

Technologyforecast

Driving growth with
cloud computing

A quarterly journal
2010, Issue 4

In this issue

04

The cloud you don't know: An engine for new business growth

26

Making the extensible enterprise a reality

44

How CFOs should audit the cloud balance sheet

Contents

Features

04 The cloud you don't know: An engine for new business growth

Cloud computing can unlock latent value in your key internal capabilities and processes by enabling the extensible enterprise.

26 Making the extensible enterprise a reality

The CIO should help identify new cloud-based business opportunities and deliver the network of business platforms to support them.

44 How CFOs should audit the cloud balance sheet

Cloud computing offers CFOs new opportunities to help the enterprise grow, but presents new challenges around governance, risk, and compliance.

Interviews

16 Ecosystem integration: A cloud challenge and opportunity

Mike Capone and Jan Siegmund of ADP discuss the importance of integration among ecosystem partners in creating end-customer value.

22 Modular services drive value in the cloud

Adam Selipsky of Amazon Web Services describes the origins of AWS and the role modular services play in a cloud-oriented business model.

36 Using cloud computing to build an enterprise asset

Sanjay Mirchandani of EMC Corporation shares how cloud computing is changing the conversation with the business and can deliver a long-term strategic impact.

40 Virtualizing security

Jaushin Lee and Andrew Wahl of Imera Systems share how virtualization of security can lead to on-demand provisioning of deep integration among ecosystem participants.

54 Cloud opportunity and risks

Gary Hagmueller of Zuora details the company's journey to create a billing service in the cloud.

Departments

02 Message from the editor

58 Acknowledgments

62 Subtext

Message from the editor



In this issue of the *Technology Forecast*, we are asking our readers to look beyond all the excitement that cloud computing is creating as a change agent for cheaper and better IT. We are convinced cloud computing can transform IT. Surely IT organizations have the hard work of getting it done; no small task indeed.

But what if we look a step or two ahead? What does cloud computing mean for business strategy? What does it mean for the finance organization? In short, what is the answer to the question, “Yes, it’s better IT, but how will cloud computing impact the enterprise more broadly?”

We try to answer that question in this issue by focusing on the top concerns facing all CEOs: where to create more profitable revenue growth and how to position the enterprise for long-term success. After cloud computing has “reformed” IT, does it have an answer to these concerns?

We conclude that it does, and the answer is: cloud computing enables the extensible enterprise. An analogy with highly successful restaurants explains what we mean by extensible enterprise.

A traditional restaurant has a singular business model and product proposition. Patrons come to the restaurant and enjoy good service and good food on the premises of the restaurant. But some highly successful restaurants have recognized that their internal “value chain” comprises components that could be valuable if packaged differently or on a standalone basis.

For example, the fabulous salad dressing served at the restaurant could be sold on a wholesale basis to markets or at a retail window. Or the entire kitchen and food preparation process could be duplicated in a warehouse setting and dedicated to a catering operation. And the restaurant may go further. Since selecting the best fresh ingredients is a core capability of great restaurants, why don’t they pick for the rest of us and open a fresh produce market? In short, the core competencies of great restaurants are often modularized, incorporated into other value chains, and in doing so extend the revenue and profit potential of the business.

As we looked at the potential for cloud computing to change the very fabric of the enterprise, we saw early signs that this opportunity for modularizing and extending the reach of the business is already occurring. Business services are being fully encoded in software, provisioned in the cloud, and

opened to third-party business partners in the ecosystem to incorporate (via software application programming interfaces [APIs]) their own unique customer value propositions. This creates a very low cost of sales for extending your reach to new customers, and a very low cost of delivery for high profit margins. We think the best description for this new strategy is the extensible enterprise.

In an extensible-enterprise strategy, the business's own internal capabilities are viewed as potential business opportunities. Cloud computing allows these internal enabling capabilities to be made accessible in the cloud. These capabilities can function as a business platform, driving ecosystem interactions that are deeper and that happen at a much lower cost than previously possible.

