

Software, platforms and infrastructure solutions

The new world of cloud computing

Contents

- Revolution or evolution? **3**
- Why cloud, why now? **4**
- Deployment and service models **5**
- Key challenges **7**
- Future developments **9**
- Getting started **10**
- Case study: National Bank NA **11**
- Planning for the longer term **12**

A letter from Ben Narey

Dear customers and partners,

The banking system needs a new model of technology, one that offers greater flexibility in terms of capacity, agility and costs. Cloud computing provides such an approach. But, although it offers considerable magic, there are many mysteries that need to be resolved.

All of us at Microsoft are committed to the success of cloud computing, and we believe it will create many new opportunities for banks and their customers alike.

As part of our commitment to this process, we think it is important to clarify the magic and eliminate the mystery surrounding this technology.

We hope that the insights presented in this report will contribute to a wider discussion of these issues within the industry and to the creation of a closer partnership between technology and financial services to develop a more successful outcome for both industries.

Yours truly,

*Ben Narey
Director of U.S. Financial Services*



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This is one in a series of thought leadership papers designed to share insight into leading industry issues and help our clients realize their vision of the future.

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Revolution or evolution?

Cloud computing is generating a huge amount of excitement. Many providers are rushing into this space offering a variety of services. But, banks are taking a more cautious approach. Although many new and powerful applications are emerging, cloud computing is still a work-in-progress, offering many benefits, but with important trade-offs to consider.

Evolution in the short term, but revolution in the long term, best summarizes the opportunity. Cloud computing offers immediate benefits to banks looking to increase their computing capacity, and exchange capital costs for operating expenses. But governance, risk and security standards need to catch up with deployment and operating models if the full promise of this new technology deployment model is to be realized.

Analogies have been made to the early days of the electricity industry. Years ago, many companies powered their operations solely through their own generators. Later, electric utility companies arose, allowing any company, big or small, to acquire electricity from a central provider, replacing sunk capital costs with variable operating expenses. Companies still have generators, but for back-up and contingency purposes. Electricity has become a utility.

Should banks be rushing to embrace this new technology?

Cloud computing is certainly having an immediate impact, but adoption may depend on a number of regulatory and competitive considerations.

The demand for cloud services will tend to vary by type of institution. Those firms with high transaction volumes looking for low latency solutions will find the cloud solution of flexible computing, variable operating expense and speed to market particularly compelling. But all financial institutions will find in the cloud an opportunity to break out of a paradigm of legacy technologies and declining margins.

For electric utility companies, the change didn't happen overnight, either. In fact, it took several years for them to become viable alternative suppliers.

Like the early electricity supply companies, cloud computing is still in its early stages of development. However, it is a rapidly evolving suite of services, and as it grows in sophistication over the next few years, banks really will be able to position their datacenters and other mission-critical applications on the cloud (Internet).



Financial institutions will find in the cloud an opportunity to break out of a paradigm of legacy technologies and declining margins.

Why cloud, why now?

From a technology perspective, banks find themselves in a difficult position. Industry consolidation has left them with a legacy of fragmented technologies. Rising maintenance costs and tighter budgets leave fewer funds available each year for new development. Greater compliance responsibilities and tougher markets only add to these pressures.

Traditional operating models struggle in this new environment. Higher capital and liquidity requirements required by financial reform suggest leaner margins in the future. Continued market volatility and shifting consumer preferences imply changing business requirements and product priorities. This is a nightmare for operations managers who often have to support changing operating requirements with a static and inflexible infrastructure.

The industry needs a new model of technology, one that allows the business to bring products to market faster and cheaper and retire obsolete ones — a solution that allows a rising tide of new regulations to be absorbed and managed more easily. Computing power must adapt quicker to shifting product portfolios. The value of scale is giving way to the need to be more agile and flexible.

The fixed capacity-fixed cost structure of existing technologies is banking's Achilles heel. It is ill-suited to support dynamic requirements. Also, as other industries embrace new technologies more rapidly than banking, customer expectations rise and are harder to meet with outdated technology. Cloud computing offers banking a more flexible alternative approach, and is particularly well suited to a model of variable technology consumption.

