonstrated interest by consumer groups has encouraged financial firms to continue exploring the benefits of cloud technology.

What are the main risks associated with cloud technology?

Despite the potential benefits of cloud computing, it is still an emerging technology that has its risks. Questions about data security, technological standardization, country jurisdictions, and control issues hinder the widespread adoption of clouds. Before banks and other financial institutions embark on this path, they should be aware of these risks and balance them with their business needs.

Concern over data security is the primary reason some Asian banks have been hesitant to use external or hybrid clouds. The very nature of these configurations weakens the control customers have on the configuration of the cloud system, including where the physical infrastructure is located, because customers rely on the cloud vendor to determine these details. Since most Asian governments maintain strict data privacy requirements for both financial firms and the banking industry, financial institutions wishing to utilize clouds must verify that their cloud system and vendor meet these standards. This is a difficult task for a few reasons. Currently, the cloud industry lacks comprehensive guidance on security measures relating to personal and financial data. In addition, it is often difficult for potential customers to ascertain whether a cloud vendor meets the current IT security requirements set by regulators in their

country (or countries) of operation. These security requirements may include specifications on data transmission, authentication, integrity, availability, location (including security of location), recoverability, consumer privacy and confidentiality. While some cloud service providers may simply be unfamiliar with the laws and regulations unique to the financial services industry, others may be unwilling to contractually guarantee the service levels that financial institutions and their customers expect.

Another key issue for banks and financial firms is the possibility that their data may be stored in cloud vendor sites located in foreign countries. In this case, both governments and financial firms must determine whether the laws of the country in which the firm operates or the laws of the country in which the data is stored, govern data ownership rights, consumer privacy practices, confidentiality requirements, and other legal consequences. Regulators are additionally concerned about the implication of geographical location on taxes. This issue was first raised by the large auditing firms. For example, if a bank in Country A sells assets to a bank in Country B, but the transaction is recorded on a cloud server in Country C, what are the tax consequences of this trade for each of the countries involved? Which country can collect taxes? Would Country C be able to collect a transaction tax? This type of problem could impact many Asian financial institutions since they play a major role in international business and trade financing.

As in other situations of outsourcing, financial firms have expressed concern about the accessibility and customizability of cloud services. If a firm chooses to rely on a cloud vendor for SaaS or PaaS systems, they may lose control over what software is used and when it is updated. This could be a significant handicap for banks that seek to offer innovative products to customers using the newest software. Additionally, power and telecommunication capabilities, broadband quality, and a number of environmental factors may affect the quality and accessibility of cloud services. Any disruption in service exposes a financial firm to significant operational risk.

Adding to the difficulties discussed above is the fact that the cloud industry has yet to be standardized. There are no universal parameters regarding the quality of cloud services, data ownership rights, typical IT support, and reasonable operating costs. With an ever growing market of vendors and the absence of service standards, financial institutions are finding it increasingly difficult to compare and price service providers. With the increasing number of new vendors entering the cloud technology market, the ongoing viability of some cloud providers may be uncertain. The absence of industry standards also makes regulatory efforts more difficult because regulators must acquire significant technological expertise to determine what cloud services are acceptable for the institutions they supervise. To avoid some of these problems, many financial institutions are opting to contract with established computing companies such as Microsoft, IBM, Amazon.com, and Salesforce.com. The reliance on these large companies however, could impact the success of new firms seeking to offer cloud services and eventually lead to a concentrated vendor market.

In summary, cloud computing poses some serious risks to the

business operations of financial institutions. Only after the establishment of well-defined data and technological standards will clouds be more widely implemented by financial firms in Asia. Before such standards and laws are established, banks wishing to use cloud services will need to create complex licensing arrangements with cloud vendors to account for all possible operating contingencies; an extremely costly and time consuming effort.

Regulatory Responses

Banking regulators in Asia are becoming increasingly aware of the benefits and dangers of cloud technology. The predominant approach has sought to address the potential risks without stifling the use of this new industry. Establishing industry standards has been a starting point for these efforts. Asian regulators are proactively engaging the engineering and IT professions through the creation of regulatory workgroups and worldwide conferences on cloud computing. Currently, the governments of China, Hong Kong, Malaysia, and Singapore hold annual conferences on a comprehensive set of cloud computing topics. The goal of these conferences is to establish best practices for the industry and suggest possible methods for implementing safe and practical cloud standards. To further demonstrate their support of cloud technology, the governments of China, Hong Kong, and Malaysia have all established plans to introduce cloud systems into their daily operations.