This issue of the *Technology Forecast* covers the cloud-computing phenomenon not from a how or where perspective but from a starting assumption of yes, cloud computing is becoming the IT fabric of the future. What should CEOs, CIOs, and CFOs do with it beyond making IT perform better? The first article addresses this question from the CEO perspective, describing the extensible-enterprise concept and what it takes to become one. The second article describes the changing role of CIOs as CEOs engage with the extensible-enterprise concept. And the third article describes the impact all this will have on the CFO.

As always, our articles are supported by in-depth interviews with leading executives and thought leaders who are defining the future of business and IT:

- Mike Capone and Jan Siegmund of Automatic Data Processing (ADP) discuss the importance of integration among ecosystem partners in creating end-customer value.

- Adam Selipsky of Amazon Web Services (AWS) describes the origins of AWS and the role modular services play in a cloud-oriented business model.
- Sanjay Mirchandani of EMC Corporation forecasts how cloud computing is changing the conversation with the business and can deliver a long-term strategic impact.
- Jaushin Lee and Andrew Wahl of Imera Systems share how virtualization of security can lead to on-demand provisioning of deep integration among ecosystem participants.
- Gary Hagmueller of Zuora details his company's journey to take the internal capability of billing and create a service in the cloud for others to build on.

Please visit pwc.com/techforecast to find these articles and other issues of the *Technology Forecast*. If you would like to receive future issues of the *Technology Forecast* as a PDF attachment in your e-mail box, you can sign up at pwc.com/techforecast/subscribe.

And as always, we welcome your feedback on this issue of the *Technology Forecast* and your ideas for where we should focus our research and analysis in the future.



Tom DeGarmo
Principal
Technology Leader
thomas.p.degarmo@us.pwc.com

The cloud you don't know: An engine for new business growth

Cloud computing can unlock latent value in your key internal capabilities and processes by enabling the extensible enterprise.

By Vinod Baya, Bud Mathaisel, and Bo Parker



CEOs who think of cloud computing as strictly a better solution to internal IT will miss a potentially huge opportunity.

Double-digit unemployment would seem to spell trouble for a payroll services provider, but Automatic Data Processing (ADP) managed through the recession with flat revenues. How did it do that?

Cloud computing was a key factor. Most media coverage—you’ve probably seen some—has focused on how the cloud makes IT less expensive and more agile. ADP has improved the efficiency of its IT organization by using the cloud, but the bigger payoff—and what helped the company avoid declining revenue—has been ADP’s use of the cloud as a strategic new business development and deployment platform.

Case in point: Customers needed tools to manage their talent better in tough times, so ADP filled out its portfolio of payroll and related services by partnering with the provider of a talent management suite. The provider also operates in the cloud, which means the two partners could quickly integrate the business processes of their two platforms and reap new revenue.

By leveraging the deep-integration capability of cloud computing, ADP expanded its business prospects.

Amazon.com also used the cloud to extend its business prospects, but took a different tack.

Amazon modularized certain internal processes, making them more versatile, and exposed them to an ecosystem of partners who created a large number of new uses. This approach unlocked latent value that Amazon had not anticipated. The result: higher traffic to the Amazon site and more revenue created by its ecosystem.

ADP, through deep integration, and Amazon, through versatile processes, exemplify how cloud computing can create strategic advantage and drive revenue growth. They illustrate two key characteristics of what PricewaterhouseCoopers (PwC) calls the extensible enterprise—a concept that represents a distinctive, new growth strategy. (See Figure 1.) CEOs who think of cloud computing as strictly a better solution to internal IT will miss a potentially huge opportunity.