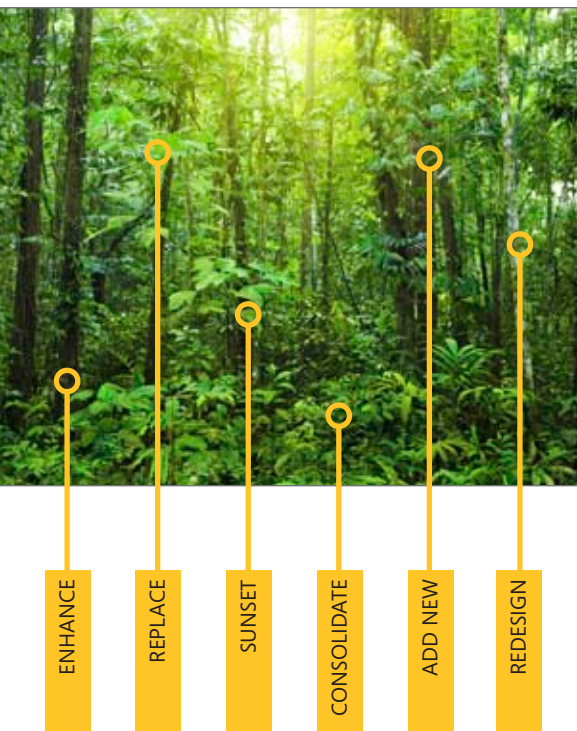
Over the past dozen or so years, banking, once a technology leader, has become a follower. Industries that once lagged banking in new technology are now powering ahead of it. Nowhere is this more evident than in the banking industry's relative performance in labor productivity growth.

Migration to the cloud provides an opportunity to revisit existing technology architectures, retire legacy systems, add new technology and create a new operating architecture. Many large enterprises, not just in banking, have technology infrastructures that resemble dense forests, with many applications that should have been retired a long time ago. In considering migration to the cloud, part of the business case should include an opportunity to prune the technology forest of its dead wood, allowing the younger, healthier trees to grow more strongly. (See Figure 1.)

Cloud migration has both benefits and costs. There is potential for significant cost savings, but there may be other costs as well that need to be considered, such as the costs of migrating from one deployment model to another.

A lot will depend on the type of applications and systems that are being migrated, the partners selected, and the deployment and service models being adopted. The economics of cloud migration will vary with timing and

FIGURE 1
Large enterprises have technology environments that resemble dense forests



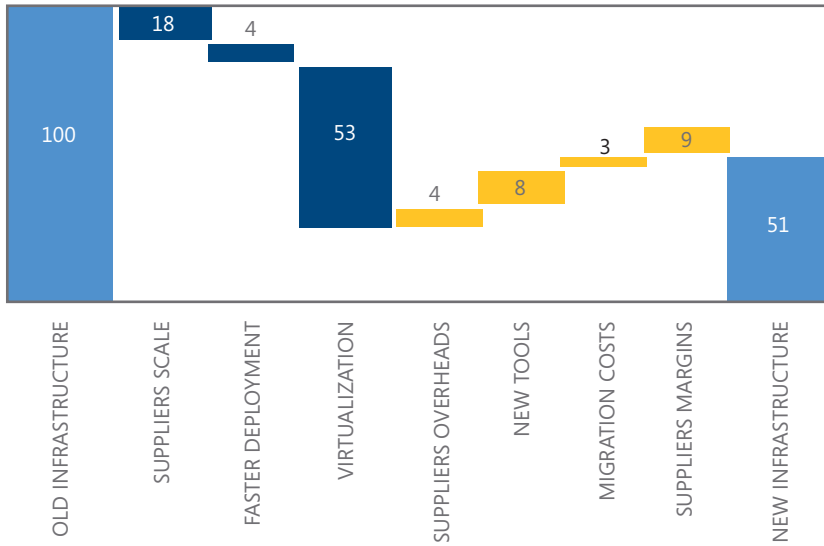


FIGURE 2
Potential costs and benefits of cloud migration

circumstance. The pattern of IT spending during the recession has focused on relatively small, short-term projects with a quick, say six months, payback. But as recovery becomes expansion, larger, more ambitious projects are likely to emerge, creating the possibility for much leaner operating environments.

With the technology available today, economies of fifty percent or more are possible, depending on circumstances. Virtualization is one of the key benefits, providing significant flexibility to users. Some costs associated with moving to the cloud must be taken into consideration. (See Figure 2.)

Deployment and service models

But, in considering a cloud solution, banks face an array of different and potentially confusing solutions. With different deployment and service models, there are many options to choose from. Some solve specific problems, some provide complete application development environments, and others provide partial or complete infrastructures. But they all have different trade-offs and address separate issues, and they are all rapidly changing.

