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## **Paper 15/2 – How Commonwealth Bank of Australia Gained Benefits Using a Standards-Based, Multi- Provider Cloud Model**

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# How Commonwealth Bank of Australia Gained Benefits Using a Standards-Based, Multi-Provider Cloud Model<sup>123</sup>

*The standards-based, multi-provider cloud IT sourcing model implemented by CBA enables applications to be frequently and rapidly shifted between cloud providers. The model moved CBA toward pay-as-you-go IT, cut some infrastructure provision and maintenance costs by 40%, and reduced time to market for new applications by several weeks. Implementing it required internal capabilities to design complex IT solutions, manage and integrate external providers, and govern application development.*

## Benefits and Risks of Cloud Computing

Cloud computing is beginning to transform the role of the IT function and how companies buy IT. The IT function is increasingly moving toward the role of an “IT broker” that provides business departments with external, cloud-based IT resources rather than in-house IT resources. The overall cloud computing market is growing rapidly. For example, Forrester Research estimates that the global market was \$15 billion in 2010, will be \$78 billion in 2014 and will reach \$241 billion in 2020.<sup>4</sup>

Providers such as Amazon, Google, IBM and Microsoft have convinced many IT executives of the benefits of cloud computing. Even companies with mission-critical security needs, such as banks, are moving their IT services into the cloud.<sup>5</sup> The flexibility, scalability, cost savings and opportunities for rapid deployment are compelling arguments.<sup>6</sup> A growing number of companies are finding that cloud computing simplifies IT and can increase security.<sup>7</sup> Business executives expect the cloud to be transformational in enabling innovation and may even change

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<sup>2</sup> We thank and acknowledge our research sponsor, Accenture, especially Miguel Custodio, and our case organization, the Commonwealth Bank of Australia (CBA), for contributing resources, knowledge and time.

<sup>3</sup> The Pre-ICIS 2013 Society for Information Management (SIM) and MIS Quarterly Executive Academic Workshop saw an earlier version of this article. The workshop led to this special issue on the business payoff of cloud computing. We acknowledge the feedback and insights the workshop provided.

<sup>4</sup> Sizing the Cloud: A BT Futures Report, Forrester Research, April 21, 2011. See also Willcocks, L., Venters, W. and Whitley, E. Moving to the Cloud Corporation, Palgrave MacMillan, 2014. Estimates of the cloud computing market vary greatly, the more reliable being based on supplier revenue or client expenditure projections. Our own estimates suggest that enterprises will devote some 11% of their IT products and services budget to cloud computing by 2016.

<sup>5</sup> “The IT Cloud: Silver Linings: Banks Big and Small Are Embracing Cloud Computing,” The Economist, July 20, 2013.

<sup>6</sup> For example, see “Accenture Technology Vision 2013,” Accenture, 2013; Willcocks, L. and Lacity, M. The New IT Outsourcing Landscape: From Innovation to Cloud Services, Palgrave MacMillan, 2012; and Venters, W. and Whitley, E. “A Critical Review of Cloud Computing: Researching Desires and Realities,” Journal of Information Technology (27:3), 2012, pp. 179-197.

<sup>7</sup> A 133-respondent survey reported in Lacity, M. and Willcocks, L. “Cloud Services Forecast: Rain and Shine,” Pulse Magazine, May/June 2013, pp. 2-6.

organizational forms.<sup>8</sup>

However, a range of concerns with cloud computing has also emerged. Cloud providers have largely addressed earlier concerns about data sovereignty (where data is subject to the laws of the country in which it is located) and security by opening onshore data centres. However, other concerns about cloud computing remain. Our research found that IT executives worry that technical lock-in, long-term business commitments and lost IT capabilities will lead to over-dependence on cloud providers. Cloud computing reduces IT executives' ability to control the IT environment directly, even though they are still held directly accountable for the performance of this environment. IT executives have to deal with substantial technological and business issues as their companies adopt cloud computing.<sup>9</sup>

Based on our case study of the Commonwealth Bank of Australia (CBA), this article describes how IT executives can capture the benefits and avoid, or at least mitigate, the risks of cloud computing. The case study is part of a larger multi-site research project on cloud computing (supported by Accenture)<sup>10</sup> and a longitudinal study of CBA (the Appendix describes the research base and methodology). We analyse how and why CBA has created and implemented a cloud computing market for its IT sourcing needs. This market is available to cloud infrastructure providers, though CBA is the only buyer and providers have to comply with CBA-specified standards and agree to flexible short-term contracts.

The market has provided CBA with the flexibility to move workloads dynamically between cloud providers and the ability to take advantage of competitive pricing at all times. In this way, CBA has moved toward pay-as-you-go IT. By using cloud services, costs for IT infrastructure and software development and provision have fallen, for example, by around 40%.<sup>11</sup> The time to market for new applications and services has been reduced by four to six weeks. For IT executives of other large companies<sup>12</sup> that are considering cloud computing, the analysis of CBA's cloud strategy provides rich insights and five major lessons:

- Define and enforce technical cloud standards across providers to allow switching between providers.
- Negotiate flexible, short-term contracts with sets of cloud providers to allow for market pricing at any point in time.
- Retain internal capabilities in the IT function to allow it to become a competent IT broker able to integrate external and internal IT resources and to design state-of-

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<sup>8</sup> Willcocks, L., Venters, W. and Whitley, E., op. cit., 2014.

<sup>9</sup> Willcocks, L., Venters, W. and Whitley, E., op. cit., 2014.

<sup>10</sup> For further details, see Willcocks, L., Venters, W. and Whitley, E. "Cloud Sourcing and Innovation: Slow Train Coming: A Composite Research Study," *Strategic Outsourcing* (6:3), 2013, pp. 184-202.