Asian banks are also taking part in the cloud standardization process through the creation of bank-run compliance and standardization workgroups. These workgroups seek to establish cloud standards for the entire banking industry and include participation from a large number of banks and regulators from around the world. The Open Data Center Alliance (ODCA), for example, is an association of 280 member banks from Asia, Europe, and North America and represents over US\$100 billion in IT investments. Members of this association have created committees to establish guidelines in four main categories: security, automation, management and policy, and transparency.²⁷ In addition to the efforts of the banking community, payments companies are meeting to discuss additional cloud standards. The Payment Card Industry Security Standards Council, based in part on encouragement from Asian banks, is expected to issue guidelines in 2012 for firms wishing to carry out payment transactions via a cloud computing environment.²⁸ Members of the Council include international financial institutions, payment organizations, and credit/debit card issuers.

While the adoption of new technology is challenging, banks and regulators in Asia are working with the cloud industry so that the benefits of clouds can be an option for financial firms. The goal is that the long-run benefits will outweigh the short-run costs associated with standardization and implementation.

Conclusion

As the capabilities of cloud technology continue to evolve, so do the potential applications for Asian financial institutions. Given the strong adoption of cloud systems by a

variety of large and small Asian banks, it is clear that the industry has great interest in this technology. As part of the IDC study mentioned at the beginning of this report, the firm estimates that because India and China are early adopters of cloud technology, these countries will account for nearly half of the 14 million new jobs that are expected to be created by this new industry worldwide by 2015.²⁹ With the appropriate security, integrity, availability, and consumer protection practices in place, financial institutions in other countries are sure to follow. The Asian experiences with cloud computing have been educational and will likely have an impact on the adoption efforts of banks around the globe.

¹ The increase in revenue cited by IDC is generated through significantly reduced capital expenditures on IT expenses thus freeing this capital for use in business innovation. Cloud computing offers the potential for cost savings on IT division expenditures for maintenance of older computer system infrastructures, reduced capital expenditures on computer hardware and software, energy usage, IT and personnel costs, and other related expenses. In addition, this technology offers the potential for employees to collaborate and innovate in a dynamic and portable environment. The study was commissioned by Microsoft. See: IDC. 2012. *Cloud Computing's Role in Job Creation*. Framingham, MA.

² Exchange rate (June 2012) 6.355 RMB to 1 US Dollar.

³ Jingting, Shen. "Tablet to utilize Alibaba OS." *China Daily on the Web*, 25 Oct. 2011. <http://www.chinadaily.com.cn/usa/business/2011-10/25/content_13967255.htm>.

⁴ The NDRC has established pilot cloud programs with select Chinese businesses in 5 of its major cities: Beijing, Shanghai, Shenzhen, Hangzhou, and Wuxi. Source: Xiao, Cai. "Five Cities Chosen for Cloud Computing Pilot Plan." *China Daily on the Web* 18 November 2011. <http://www.chinadaily.com.cn/usa/business/2011-11/18/content_14120124.htm>.

⁵ For clouds and banking in China, see the 4th Cloud Computing China Congress (CCCC 2012) <<http://www.cloudcomputingchina.org/>>.

⁶ Withers, Stephen. "Singapore Regulator Casts Doubts on Banking Clouds." *IT News for Australian Business on the Web*, 21 Oct. 2010. <<http://www.itnews.com.au/News/235977,singapore-regulator-casts-doubt-on-banking-clouds.aspx>>. "Electronic Banking & Technology Risk Management," Hong Kong Monetary Authority. On the Web, 1 Aug. 2011. <<http://www.hkma.gov.hk/eng/key-functions/banking-stability/banking-policy-and-supervision/electronic-banking-and-technology-risk-management.shtml>>.

⁷ The most commonly accepted standards for electronics and computing are established by the Institute of Electrical and Electronics Engineers (IEEE). The IEEE has yet to make a formal announcement on the definition of cloud computing and set industry level standards. The IEEE has established an initiative and work group dedicated to cloud computing, the IEEE Cloud Computing Standards Committee.

⁸ The National Institute of Standards and Technology at the U.S. Department of Commerce has recommended one definition of cloud computing but it has not been widely accepted by the industry. See: Mell, Peter and Timothy Grance. 2011. *The NIST Definition of Cloud Computing: Recommendations of the National Institute of Standards and Technology*. The U.S. Department of Commerce. Special Publication 800-145.

⁹ The Federal Financial Institutions Examination Council (FFIEC) has issued a short informational document on cloud computing. In this article they express that cloud outsourcing should meet the risk management procedures outlined in the FFIEC IT Handbook; however, they agree that cloud computing may require more robust controls due to the nature of the service. See: Federal Financial Institutions Examination Council. "Outsourced Cloud Computing." 10

July 2012. On the Web.

<http://ithandbook.ffiec.gov/media/153119/06-28-12_-_external_cloud_computing_-_public_statement.pdf>.

¹⁰ A computing platform (sometimes referred to as computer system) consists of the hardware and software architecture on which an application can be run. Examples include Microsoft Windows, Mac OS X, Linux, and Unix.