The major deployment models are as follows:

> **Private.** A term used to describe offerings that emulate cloud computing on private networks. These products claim to deliver some benefits of cloud computing without the pitfalls, capitalizing on data security, corporate governance and reliability concerns. They have been criticized on the basis that users still have to buy, build and manage them, and benefit less from lower upfront capital costs that makes cloud computing such an intriguing concept. These services are built behind a corporate firewall, or within another secured network, with access limited to the company itself. This model suggests a more secure environment.

The industry needs a new model of technology, one that allows the business to bring products to market faster and retire obsolete ones.

In considering a cloud solution, banks have many options of deployment and service models to choose from.



> **Hybrid.** An environment consisting of multiple internal and/or external providers. By integrating multiple cloud services users may be able to ease the transition to public cloud services while avoiding issues such as payment card industry (PCI) compliance.

Another perspective on deploying a Web application in the cloud is using hybrid Web hosting, where the hosting infrastructure is a mix between cloud hosting for the Web server and a managed dedicated server for the database server.

> **Community.** Where several organizations have similar requirements and seek to share infrastructure to realize some of the benefits of cloud computing. With the costs spread over fewer users than a public cloud (but more than a single tenant) this option is more expensive but may offer a higher level of privacy, security and/or policy compliance.

> **Public.** Describes cloud computing in the traditional mainstream sense, whereby resources are dynamically provisioned on a fine-grained, self-service basis over the Internet, via Web applications or Web services, from an off-site third-party provider that shares resources and bills on a fine-grained utility computing basis. Cloud services are available from any provider, located anywhere, and are accessed through the Internet as on-demand services. This model could present some security concerns for banks.

But, public cloud environments can be architected to offer a very high level of isolation and security, certainly equal to any other managed service. Despite this, it is one of the most common concerns voiced when companies consider moving applications and data to public clouds. Cloud environments, when built correctly, can offer complete isolation between guests at the memory, CPU, storage and network level. Some public cloud providers are offering “hosted private clouds,” in which users are segregated onto their own physical infrastructure to accommodate compliance requirements.

Service models

Banks also have choices in how the service is provided. Some options, like software as a service (SaaS), have been around for some time. Banks have long been able to have pre-built applications hosted by another provider. Other models, such as platforms as a service (PaaS), are relatively new and continue to evolve. Like deployment models, there are risk and revenue considerations attached to each model.

Just about any service model can go on the cloud, but there are major categories such as storage, database, information, process, integration, security, management and governance, and testing — fine-grained solutions. There are also platform, application and infrastructure — coarse-grained solutions.

There are four basic service models currently in play:

> **Business process as a service (BPaaS).** Provides companies with a business service where the application runs on the cloud.

> **Software as a service (SaaS).** Consists of software applications that deliver specific business capabilities. This represents an alternative to clients running software on their own servers.

> **Platform as a service (PaaS).** Is the delivery of development environments as the service. PaaS offerings may include facilities for application design, application development, testing, deployment and hosting as well as application services such as team collaboration, Web service integration and marshaling, database integration, security, scalability, storage, persistence, state management, application versioning, application instrumentation, and developer community facilitation. These services may be provisioned as an integrated solution over the Web.

> **Infrastructure as a service (IaaS).** Delivers computer infrastructure, typically a platform virtualization environment, as a service. Rather than purchasing servers, software, datacenter space or network equipment, clients buy those resources as a fully outsourced service. The service is typically billed on a utility computing basis and amount of resources consumed (and therefore the cost) will typically reflect the level of activity. It is an evolution of virtual private server offerings.

These broad deployment models contain several subsets. (See Figure 3.)

Each service model can be combined with a deployment model to create a complete cloud solution. In choosing the right service or deployment model, banks will need to consider what their business priorities are, time to market versus total cost of ownership and what areas they should most urgently address. In addition they will need to carefully consider the trade-offs associated with these choices.

Key challenges

There are many reasons pointing toward an evolutionary approach. Offsetting the many benefits are numerous challenges attached to cloud computing. However advanced the technology may be, there are many issues that have to be resolved.

> **Data privacy.** The cloud model has been criticized by privacy advocates for the greater ease in which the companies hosting the cloud services control, and thus can monitor at will, lawfully or unlawfully, the communication and data stored between the user and the host company. Although there have been efforts (such as US-EU Safe Harbor) to harmonize the legal environment, providers still cater to major markets (typically the United States and the European Union [EU]) by deploying local infrastructure and allowing customers to select availability zones.