<sup>11</sup> Michael Harte, cited in "'Absolute Garbage': Comm Bank CIO Dismisses Security, Data Sovereignty as Cloud Barriers," *Computerworld*, November 13, 2012, available at <http://www.computerworld.com.au/article/441854/>. For a financial analysis of CBA's cloud benefits, see "CIO Puts Financial Foot Forward," *Wall Street Journal*, June 27, 2012, available at <http://blogs.wsj.com/cio/2012/06/27/cioputs-financial-foot-forward/>.

<sup>12</sup> Smaller organizations benefit even more from cloud computing by choosing a provider or intermediary that suits their needs. See Lacity, M. C. and Reynolds, P. "Cloud Services Practices for Small and Medium-Sized Enterprises," *MIS Quarterly Executive* (13:1), 2014, pp. 31-44.

the-art overall IT solutions.

- Prioritize cloud transformation and keep “non-cloud-able” applications out of the cloud until life-cycle events allow for an economically viable move to the cloud.
- Engage in industry-level cloud standard-setting efforts and adopt the resulting standards early.

## **Overview of CBA, Its IT Sourcing Modes and Move to the Cloud**

### **CBA Background**

CBA is a large multinational bank headquartered in Sydney, Australia. The Australian federal government founded CBA in 1911, privatizing it in 1991. In 2014, CBA employed 50,000 people, of which 6,000 were in “IT and operations.” CBA managed total assets of A\$800 billion (approximately \$750 billion).<sup>13</sup> CBA is considered to be among the top 20 IT consumers worldwide and has acquired an excellent reputation for the strategic use of IT. Contributing to this reputation are several successful major IT projects completed in the past decade. One major project was the IT enablement of CBA through the “Which New Bank” program (2003-2005).<sup>14</sup> Another major project was the replacement of CBA’s core banking systems (2007-2012).<sup>15</sup> CBA has also been successful with its progressive cloud computing approach, which is the topic of this article.

### **CBA’s IT Sourcing Modes**

The banking sector is a complex environment for IT. Customer trust is critical for banks, and that trust is underpinned by security, compliance and availability of IT systems. Cloud computing affects all three of these critical components. For example, compliance becomes particularly complex in the banking sector when using cloud computing. CBA operates under many regulatory requirements. Australian federal legislation prohibits storage of certain financial data in other countries. Being a pioneer in cloud computing presented CBA with some challenges because many large cloud providers operate from the U.S. Although security, compliance and availability issues have complicated CBA’s progressive cloud computing approach, they have not inhibited it.

Prior to adopting cloud computing, CBA had progressed through two different modes of external IT sourcing. In the first mode, CBA outsourced most of its IT needs to Enterprise Data Systems (EDS, now Hewlett-Packard Enterprise Systems) in 1996 under a 10-year contract. This single-provider outsourcing contract had some unit cost elements. However, at its core were long-term agreements with fixed fees and guaranteed volumes.

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<sup>13</sup> Source: CBA Half-Year Profit Announcement, 2014.

<sup>14</sup> Which New Bank was a major modernization and transformation program with 80 individual projects and a budget of A\$1.5 billion (approximately \$1.4 billion). The program included several important IS projects, most notably the CRM platform “CommSee,” which was completed in November 2005.

<sup>15</sup> More on the core banking replacement project can be found in “CBA Profits from Technological Gains,” Australian Financial Review, March 4, 2014.

By the early 2000s, CBA had reduced internal IT staff because EDS was providing almost all its IT services, and, as a consequence, it had lost some in-house IT capabilities. This loss of capabilities was particularly challenging for the coordination and integration of new services. CBA increasingly faced IT-related tensions between internal units as well as with EDS. As a consequence, CBA adopted a strategic agenda to develop a new IT vision, regain IT capabilities and rebuild its IT function so it could select and integrate external IT providers. The regained IT capabilities enabled CBA to successfully complete major IT projects, such as those in the Which New Bank program.

In the second IT sourcing mode, CBA drew on the regained internal IT capabilities to move its IT sourcing to a multi-provider sourcing mode in 2006. With this mode, the bank managed a range of IT providers with individual contracts.<sup>16</sup>

Concurrently with developing skills in multi-provider management, CBA tested cloud-like structures through virtualization, which provided it with savings and effectiveness gains. For example, virtualization made the deployment of virtual desktops faster and easier to manage compared with the deployment of physical desktops. CBA's IT staff could automatically patch multiple virtual desktops by applying a patch to one physical server. Inefficiencies remained though: the storage space savings with virtualization, for example, were not significant because a virtual desktop still needed dedicated space on a server comparable with the space needed for a physical desktop. Nonetheless, virtualization resulted in some time and cost savings.

At the end of the 2000s, CBA still had substantial IT infrastructure costs and was seeking further cost reductions. Cloud computing promised a cost-effective, pay-as-you-go IT sourcing mode that could also help get new applications to market faster. CBA developed a new IT vision of exploiting cloud computing to deliver "IT-as-a-service." The flexibility and scalability of cloud computing were attractive because CBA's workloads were unpredictable and variable. The cloud promised to remove the need to set up physical hardware and to improve the integration of software development and operations (DevOps).<sup>17</sup>

## **Moving to Cloud Computing**

Michael Harte, CBA's CIO between 2006 and 2014, and his staff provided internal IT leadership and a principle-based commitment to cloud computing. This clear IT leadership was instrumental in encouraging what one interviewee called "*server huggers*," who would otherwise have been too sceptical, to execute a cloud strategy. Harte also advocated cloud computing in external forums and encouraged IT providers to change their delivery models.