¹¹ An internet is a massive network of networks. (A network is a group of two or more computer systems that are linked together.) The internet connects millions of computers together, forming a network in which any computer can communicate with any other computer as long as they are both connected to the internet. The World Wide Web is an example of a global, publicly accessible internet.

¹² A server is a computer or computer program that manages access to a centralized resource or service in a network.

¹³ Theoretically to take advantage of a cloud and all its services, a user would only need an internet viewing device such as a tablet or mobile device. This would make computing cheaper and more portable than the purchase and use of a personal computer or business server.

¹⁴ IBM. "Bank of Tokyo-Mitsubishi UFJ Adopts IBM's Desktop Cloud Service." On the Web, 20 Oct. 2009. <<http://www-03.ibm.com/press/us/en/pressrelease/28658.wss>>. Enomaly. "Customers." On the Web, 27 Jan. 2012.

<<http://www.enomaly.com/Customers.clients.0.html>>. Hong Kong Economic and Trade Office. "News Release: Hong Kong Government Adopts Cloud Computing for E-Government Service Delivery." On the Web, 29 Jul. 2011.

<http://www.khetousa.gov.ko/usa/press/2011/jul11/072911_2.html>.

¹⁵ Gunn, Matt. "IBM Announces Cloud Partnerships in Japan." *Bank Systems and Technology on the Web*, 20 Aug. 2010.

<<http://banktech.com/architecture-infrastructure/226800444>>.

¹⁶ "Commonwealth Bank of Australia: Using the Cloud to Fund a Wave of Innovative Financial Services." *Tata Consulting*. On the Web, 26 Mar. 2012. <<http://sites.tcs.com/cloudstudy/the-state-of-adoption-of-cloud-applications>>.

¹⁷ A smart card is any pocket sized card that has embedded integrated circuits which can be used for data storage.

¹⁸ Biometrics refers to the identification of humans based on specific characteristics or traits, including fingerprints, voice, or DNA.

¹⁹ This branchless banking system was designed and is currently offered by Tata Consultancy Services. "Banking in the Backwaters." *Business Today Monitor Study on the Web*, 20 May 2010.

<<http://businesstoday.intoday.in/story/banking-in-the-backwaters/1/5622.html>>.

²⁰ Ibid.

²¹ NIKKEI.com. "Salesforce.com Targeting Japanese Banks as Cloud Users." On the Web, 26 Nov. 2011.

<http://jetro.go.jp/en/topics/topics_20111126_01.html>.

²² Crosman, Penny. "Mainframe of the Future Looks Like a Cloud, IBM Chief Systems Engineer Says." *American Banker*. On the Web, May 2011. <<http://www.americanbanker.com/bulletins/-1037023-1.html>>.

²³ Drury, Barbara. "Giving you cloud control." *The Sydney Morning Herald*. On the Web, 6 June 2012.

<<http://www.theage.com.au/money/planning/giving-you-cloud-control-20120605-1zsnt.html>>.

²⁴ Westpac's move is considered innovative because it relies on an external cloud for part of its payment analysis. Westpac believes this will further cut processing time. Firms in South Korea, Hong Kong, and Japan are more concerned about the potential data vulnerabilities of an external cloud and are pursuing internal clouds for their fraud detection and transmission systems.

²⁵ Crosman, Penny. "Mainframe of the Future Looks Like a Cloud, IBM Chief Systems Engineer Says." *American Banker*. On the Web, May 2011. <<http://www.americanbanker.com/bulletins/-1037023-1.html>>.

²⁶ “Commonwealth Bank of Australia: Using the Cloud to Fund a Wave of Innovative Financial Services.” Tata Consulting. On the Web, 26 Mar. 2012. <<http://sites.tcs.com/cloudstudy/the-state-of-adoption-of-cloud-applications>>.

²⁷ Crosman, Penny. “Cloud Computing Guidelines Expected to Boost Cloud Spending By \$50 Billion, Decrease IT Spend \$25 Billion, UBS’s Feig Says,” American Banker. On the Web, June 2011. <http://www.americanbanker.com/bulletins/Feig_At_UBS_Projects_50_Billion_Spend_Increase_in_Cloud_Computing-1038749-1.html>.

²⁸ Heun, David. “Cloud Computing, Online Security Garner Further Study.” American Banker. On the Web, 16 Nov. 2011. <http://www.americanbanker.com/issues/176_223/pci-council-cloud-online-security-1044137-1.html>.

²⁹ “Cloud Computing to Create 14 Million New Jobs by 2015.” Microsoft on the Web, 5 Mar. 2012. <<http://www.microsoft.com/en-us/news/features/2012/mar12/03-05CloudComputingJobs.aspx>>.

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