> **Financial reform.** Rising regulatory standards may act as a brake on banks considering cloud solutions. Not just higher regulatory standards, but also regulatory uncertainty is likely to caution the industry's transition to cloud capabilities. Once the shape of financial reform has become clearer, it will become easier for the industry to make the necessary trade-offs between cloud and noncloud alternatives.

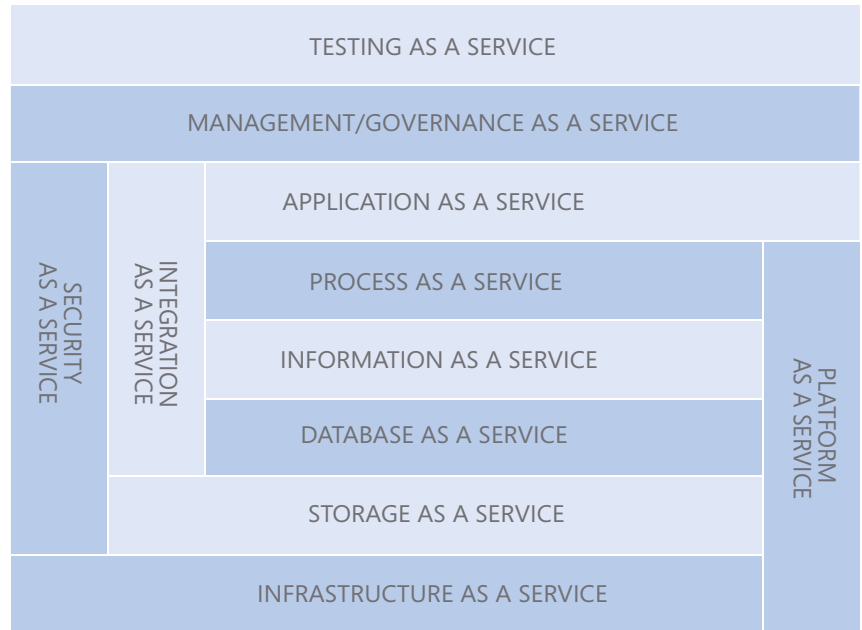


FIGURE 3
Alternative cloud service models

The
Open Cloud
Consortium
(OCC)
is working
to develop
consensus on
early cloud
computing
standards
and practices.

> **Compliance.** Users will need to ensure cloud solutions are in compliance with regulations including FISMA, HIPAA and SOX in the United States, the Data Protection Directive in the EU, and the credit card industry's PCI DSS.ⁱ Customers in the EU contracting with cloud providers established outside the EU/EEA have to adhere to the EU regulations on export of personal data.

Many providers also obtain SAS 70 Type II certification, but this has been criticized on the grounds that the handpicked set of goals and standards determined by the auditor and the auditee are often not disclosed and can vary widely. Providers typically make this information available on request, under nondisclosure agreements.

> **Open standards.** Open standards are critical to the growth of cloud computing. Most cloud providers expose APIs, which are typically well-documented (often under a Creative Commons license) but also unique to their implementation and thus not interoperable. Some vendors have adopted others' APIs, and there are a number of open standards under development, including the OGF's Open Cloud Computing Interface. The Open Cloud Consortium is working to develop consensus on early cloud computing standards and practices.

> **Migration risks.** There are migration risks involved in transferring from any legacy environment to a new computing model. Obviously, the more sensitive, mission-critical applications such as core banking and risk management systems will have higher transferring risks than other services. This may well impact the prioritization of cloud priorities.

> **Business continuity.** Banks are likely to demand that cloud service providers have industrial-strength business continuity capabilities and real-time disaster recovery plans in place. This is likely to limit the range of potential cloud providers to large firms capable of providing more industrialized solutions.

> **Security.** There are many security issues associated with cloud computing models, the main one being data privacy. But the industry offers solutions that are fully compliant with regulatory standards. Often, it is a matter of making clients comfortable with moving from an existing environment they know is fully compliant to one they are less familiar with. The solutions that appear to offer the most benefits also raise the greater security concerns. For example, public cloud solutions available from any provider through the Internet may present greater economic benefits to banks, but they also raise the most questions about security.