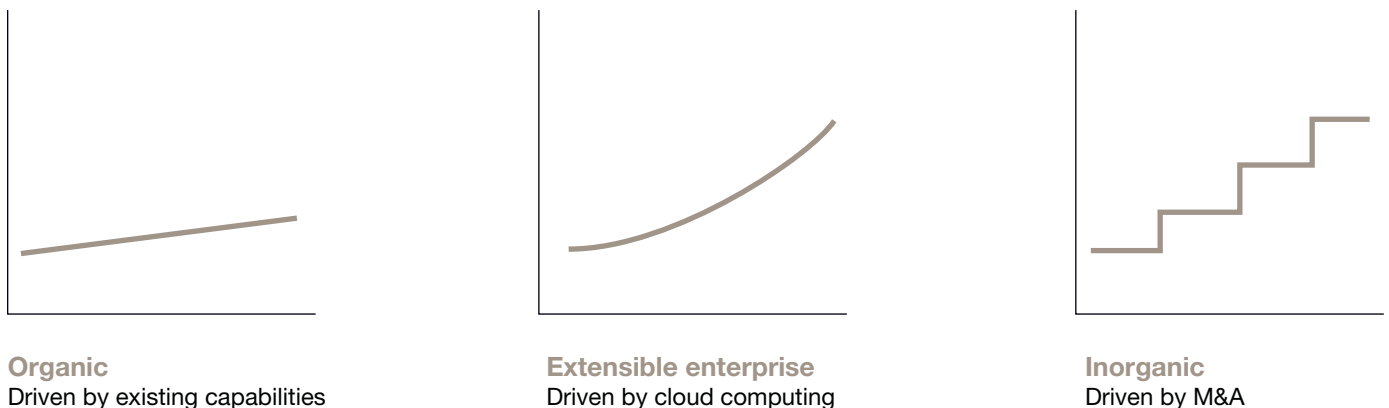


Figure 1: Cloud computing represents a new source of enterprise growth.

In this issue of the *Technology Forecast*, PwC examines the potential of cloud computing to create the extensible enterprise. This first article takes a CEO's view of the strategic business aspects of the extensible enterprise, drawing on examples of companies already benefiting. The second article looks at the CIO role, and the third examines ramifications for the CFO.

Cloud computing represents the dawn of the extensible enterprise

Cloud computing creates a new strategic option for enterprise growth. This form of growth blends organic (internal initiatives) and inorganic (mergers, acquisitions, and partnerships) methods by offering business services as cloud services. Once in the cloud, a network of partners can help grow your business by linking to your cloud services at minimal marginal cost to you. PwC calls this the extensible enterprise.

The extensible enterprise represents the transition from the slow, one-off ecosystem partnering and customer acquisition processes of the pre-cloud era to the scalable partnering, service delivery, and customer acquisition made possible by the cloud. This scaling occurs in a self-organizing and nondirected fashion—at no cost to the enterprise in many cases. CEOs need to understand that cloud computing is more than better IT or new Web destinations for customers to browse. The distinctive opportunity is to build software-based business services in the cloud that other cloud-based providers link to and extend.

Cloud-resident business value propositions can scale revenue much faster than traditional approaches. And the revenue can be generated at much lower cost.

Business ecosystems are not new; businesses have prospered through working with partners and indirect sales channels for years. But the self-service aspect of business combinations and the extensible value propositions that agglomerations of cloud platforms create are new. Cloud-resident business value propositions can scale revenue much faster than traditional approaches. And the revenue can be generated at much lower cost. The management challenge is to turn internal business processes inside out, exposing them to potentially large ecosystems of partners who often find new ways to join their value to yours. This is what Amazon experienced when it published interfaces to the modular components of its online retailing system.

An extensible enterprise relies on two key characteristics, as shown in Figure 2. Enterprises need to have versatile processes, and they need to enable deeper process integration with partners and collaborators.