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<sup>16</sup> Further details on changes in CBA's IT strategy in 1997-2007 can be found in Willcocks, L., Reynolds, P. and Feeny, D. "Evolving IS Capabilities to Leverage the External IT Service Market," *MIS Quarterly Executive* (6:3), 2007, pp. 127-145; and Reynolds, P. and Willcocks, L. "Building and Integrating Core IT Capabilities in Alignment with the Business: Lessons From the Commonwealth Bank 1997-2007," in Hirschheim, R., Heinzl, A. and Dibbern, J. *Information Systems Outsourcing: Enduring Themes, New Perspectives and Global Challenges*, Springer, 2006, pp. 75-104.

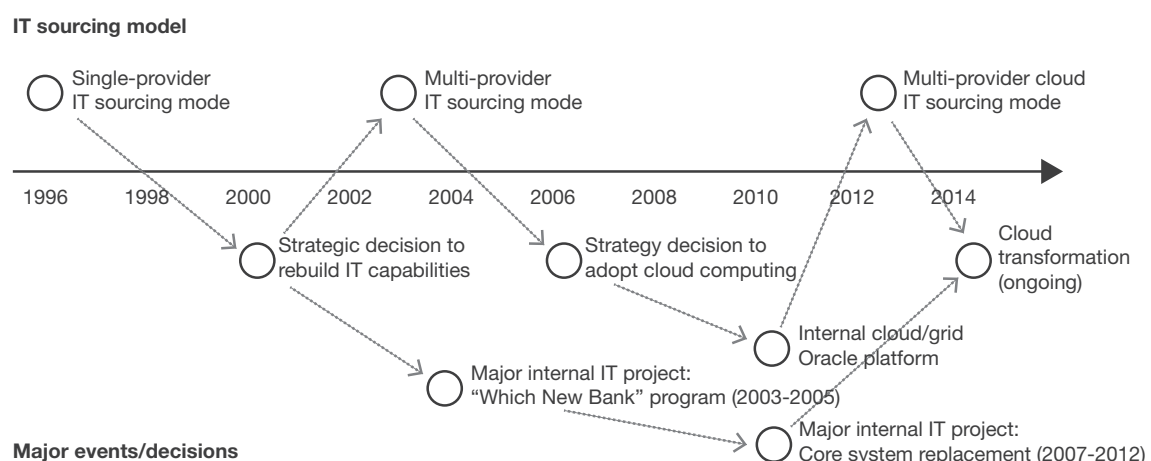
<sup>17</sup> CBA already used DevOps as a system for supporting rapid delivery of software (through, for example, closer collaboration between software development and operations departments). Cloud computing assists DevOps by reducing complexity and workload.

CBA's first managed "cloud" platform was an internal Oracle grid platform, which delivered—rapidly, cheaply and on-demand—standardized, preconfigured databases for development and business needs. Creating a new database instance required only a small configuration change to let the new instance know on which physical machine it was to run. Separating database location from the rest of the database configuration was the key design decision. This design allowed CBA to create new database instances almost immediately and at substantially lower cost. The bank moved several hundred previously local databases onto this platform, including business-critical high-load databases. According to our interviewees, the Oracle platform was a great success and a great encouragement for creating a management layer between IT applications and the physical IT infrastructure.

This positive experience with the Oracle platform reinforced the cloud vision and supported CBA's move to the cloud. However, development and operations departments had IT needs beyond databases, and the next step was to standardize the various IT needs. CBA developed a set of eight standard platforms, ranging from basic platforms such as a standardized Linux environment through to platforms "further up the stack" such as a standardized SAP ERP server.

The final step for CBA was to implement a platform model similar to that used for its Oracle platform, but with the model being able to integrate external clouds as well as internal IT.

Figure 1 depicts the order of major events and decisions that led to CBA's current cloud IT sourcing mode. Above the timeline in Figure 1 are the three major IT sourcing modes that CBA has used over the past 20 years (single provider IT sourcing, multi-provider IT sourcing and multi-provider cloud IT sourcing). Below the timeline are the key events and decisions in the re-organization of CBA's IT function that led to the emergence of the multi-provider cloud sourcing mode. The arrows indicate the major influences.



**Figure 1: Timeline of CBA's IT Sourcing Modes and Major IT-Related Events**

For example, the first arrow on the left indicates that some negative effects of the

single-provider outsourcing mode led to CBA’s strategic decision to rebuild its internal IT capabilities; this decision in turn enabled successful completion of major IT projects, as well as leading to the multi-provider IT sourcing mode. The major drivers of CBA moving to a multi-provider cloud IT sourcing mode are summarized in Table 1, along with the barriers that had to be overcome.

Drivers	Barriers
<ul style="list-style-type: none"> <li>▪ <i>Variable costs</i> through IT-as-a-service/pay-as-you-go instead of fixed costs and guaranteed volumes</li> <li>▪ <i>Competitive costs</i> from many providers in the market instead of upfront agreement with one or a few providers</li> <li>▪ <i>Rapid provision</i> of new environments and hence <i>reduced time to market</i></li> <li>▪ <i>High total volume of IT</i> and variable workloads.</li> <li>▪ <i>IT Leadership commitment</i> to cloud</li> <li>▪ <i>Successful prototype</i> (Oracle platform) as proof-of-concept implementation</li> <li>▪ Multi-provider cloud promised <i>increased flexibility and scalability</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ <i>Existing contracts with large providers</i> that had substantial knowledge about CBA and the bank had long relied on them</li> <li>▪ Internal <i>cultural barriers</i> to cloud computing</li> <li>▪ <i>Security and availability concerns</i></li> <li>▪ <i>Regulatory framework</i> prohibited certain options for data storage in the cloud</li> <li>▪ Perception that existing <i>in-house virtualization</i> already provided some <i>scalability</i></li> <li>▪ Perception that existing conventional <i>multi-provider sourcing</i> already provided some <i>flexibility</i></li> </ul>

**Table 1: Drivers of and Barriers to CBA’s Cloud Adoption**

## CBA’s Multi-Provider Cloud Model

### Structure of CBA’s Cloud Model

In 2011, CBA began implementing its multi-provider cloud model that now allows it to deploy “stateless”<sup>18</sup> applications wherever it chooses. Examples of such applications at the time of writing are the range of new “apps” for the web and mobile space. The first benefit of the model is that it moved CBA’s IT costs close to true pay-as-you-go. That is, pay-as-you-go IT costs replaced previously fixed or stepped IT costs. Also, applications running in the cloud now use IT resources that automatically scale with CBA’s variable workloads. Finally, the model allows development, test and production environments to be commissioned in minutes instead of weeks, reducing time to market for new banking applications and services.