ⁱ FISMA is the Federal Information Security Management Act of 2002
HIPAA is the Health Insurance Portability and Accountability Act of 1996
SOX is the Sarbanes-Oxley Act of 2002
PCI DSS is the Payment Card Industry Data Security Standard

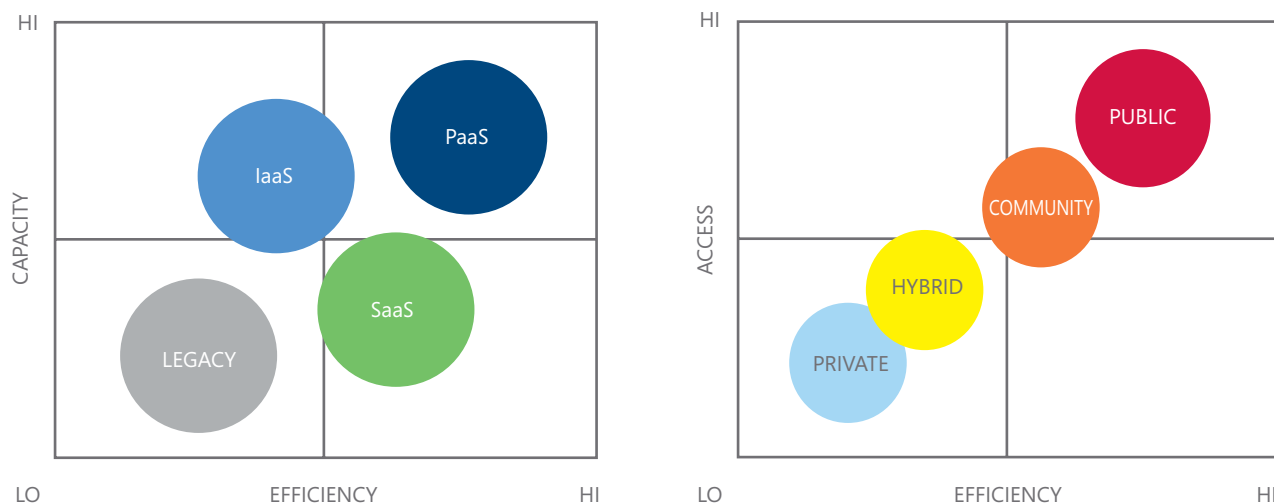


FIGURE 4 The evolution of service and deployment models

Future developments

Despite the different trade-offs, cloud computing will continue to grow, but at different rates for different combinations of deployment and service models. The trade-offs associated with each service and deployment model will restrain growth in the short term, but once resolved or diminished will allow the full benefits of the cloud to be realized. The banking industry will then experience a classic tipping point where the cloud becomes a mainstream activity.

Although all cloud service models are likely to see growth, the fastest will come from PaaS solutions for at least two reasons. First, as a relatively new opportunity, they start from a lower base. Second, as more applications are developed on platform technology, SaaS and IaaS will converge with the PaaS service model, because more applications will be written in this environment.

Banks will eventually migrate part or all of their datacenters to IaaS, but IaaS will consume a relatively smaller part of IT budgets longer term, as infrastructure applications commoditize. IaaS migration may take place more quickly in smaller rather than larger banks, where competitive cost pressures are more keenly felt. In the next two to three years, the growth trajectories of service models will converge, and then accelerate, with PaaS as the dominant model. (See Figure 4.)

In terms of deployment models, banks will tend to favor private and hybrid solutions first because of the priority given to security, and governance standards over efficiency, but migrate to public models over time as confidence, experience PaaS and standards grows. Community models will likely suffer from the absence of common governance and security standards, and become less important. Ultimately, as standards mature, the public deployment model will become the industry standard. (See Figure 4.)

Longer term, the various service and deployment models will converge, helped by the convergence of business process outsourcing and the outsourcing of application development and information technology. The current fragmented environment will eventually become highly integrated.



The cloud provider is likely to be not just a technology partner, but a business partner.

Getting started

The challenge for many firms is knowing where to start. Cloud may seem like an answer to several problems, but firms need to have a clear plan in mind when embarking on a cloud journey. In addition to the many technical considerations there are many policy and business issues to be considered.

Competitive considerations

Many Wall Street firms consider their technology and data to be proprietary, and that is probably one of the most important reasons so much of it remains on premises. One question to consider is whether that proprietary advantage is really more secure in-house or within the firewall of a cloud partner.

Where the software is provided by a vendor, the proprietary nature of the technology is less of an issue. Here the concern is mainly about data. As far as data privacy is concerned, in the cloud, data is widely dispersed across several servers that may also be geographically diverse. It is likely to be much less concentrated than in an on-premises environment. So, ironically, it may be more secure in a cloud environment than on premises.