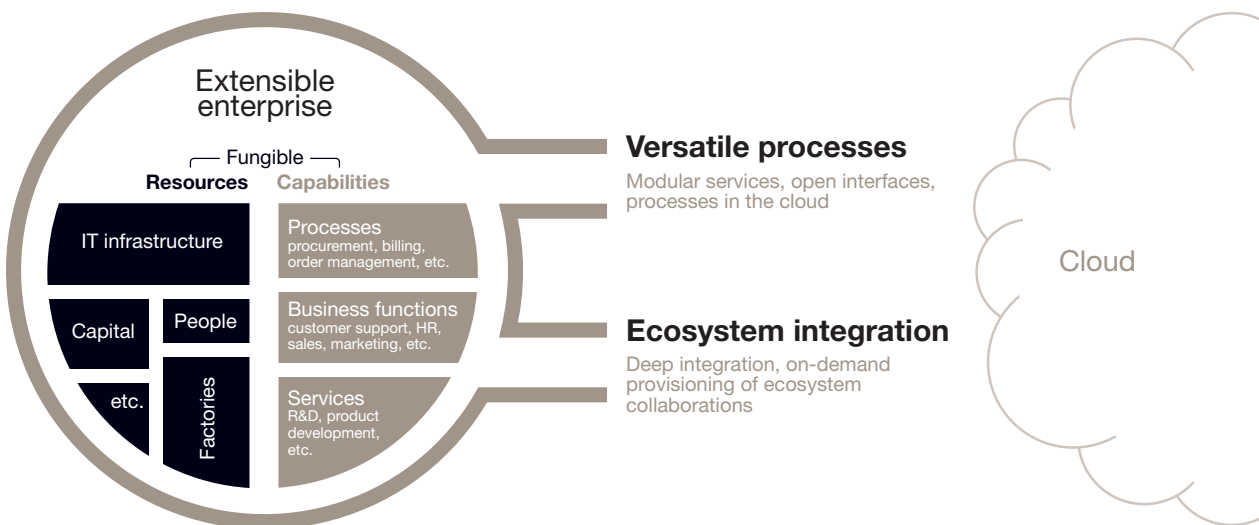


Figure 2: The extensible enterprise is built on the characteristics of versatile processes and ecosystem integration, which are developed by taking advantage of enterprise resources and capabilities.

Amazon: A case of versatile services

The versatility of the processes that should or could be extended in a cloud is a key enabler of the extensible enterprise. Amazon ended up with versatile services, but its journey to that destination was not direct.

Although best known as the online book retailer and one of the original e-commerce success stories, Amazon executives will tell you they're a customer-obsessed technology company with retailing as one business in which the technology is expressed. Their self-described "obsession with listening to customers" drove them right into the middle of cloud computing.

Amazon's rapid growth has required it to continually revisit assumptions about compute infrastructure that would scale efficiently. This led the company to invest in technology internally that later became part of the cloud. A watershed moment occurred when Amazon opened its proprietary capability for online retailing, making all the information in its catalog, images, pricing, and other details available to anyone who wanted to access it.

"We essentially said, 'Here's the content layer, exposed as a Web service,'" says Adam Selipsky, vice president of Product Management and Developer Relations, Amazon Web Services. "It was the first Amazon Web service, but it was and still is all about our e-commerce business. It was basically a way to drive traffic and business for our retail sites. It has become our associates' business, where people could take that data, use it, and put up their own shoe store, camera store, or whatever. They could access whatever information they wanted, display it however they wanted, and then drive traffic back to Amazon and get affiliate commissions, which they still get today."

Opening up the internal capability unlocked latent value. "We were surprised, frankly, that there was this explosion of interest from developers who thought this was amazing that Amazon would take all this proprietary internal stuff and just expose it. People built serious businesses on it, such as shopping comparison engines and things like that," Selipsky says.

In making its capabilities accessible to outside developers, Amazon broke its process into many modular services. This modularity has allowed Amazon to extend its business all the way to providing a complete online retailing environment for Target.com, Marks & Spencer, and others.

The Amazon Web Services public application programming interfaces (APIs) have encouraged thousands of developers and cloud-based businesses to offer comments and suggestions for improvements. As a result, Amazon Web Services are far more versatile, reusable, and extensible by collaborators and business partners.

More about versatile processes

As Amazon discovered, versatile processes support the broadest range of use cases, and hence the broadest set of ecosystem partners and a bigger revenue stream. Versatility is created by focusing on the following features:

- **Modularity**—Modularity means breaking up internal capabilities or processes into modular service components that have standardized and open interfaces for integration with other business platforms. Any organization that has begun to use the principles of service-oriented architecture (SOA) for business processes (not just for IT) will be familiar with this idea. Modular services can be mixed and matched quickly and securely to adapt to market demands or create new business propositions. In opening its capabilities to the world, Amazon's system architects resolved that the only truly scalable approach was to dramatically redesign the software to be highly modular. "When you hit an Amazon.com detail page today, such as a book page, there are between 250 and 300 individual services running inside of Amazon, which dynamically on the fly come together to render that page," Selipsky says. What distinguishes Amazon's approach is modularity in software services applied at multiple levels, from raw compute power up to the business processes of online retailing.