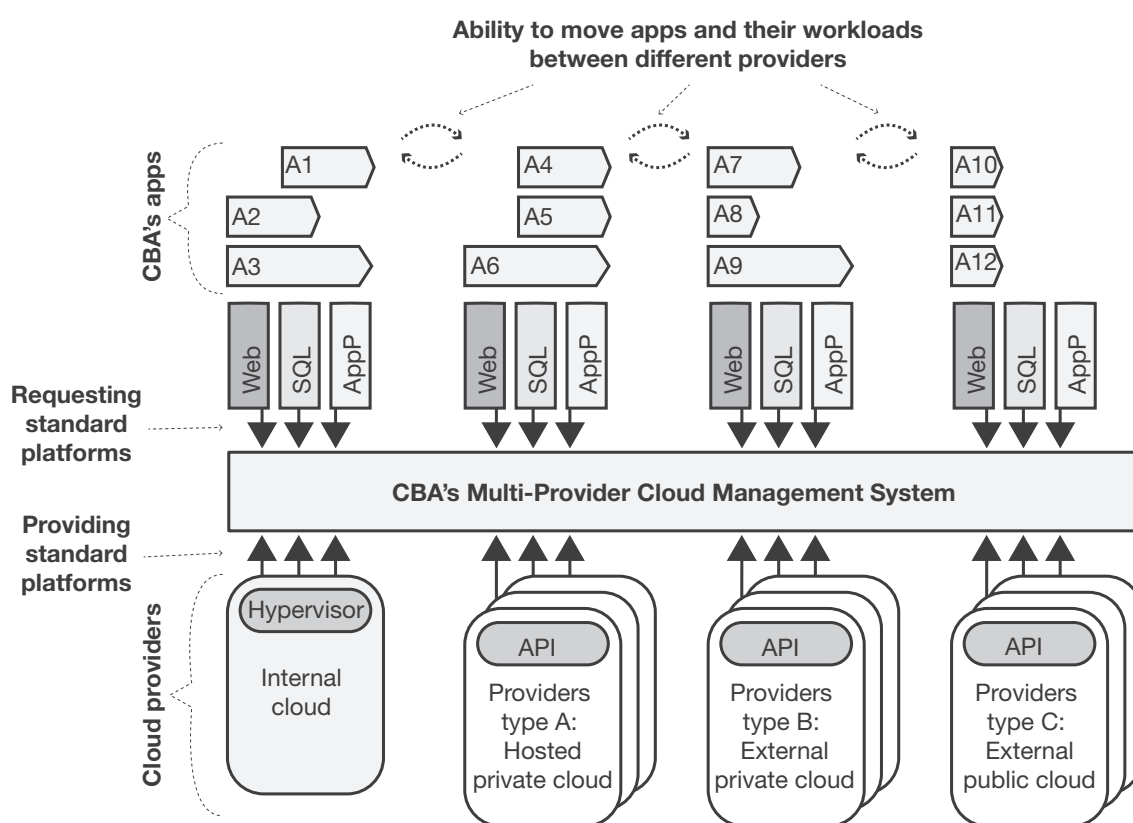
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<sup>18</sup> A stateless application does not record data in one session with a user for changing its behavior in the next session with that user. A stateless application always launches in a default “state” (condition). The opposite is a “stateful” application.

CBA's IT department set up a team dedicated to working on the implementation of the model. The team drew on support from other departments (e.g., for legal expertise). Externally, CBA collaborated with several cloud providers and other industry partners to develop and mandate cloud standards, such as application programming interfaces (APIs), across applications and providers. This meant that, instead of accepting the cloud providers' standards, CBA required cloud providers to accept its own standards. Thus, CBA reversed the typical cloud model where the cloud provider defines interfaces and standards.

CBA also negotiated short-term, flexible, on-demand contracts with a range of cloud providers. Those unable to accept the standards or contractual flexibility were unable to bid in the CBA-created market for IT supply. CBA said that new application developments were "governed towards the cloud," which meant that new apps had to use the cloud standards.

Figure 2 depicts the design of CBA's multi-provider model of cloud computing.



**Figure 2: CBA's Multi-Provider Model of Cloud Computing<sup>19</sup>**

<sup>19</sup> This depiction draws on multiple public CBA presentations, including "Everything-as-a-Service" presented at the Cloud Computing Forum 2012. Note that CBA also uses some cloud services outside of this primarily infrastructure-as-a-service (IaaS) cloud model—for example, Salesforce's software-as-a-service (SaaS) offering.



CBA's cloud model has three main layers. The top layer (CBA's apps) consists of a set of applications that adopt the cloud standards. One interviewee called this an "*AppStore-like*" offering for CBA's business units. CBA's business units or customers are the end users of the cloud-hosted applications (although they will typically not know or care that the applications now run in the cloud). These applications use different standards, depending on their respective requirements. For example, if an application needs an SQL server, then it needs to comply with CBA's SQL server standard, and an application needing a web server has to comply with CBA's web server standards. In the figure, application A1 would require a web server and an application platform, while application A2 would require a web server and an SQL server. However, the cloud management system—the central layer of the model—dynamically and automatically chooses the physical location of the web server, SQL server and application platform.