Where the software is proprietary the risks are different. It is much more difficult to conduct software piracy in a cloud environment than it is on premises. Again, the cloud environment may provide much greater protection than an on-premises situation.

Mission-critical and less mission-critical applications

Testing the waters with cloud is probably a good place to start, making less mission-critical applications early candidates for cloud adoption. Firms may feel more comfortable running their risk management and trading systems in the cloud once they have had success with communication, document management and CRM applications, for instance.

Choosing the right partners

Cloud deployments are likely to involve more than one partner, and with an enterprise technology environment it may be one of a number of different deployment models. But the decision to adopt a cloud solution is a little more strategic than other types of technology decisions. Therefore cloud deployment decisions taken at a line of business level need to be much more sensitive to enterprise-wide considerations.

For example if one line of business is considering purchasing a CRM application and running it on the cloud to reduce the total cost of ownership, one of the considerations it needs to make is whether that CRM application can be used in other lines of business as well, if the full benefits of cloud deployment are to be realized.

Investing in the success of the enterprise

If cloud deployments are likely to lead to broader enterprise-wide engagements, then selecting a cloud partner is likely to be a much more strategic decision for a financial institution than selecting an individual software package.

Given the likely transition of cloud deployment models to platform as a service, it will be important to consider both the short- and the long-term development

plans of cloud partners. The other important consideration is scale. Cloud providers need to have both the technical and financial resources to be able to support what may become mission-critical applications.

Finally, the cloud provider is likely to be not just a technology partner, but a business partner, understanding the client's business in detail and committed to its success. There is simply too much at stake for this to be just a vendor relationship.

Case study: National Bank NAⁱⁱ

National Bank NA has evolved through mergers and acquisitions to become a major universal bank. But in the process, customer, counter party and marketplace data became fragmented across multiple business units in a variety of formats, much of it unstructured. Risk managers lacked complete and comprehensive information to manage their risk positions on a timely basis. New banking regulations escalated compliance costs, which is mainly a manual process managed at a line of business level.

Business managers complained that it took too long to bring new products to market. They felt the bank was losing market share to competitors who were more responsive to changing market conditions.

The new CIO explained that part of the problem was the bank's fragmented technology environment, which would take years to integrate, even if he had the resources.

Under intense pressure, the CIO eventually decided on a single platform approach on the cloud. This would provide an application environment for future development and an immediate database solution to the bank's data challenge. Initially the platform would be hosted on an independent hub that would link legacy systems many of which were written in Microsoft .NET. This solution had the following benefits:

- > **Scalable.** Additional lines of business could be integrated with the hub without difficulty.
- > **Flexible.** Developers could use the application environment to develop new products and services to a common standard using the application environment.
- > **Economic.** Existing computing resources were left undisturbed, and additional costs were billed to each line of business or to corporate based on demand. New products were faster and cheaper to develop. Existing IT budgets remained intact.

Customer and risk information could be easily accessed across the enterprise, and channels more easily integrated. New products came faster to market integrated with existing systems. Based on this success, the CIO began to consider a cloud solution for parts of the bank's infrastructure, and eventually integrated other applications into the same environment.

Customer and risk information can be easily accessed across the enterprise, and channels more easily integrated.

ⁱⁱ National Bank NA is a fictitious case study designed to illustrate a potential client situation.

Planning for the longer term

Many banks are viewing the cloud opportunity from a tactical perspective, but it demands a strategic approach. Numerous mergers and acquisitions have left the industry with outdated systems, fragmented technologies and businesses struggling to get the services they need. As banks become more complex, the gap between the infrastructure they need and the one they have will only increase.

Other industries that once lagged banking in technology adoption now lead it, raising the bar on customer expectations and industry performance. Banks have to recognize they not only compete with each other, but with other industries for the hearts and minds of customers and stakeholders alike. Capital ultimately goes to the industries that best deploy it.

Cloud computing offers a potential solution. The platform service model offers a single application environment for the development of new services. This reduces development costs in the long term and ensures services are developed to a common set of standards, reducing governance concerns, time to market and total cost of ownership. Banks can develop new products faster, more economically and more robustly than before.

Once governance and security standards have caught up with the technology, an integrated service and deployment model will allow cloud solutions to provide even more benefits.

Banks may vary in their opinions on the cloud, but they ignore it at their peril. As cloud computing grows in sophistication, it will create a new technology model for the marketplace. Banks that remain tied to an outdated, inflexible fixed-cost approach may find themselves at a competitive disadvantage.

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