The versatility of the processes that should or could be extended in a cloud is a key enabler of the extensible enterprise.

- **Provisioning in the cloud**—This means moving a process, which was largely internal or local, to a cloud-computing platform where it can be shared and integrated with other cloud-resident processes. In effect, it means making the extensible part of your enterprise part of the public cloud. Amazon has provisioned the shopping process in the cloud, ADP has provisioned the payroll process in the cloud, Zuora has moved the billing process to the cloud, and LinkedIn has moved portions of hiring and recruiting into the cloud. Being resident in the cloud requires and drives process versatility because of the potential for use in multiple contexts.
- **Instantaneous process scaling**—Just as videos and other content can go viral, causing spikes in demand, business functions and processes can experience similar dynamics. Positioning processes for use by the cloud-scale ecosystem requires that they be encoded in software. Enterprises must model business activities more broadly, and the software must be robust to accommodate unexpected demands and exceptions. Relying on staff to handle exceptions doesn't scale in the extensible enterprise. The goal is to bring cloud characteristics associated with IT—multitenancy, scalability, elasticity, and on-demand provisioning—to business functions. By deploying the full range of necessary process logic in software, these versatile processes can scale up or down to meet demands. For example, the company LiveOps has built these characteristics into customer support processes. The LiveOps On-Demand Contact Center Platform enables enterprises to deploy, on demand, an instantly scalable contact center solution using a pay-per-use model. Zuora has done the same with billing by allowing the rapid scaling of billing operations via its Z-Billing product.

The more modular, scalable, and open to third parties your processes are, the greater their versatility. From a CEO perspective, the real payoff comes from delivering more strategic options for the business, more and faster ways to partner, more ways to reach customers, and more ways to generate profitable revenue. Indeed, there are significant people, change management, and training issues that enterprises should understand and adequately manage to successfully develop the capabilities necessary for versatile processes.

ADP: A case of ecosystem integration

The second key characteristic of the extensible enterprise is to enable integration among ecosystem participants. ADP successfully has brought together various business platforms, taking advantage of the cloud's ability to integrate faster and at lower cost. Customers who want the functionality offered by different platforms can access them in a pre-integrated way.

With 570,000¹ customers and \$9 billion in annual revenue, 60-year-old ADP is best known for payroll services but is arguably the oldest and largest cloud service provider. It ventured into cloud computing almost a decade ago, offering payroll and related HR services in a software-as-a-service (SaaS) model. Currently, ADP has almost 10 million users of a variety of revenue-generating services. (See Figure 3.)

1 <http://adp.com/about-us.aspx>

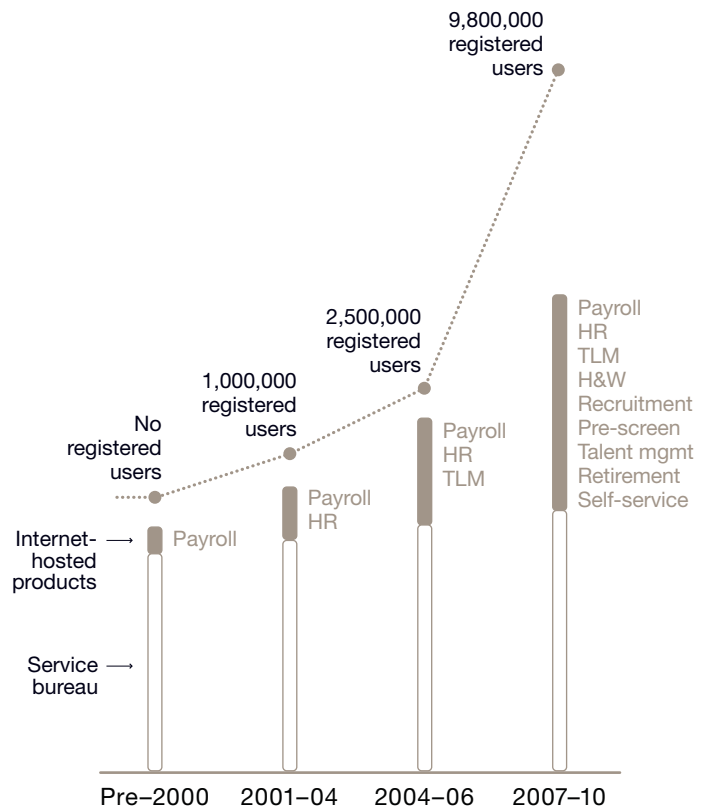


Figure 3: ADP's software-as-a-service products experienced rapid growth by taking advantage of cloud computing.