The arrows in Figure 2 indicate how applications request and how clouds provide computing capacity based on technical, legal, cost and performance considerations. Instead of dedicated computing resources, the applications rely on the central multi-provider cloud management system to dynamically allocate the computing capacities they need. The model thus allows CBA to shift applications and their workloads on the go, depending on prices, performance and service level agreements for security, compliance or availability.

The multi-provider cloud management system matches the applications on the upper layer to the cloud computing infrastructure on the lower layer. The primary purpose of the management system, which was launched in 2012, is to dynamically determine which provider should execute an application and to assign the application to that provider. The cloud management system remains inside CBA's firewall, and CBA manages and controls the system. The actual computing could take place on either side of the firewall according to the cloud management system's dynamic allocations. In this way, the management system provides the applications with on-demand infrastructure, which it sources from any cloud provider supporting the infrastructure standards.

CBA's IT department actively manages this central management system, which is built around ServiceMesh's software technology.<sup>20</sup> The management system codifies CBA's policies and contracts, and dynamically allocates applications and their workloads to cloud providers. The allocations take account of real-time costs and performance as well as general security, compliance and availability needs. The system optimizes the allocation across providers on an on-going basis within these constraints. This automatic optimization across providers reduces costs and maximizes the availability and performance of applications.

The bottom layer in Figure 2 ("Cloud providers") includes internal, private external and public clouds that comply with CBA's standards. This layer includes Amazon, Fujitsu, Hewlett- Packard and several other cloud providers. CBA's own IT function is also one of the cloud providers that the multi-provider model manages. Providers

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<sup>20</sup> CBA partnered with ServiceMesh (which was acquired by CSC in October 2013) to develop CBA's distributed cloud management system. ServiceMesh provided much of the software (the "agility" platform) for CBA's cloud management system. For more information on this software, see <http://www.servicemesh.com/agility-platform-cloud-management/>.

host cloud environments internally in the bank, domestically in Australia and abroad in countries such as the U.S. or Singapore. Providers do not need to provide all the types of services CBA needs. However, the services they do provide must comply with CBA's standards.

### **Benefits of CBA's Cloud Model**

One of the key features of CBA's multi-provider cloud model is the ability to move applications between providers on a pay-as-you-go basis at any point in time. The online integration is a key enabler by moving applications and workloads instantaneously. Moreover, the model enables CBA to avoid high upfront costs and long-term commitments. The ability to shift applications and workloads automatically based on standard platforms allows the bank to capture substantial value from cloud computing by creating "contestability" (the ability to constantly buy IT at competitive market prices) at any point in time. The model allows CBA to use the capacities of diverse providers efficiently to reduce costs and increase flexibility.<sup>21</sup>

In terms of flexibility and scalability, the multi-provider cloud IT sourcing model is superior to internal IT providers, single-provider arrangements or sets of non-integrated cloud providers. Internal providers face physical in-house computing capacity constraints. Single cloud providers face similar constraints, and performance may depend on other clients that use the same provider. Multiple non-integrated cloud providers do not capture dynamic market efficiencies because workloads cannot easily move between them.

Table 2 compares CBA's integrated multi-provider cloud IT sourcing model to traditional in-house IT sourcing and to single, non-integrated (cloud) provider IT sourcing.

	<b>Traditional In-House IT Sourcing</b>	<b>Single, Non-Integrated Provider (Cloud) IT Sourcing</b>	<b>CBA's Integrated Multi-Provider Cloud IT Sourcing Model</b>
<b>Pricing Model</b>	Fixed costs	Some pay-as-you-go, but often with upfront charge and ongoing commitment (e.g., guaranteed volumes)	True pay-as-you-go
<b>Contestability</b>	No contestability: depends on effectiveness of internal IT capacities	Typically competitive pricing at the time of contract; less competitive over time	Full contestability over time

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<sup>21</sup> CBA interviewees estimated a reduction in time to market of several weeks for a typical software development, and total cost reduction for service provision and software development at about 40% (CBA did not provide absolute internal figures to us for competitive reasons).

<b>Flexibility and Scalability</b>	Restricted to physical in-house capacity	Depends on capacity of single cloud provider and the use of capacity by its other clients	Almost infinite flexibility/scalability because resources needed can be shifted between providers, and additional providers can be integrated
<b>Automatic Deployment of Software Development Environments</b>	Non-automated slow work-intensive process to set up applications and environments	Faster time to set up applications and environments but without automation; depends on abilities of provider, typically not part of offering	Even faster time to deploy and set up applications and environments through automation with blueprints
<b>Security</b>	In-house storage of data has potentially the highest security but depends on local IT capabilities	Storage of data and security depends on provider	Storage of data customized to relative security and compliance needs of particular apps, and the capabilities and locations of the different providers
<b>Standardization</b>	Standardization not necessarily part of the model	Standardization by the cloud provider	Standardization by the cloud client

**Figure 3: Comparison of Non-Cloud, Single-Provider Cloud and Integrated Multi-Provider Cloud**

The integrated, standards-based multi-provider cloud model allows CBA to capture high performance, low costs and flexibility. The model is not limited by how many providers connect to it and it allows the rapid addition of new providers. CBA found that running multiple instances on different providers with rapid shifts of provider could increase application availability from approximately 99.5% to 99.999%.

The cloud model also accommodates CBA's security and compliance requirements. The cloud management system captures security and compliance requirements as constraints and considers them when allocating workload to providers. For example, much of CBA's core data must remain in Australia, which excludes some providers from some applications and workloads. In contrast, test and development environments and public web applications typically have much fewer constraints. The cloud management system selects providers that meet the defined security and compliance needs.

One of the largest benefits of the model is fast and easy provision of computing environments and servers in the software development and deployment cycle. CBA can now provide environments in minutes, with the central management system drawing on the abilities of the different cloud providers. Environments that previously took weeks to design, purchase, set up and test are now set up almost instantaneously. This leads to faster application development and reduces both the time to market for new applications and services by several weeks and the costs of software

development. CBA managers said, for example, that many of the current web developments reached the market much faster because of cloud support, providing CBA with an edge in a competitive market.

The automated provisioning of development, maintenance and deployment environments is facilitated by “blueprint” standards. These blueprints reflect changing IT needs as an application evolves through the development and deployment cycle. The IT requirements of any application change from development through to quality assurance, test and production. An application in development has security configurations or workloads that are different when compared with the application in production. The changes necessary as an application progresses from development to production typically required substantial IT staff involvement. CBA recognized that applications often have the same requirements in the same stage of the cycle. The bank therefore defined blueprints for standard environment definitions, which specify the sourcing rules for external or internal cloud providers. Applying the appropriate blueprint simply means dragging and dropping an icon into the next development stage in the cloud management system. Thus, applications can move from the development environment to the testing environment with a single drag and drop of an icon representing the respective application. The cloud management system automatically creates and decommissions the environments almost instantaneously.

The panel below provides two examples of how CBA’s cloud model provides direct cost and time savings.

#### **Examples of Cost Savings and Time Savings from CBA’s Cloud**

CBA’s website [commbank.com.au](http://commbank.com.au), which is used by individuals and retail banking customers, is now delivered via a standardized web server platform. A standardized website allows CBA to run the site on the cloud platform rather than on specialized dedicated hardware. CBA reported website costs of about A\$650,000 per year before the cloud model and about A\$30,000 with the cloud model.

CBA’s use of blueprint standards for software development environments that many cloud providers then can fulfil has effectively automated the deployments of such environments. Environment deployments that had taken several weeks before the cloud now take only 10 minutes. This results in an overall reduction in time to market for new applications of about 4-6 weeks with the cloud model.

An indirect benefit of the multi-provider cloud model for CBA’s IT department has been a favourable shift in its overall cost base. The interviewees said that, before moving to cloud computing, the IT department had an approximate 50/50 cost split between business projects and infrastructure. That has now shifted to approximately 75/25 in favour of business projects.<sup>223</sup> This shift has increased the effectiveness and

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<sup>22</sup> Michael Harte, cited in “CBA Banks on Privacy Social Contract for Future Smart Services,” Australian Financial Review, March 24, 2014.

innovativeness of the IT department because the cloud model allows it to focus on higher-value innovative work.

## **Challenges of Moving to a Multi-Provider Cloud Model**

CBA had to overcome several challenges to establish its multi-provider cloud model. These challenges were related to providers, culture and technology. The bank also found that, to begin with, only a part of its applications portfolio could leverage the cloud model. Some applications were not ready for the cloud.

### **Provider Challenges**

CBA invested effort into convincing cloud providers to accept the concept of client-side standardization. The bank found that some providers were supportive or even eager to work with it and adopt its cloud standards. This is surprising given that client-side standard setting could lead to industry-wide cloud standards that would commoditize cloud offerings and drive down prices. Many cloud providers, however, considered it important to engage in emergent standard setting and were keen to secure CBA's business. But in the initial negotiations, one large cloud provider said that it could not support CBA's standards. In the words of a CBA manager, *"We told them, 'well, we can't run it then.' So, sure enough, the next day, they promised to fix it. They fixed it in four weeks, and it became part of their platform."*

CBA's large IT volumes, brand name and reputation as an active driver of cloud computing may have helped to convince providers to accept its standards. Smaller companies can follow similar strategies by adopting existing standards or joining standard-setting efforts. CBA, for example, is an early and active member of the Enterprise Cloud Leadership Council, which encourages providers and clients to develop cloud standards.<sup>24</sup>

### **Cultural Challenges**

A second challenge related to cultural change in CBA. The move to cloud computing required a shift in mindsets and hence active change management by IT leadership. Cloud computing changes the patterns of how people interact externally and internally. CBA's IT department now engages with a range of third parties rather than a single outsourcing partner. In addition, its cloud model leads to more intense interactions with the business. New ideas from the business are now less restricted by high fixed IT costs and lengthy setup times. Innovative ideas face fewer hurdles, and this is changing business perceptions of the IT department. Overall, the role of IT has moved from an IT provider to an architect, broker and integrator of IT that works closely with the business. After some initial discussions about "doing things differently," CBA's IT staff welcomed the change in role.

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<sup>23</sup> See also "CIO Puts Financial Foot Forward," Wall Street Journal, June 27, 2012, available at <http://blogs.wsj.com/cio/2012/06/27/cio-puts-financial-foot-forward/>.

<sup>24</sup> In 2014, the Enterprise Cloud Leadership Council included CBA, Visa, Bank of America, UB and others on the client side, as well as ServiceMesh, Microsoft, Cisco, VMware, EMC and others on the provider side. The council coordinates and cooperates with the Open Data Centre Alliance, an independent organization that also aims to develop cloud standards and standard usage models. For more information, see <http://www.tmforum.org/DigitalServices/13911/home.html> and <http://www.opendatacenteralliance.org>.