Source: Automatic Data Processing, February 2010 presentation to financial analysts

“Some concepts that people view as new, for example, the internal [private] cloud, is something we embraced a long time ago,” says Mike Capone, ADP’s CIO.

“During the last few years, we’ve really been focused on agility in our IT infrastructure and our data centers—the ability to move capacity around, the ability to add capacity quickly, the ability to shed capacity quickly or reallocate it. So as certain products suffered a little bit during this downturn, we reallocated those resources to other products in our hosted environment. That allowed us to align our costs with our revenue and not have a problem with a lot of fixed costs that we couldn’t get rid of, which would have hurt our margins.”

This is the IT value proposition of cloud computing.

More recently, ADP began to use the cloud for strategic business purposes. One of its strategic goals is to provide a complete hire-to-retain HR suite. To meet that goal, ADP is using cloud computing to bring together a richer set of end-to-end services by partnering and integrating with other cloud service providers.

Two such partnerships are with Cornerstone OnDemand, a talent management provider, and PreVisor, a pre-employment talent verification service. The success of partnerships such as these relies on quickly bringing to market differentiated services that depend on collaboration and integration that are deeper than mere data exchange—an ability cloud computing makes possible.

Jan Siegmund, ADP’s chief strategy officer, explains: “When I think about alliances and how we work with our partners in the ecosystem, a primary concern for us is the integration of the services at a deep level, way beyond the data exchange level to the integration of workflows or even to the integration and adoption of the overall user experience. We work very hard with our partners. I think technology helps us to be more flexible and to make more progress with deep integration. Collaboration is the true conceptual word for me here. As we design the products and service offerings, and if I take the example of our alliance with PreVisor, the better and deeper the integration is with respect to the user experience, the more successful the distribution of these products and services will ultimately be.”

Because it has the ability to deeply integrate with other cloud service providers, ADP can extend its value proposition by combining its own capabilities with those in its ecosystem, creating wins for itself, its collaborators, and its customers.

The concept of collaboration in the ecosystem is not new. What cloud technologies enable is the ability to lower the cost of provisioning deep collaborations and to accelerate adoption. Because both ADP and Cornerstone OnDemand are cloud providers, when they decided to partner they could “get that integration up and running very, very quickly,” Capone says. “In a matter of months, we had clients live on our products and their products, so time to value was phenomenal for both organizations.”

These cloud-enabled partnerships helped ADP weather the recession better than most enterprises. Specifically, the new services and products offset revenue loss from the established business. “We have experienced a shrinking same-store sales revenue base, but we have also added new business to our product set,” Siegmund says. “We have a complex portfolio of products. Some have been experiencing slower growth rates or negative growth rates, like our payroll business, but they’re offset by faster-growing applications. We still grow our beyond-payroll offering—our HR solutions and benefit solutions—some in high double-digit growth rates.”

More about ecosystem integration

Collaboration has always been important to enterprises; the Internet only fueled it further. In a survey conducted by PwC in 2008, more than 80 percent of businesses consider the importance of collaboration rising in the next few years. (See Figure 4.) In the same survey, 62 percent believe they are pursuing more collaborative partnerships than in the past, and 85 percent agree that collaboration creates competitive advantage.

However, much collaboration today is at the edge of the enterprise, relying on nontechnical processes such as sales and marketing partnerships or some limited data exchange. Edge collaboration is largely about traditional transactions between businesses associated with the flow of components in standard value chains—sharing invoices and the like.