## **Technology Challenges**

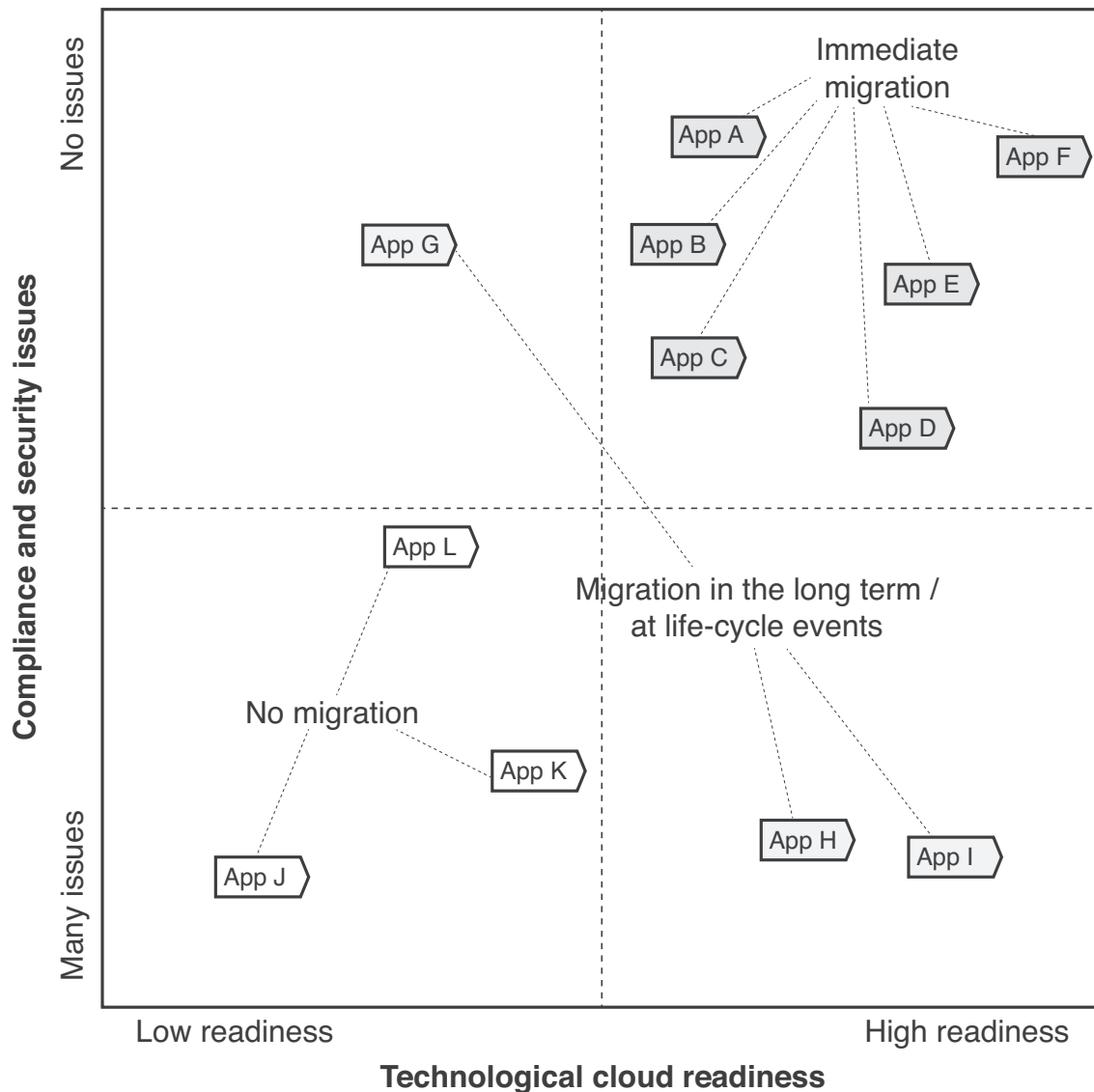
A third challenge was to find the right technology to implement the cloud management system layer of the cloud model. CBA decided to customize ServiceMesh's software as well as incorporate some of its own software developments. ServiceMesh's software provides the ability to use blueprints for software development environments and for the automatic deployment of environments. Even so, CBA needed strong internal IT skills to configure and modify the software and to incorporate custom developments. Thus, implementing the cloud model required strong IT capabilities from CBA, including the ability to architect complex solutions, develop standards, integrate internal and external IT, and govern new application development to conform with the standards.

## **Assessing Cloud Readiness of Applications**

CBA uses a "cloud readiness" matrix (shown in Figure 3) to assess which applications should move to the cloud.<sup>25</sup> The evaluation considers the technical barriers as well as other, non-technical constraints. Applications with few technical barriers and few non-technical constraints were the first that CBA moved to the cloud using the multi-provider cloud model.

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<sup>25</sup> Other organizations, including Continental AG, have developed alternative models to assess cloud readiness. See Loebbecke, C., Thomas, B. and Ulrich, T. "Assessing Cloud Readiness at Continental AG," *MIS Quarterly Executive* (11:1), 2012, pp. 11-23.



**Figure 3: ServiceMesh/CBA's Application Cloud Readiness Matrix<sup>26</sup>**

In Figure 3, the technological cloud readiness dimension refers to the nature of the application itself. For example, web and mobile applications are often stateless and can easily be made “cloud ready,” whereas legacy core banking systems or databases are stateful and need to be redeveloped before they can be moved to the cloud. Non-technical constraints are concerned with compliance and security issues. For example, some applications might be technically ready for the cloud, but privacy concerns can preclude moving them to the cloud.

CBA found that substantial effort would be required to transfer legacy applications to the cloud. Legacy applications typically require complete redevelopment. The effective use of the cloud requires stateless applications, which means that the application does not assume a fixed physical environment. CBA has taken a

<sup>26</sup> This depiction is derived from multiple public ServiceMesh/CBA presentations, including “Building Private Clouds: Scars and Arrows,” presented at Cloud Connect, Santa Clara, 2012.

pragmatic approach: any redevelopment of legacy applications for the cloud is only made at critical life-cycle events, such as a substantial hardware replacement. Without such a key event, redeveloping legacy applications for the sole purpose of moving them to the cloud is too costly and too work-intensive. As one manager explained, “*You just can’t make the business case.*” This approach ensures that CBA balances its cloud transformation work over time and avoids a single, large and risky one-off cloud transformation project.