Deep collaboration is about working together on a product or a service to co-create value for the customer. A deeper collaboration is the ability to work with other businesses in the ecosystem as if enterprise boundaries did not exist. This deeper collaboration is happening, but it is typically expensive and time-consuming to provision. Constraints on security, access, and institutional controls must be properly managed without creating new risks.

All this can happen absent the cloud. Adding cloud to the mix introduces self-service, rapid scaling, and automation to what have heretofore been extensive, tedious negotiations; major adjustments to IT; and labor-intensive change management processes. Cloud-resident services represent the opportunity to lower the cost and time of provisioning deeply collaborative value creation that goes beyond simple data exchange to integrated workflows and processes.

Fungibility: The DNA of business success in the cloud

Versatile processes and ecosystem integration depend on and leverage fungible resources, business activities, and processes. Fungibility is the characteristic of being

substitutable—different instances of something can be treated as if they are identical. The result is that a fungible resource can be used for multiple purposes. For instance, cash is the most fungible resource; it is substitutable and it can be used for purchasing a wide range of products or services. A defining characteristic of cloud computing in the data center is that it makes IT resources fungible—applications are immune to the technical differences that heretofore defined different servers or storage devices. Virtualization software makes fungible the processing and storage required by applications. Fungible is not the same as standardization, which forces sameness on everything; fungible means that something can be treated as if it is identical to something else, even when it is not.

Yet, it is becoming increasingly apparent that cloud computing is causing a rapid acceleration of the entire process of defining and establishing software interface standards. Because the technical activities occur in the shared virtual space of the cloud, the socialization process necessary to reach agreement on standards is far more productive. Also, being virtual, the cloud-based socialization process brings together contributors who have a greater diversity of perspectives, resulting in more usable and reusable standards. The cloud-computing

*How important is collaboration with nonrelated partners to your company's success today?
How important do you think it will be in three years' time?*

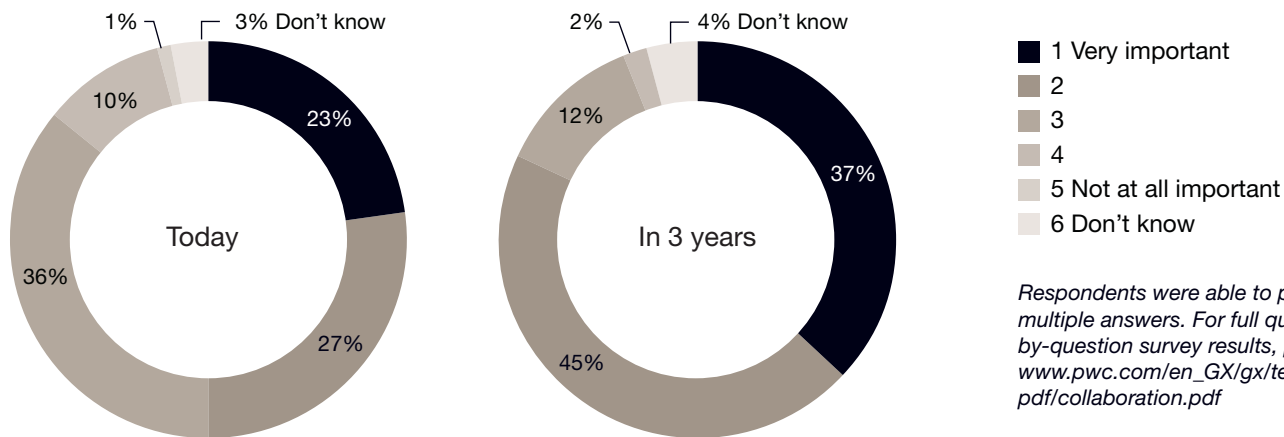


Figure 4: The importance of collaboration in the ecosystem is rising.

Source: PricewaterhouseCoopers

A deeper collaboration is the ability to work with other businesses in the ecosystem as if enterprise boundaries did not exist.

paradigm and context are solving many of the challenges that standardization efforts have previously faced, and the result is a far more fungible set of business processes available in the cloud itself.