## **Cloud Lessons Learned**

Based on the CBA case, we have identified five lessons that will help IT executives of other companies interested in implementing multi-provider cloud models similar to CBA’s.

### **1. Enforce Client-Defined Cloud Standards**

Client-defined cloud standards allow applications and computing workloads to move between cloud providers and prevent technological lock-in. Internally, CBA defines standards and then modifies existing applications and ensures new applications conform to these standards. Externally, it convinces cloud providers to agree to the standards.

### **2. Negotiate Flexible, Short-Term Arrangements**

Flexible, short-term arrangements with a set of cloud providers prevent commercial dependencies. The contracts should be flexible in terms of having no fixed prices and no guaranteed volumes. They should be short-term so they do not restrict the customer’s ability to switch providers in the future. CBA has such arrangements with cloud providers including Amazon, Fujitsu and Hewlett-Packard. These arrangements replaced previous long-term outsourcing arrangements that contracted CBA for 10 years to a specific provider with fixed fees. The combination of technology transferability and business flexibility allows market efficiencies to emerge.

### **3. Retain Sufficient Internal IT Capabilities**

Organizations adopting a multi-provider cloud model need to retain the IT capabilities necessary to design and create complex systems such as a distributed cloud management system and to integrate and manage multiple cloud and noncloud vendors. For example, CBA found that, after relying for a long time on a single provider, it had lost IT capabilities because key IT staff had left. It had to rebuild these capabilities before it could make any strategic shift in its IT sourcing model.<sup>27</sup> CBA decided against using an external integrator to manage multiple cloud service providers. Instead, it has developed and maintained the capability in its IT department to be an architect, broker and integrator of internal and external IT/ cloud solutions because it sees this capability as essential for the success of its cloud model.

### **4. Be Pragmatic About Legacy Applications**

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<sup>27</sup> See Willcocks, L., Reynolds, P. and Feeny, D., op. cit., 2007; and Reynolds, P. and Willcocks, L., op. cit., 2006.



Do not move “non-cloud-able” applications to the cloud until major life-cycle events (e.g., changes in hardware or software) provide opportunities to move them to the cloud one by one. This approach helps IT departments to justify costs and balance the cloud transformation workload over time.

## **5. Engage in Standard-Setting Efforts**

Large companies like CBA have the resources and clout to develop and mandate the use of their own cloud standards. They are large enough to impact the wider cloud ecosystem and can make this impact work in their favour. Smaller companies can use collective standard-setting efforts to achieve similar benefits. In either case, the standards should be adopted as early as possible.

## **Concluding Comments**

CBA has achieved four main payoffs from its standards-based, multi-provider cloud model:

1. CBA is now much closer to true pay-as-you-go IT services and full contestability. This reduces upfront and running costs for applications by enabling market efficiencies.<sup>28</sup>
2. The IT resources available to CBA through its cloud model are flexible and scalable, and are therefore a better fit with its dynamic workloads.
3. Reliability has increased because applications can move quickly to other cloud providers or run concurrently at several providers to avoid performance or availability problems with one provider. CBA’s cloud model is configured to use different providers contingent on particular application needs and current cloud provider performance.
4. Time to market for IT-enabled products and services has been reduced because the use of blueprints means that software development environments can be rapidly and automatically deployed in the cloud.

By implementing its multi-provider cloud model, CBA has reduced IT costs and increased the speed of application development. As a consequence, its IT department’s workload has shifted from providing and maintaining infrastructure toward higher-value and more innovative work.

The CBA case provides lessons for other organizations interested in moving to a multi-provider cloud model. On the technology side, the definition and use of standards for cloud services is critical for the ability to move applications and workloads rapidly between cloud providers. On the business side, the model requires flexible arrangements with cloud providers with variable volumes. Finally, the organization needs a central cloud management system to manage and take advantage of this flexibility. Some third-party software solutions for such a management system are becoming available, and external integrators are emerging.

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<sup>28</sup> The estimates we have suggest CBA’s cloud model has resulted in savings of 30%-40% compared with virtualization solutions.

An integrated multi-provider cloud model allows organizations to capture substantial cloud computing benefits. As with other IT investments, there is still the critical question of how to measure the cloud's overall impact. While CBA reports substantial reduced costs in application development and infrastructure provisioning, and significantly faster time to market for new applications and services, it is still in the process of determining long-term cloud impact measures.

## **Appendix: Research Base and Methodology**

Our study aimed to understand how organizations can use cloud computing to reduce costs and improve time to market. Our combined longitudinal research into CBA's IT strategy and implementation covers the 2001-2014 period. As part of this research, we developed the CBA case study<sup>29</sup> reported in this article by reviewing presentations made by Tim Whiteley and Jon Waldron, interviews with CBA managers, open discussion and on-site visits. In total, we conducted 81 structured interviews designed to collect data on CBA's IT sourcing mode. We used follow-up email and personal communication to clarify key issues.

Our research also investigated secondary sources such as trade press articles, conference presentations, academic literature, social media posts, white papers, industry research reports and CBA's annual reports. Several research assistants<sup>30</sup> were involved with the project, mainly for initial data analysis.

Collectively, the complementary methods of direct input from CBA and external data provided an understanding of the internal and external dimensions of CBA's cloud model.

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<sup>29</sup> Yin, R. K. *Case Study Research: Design and Methods*, Sage, 2013; and Pan, S. L. and Tan, B. "Demystifying case research: A structured-pragmatic-situational (SPS) approach to conducting case studies," *Information and Organization* (21:3), 2011, pp. 161-176.

<sup>30</sup> The authors thank Saoussane Boujmiraz in particular.

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