In the business context, fungibility and ambiguity are related. Humans can interpret an ambiguous customer request and apply appropriate business logic. Current software-based business processes are not so good at handling ambiguity. In a complex business environment, humans are more fungible than software. This suggests the most important design element when considering services for placement in the cloud. The software presenting these services must be designed to anticipate variable uses. And it goes two ways: your cloud services may need to integrate with other platforms to complete a transaction for a customer, and yours may be one of many similar services that another cloud service provider integrates with. This is the definition of fungible.

For any enterprise seeking to achieve the transformative growth possible from becoming an extensible enterprise, the integration process will need to be on demand and fungible. The one-off integration processes that defined Web 1.0 business hubs such as Industrialvortex.com and others (most not in business today) do not apply to cloud-based platforms. Ecosystem platform integration

in the cloud is becoming much more common, but most of the earliest examples are from companies that were already cloud-based businesses and had taken on the design requirements for easy integration. As ADP shows, the opportunity is available to all.

The Internet and cloud computing

There are many parallels and some contrasts between cloud-based business services and the Internet itself. (See Table 1.) The Internet represented a disruptive new channel to the end customer. PwC’s perspective is that cloud computing represents a disruptive approach to growing the business. The cloud can be a new venue in which to conduct business with partners by creating an extensible enterprise. As increasing numbers of extensible enterprises populate the cloud, the network effect will take over, creating more value for all—especially for first movers. This network of cloud-based business services will require adjustments in the broader business. For this reason, cloud computing is not just a CEO opportunity associated with new growth strategies or a CIO opportunity associated with improved IT. Cloud computing will be an opportunity for the entire C-suite.

	Internet	Cloud computing
<i>Time when impact was becoming visible</i>	1995 onward	2010 onward
<i>Character</i>	Network of networks	Network of business platforms
<i>What it represents to business</i>	New channel to customers	New venue to conduct new business with new rules
<i>Nature of collaboration in the ecosystem</i>	Edge integration for data exchange	Deeper integration with workflow and internal processes
<i>Enables</i>	Connections	Processes
<i>Nature of business interaction</i>	Transactional	Relationships
<i>Character of interactions</i>	One-to-one or one-to-many	Many-to-many

Table 1: **Contrasting Internet and cloud computing impact on business**

Source: PricewaterhouseCoopers

During its early years as a research project funded by the Defense Advanced Research Projects Agency (DARPA), the Internet was referred to as a “network of networks” designed to connect the many individual networks of the time. When enterprises today put platforms of services in the cloud connected to other cloud-based platforms, they are building a “network of business platforms.” (See Figure 5.) This is different from the e-commerce wave of the late 1990s when each platform was supposed to be a destination connecting enterprises directly to customers or suppliers in a one-to-many architecture. As a network of business platforms, the cloud is a many-to-many-to-many architecture where linking among platforms is theoretically unlimited.

Consider the ProVenue platform from Tickets.com. ProVenue allows ecosystem partners to tailor a ticketing solution to fit new business needs. Tickets.com differentiates by allowing others, who own their own platforms, to extend ProVenue’s functionality beyond what Tickets.com develops. Tickets.com’s platform strategy combines the SaaS delivery model with the ability to quickly and deeply integrate through data feeds and open interfaces. The ticketing process is largely proprietary to many organizations, but by making it cloud resident, the ProVenue platform allows unlimited extension of the core ticketing system.

Among those taking advantage of this platform are Mondial Assistance (insurance on ticket purchases), Qcue (dynamic pricing), StubHub (secondary reselling market), Turnkey Intelligence (market research on live events), Givex (adding stored value to tickets), and others. By being cloud resident and having the capacity for deep integration with its partners, ProVenue acts as a catalyst for growth for all participants in this network of platforms.

How to become an extensible enterprise

Enterprise extensibility starts with the modular design of business processes. Most companies never consider the incremental value of exposing certain captive processes to third parties. Instead, they optimize internal processes to be highly integrated, even entangled with other internal enterprise processes. The components of any integrated end-to-end process are typically not accessible by third parties.

However, basing enterprise processes in the cloud means that they must be exposed as services without real-time human intervention or involvement. Humans can handle exceptions and special cases, but otherwise should not be part of processes, because users expect immediate responses from cloud services.

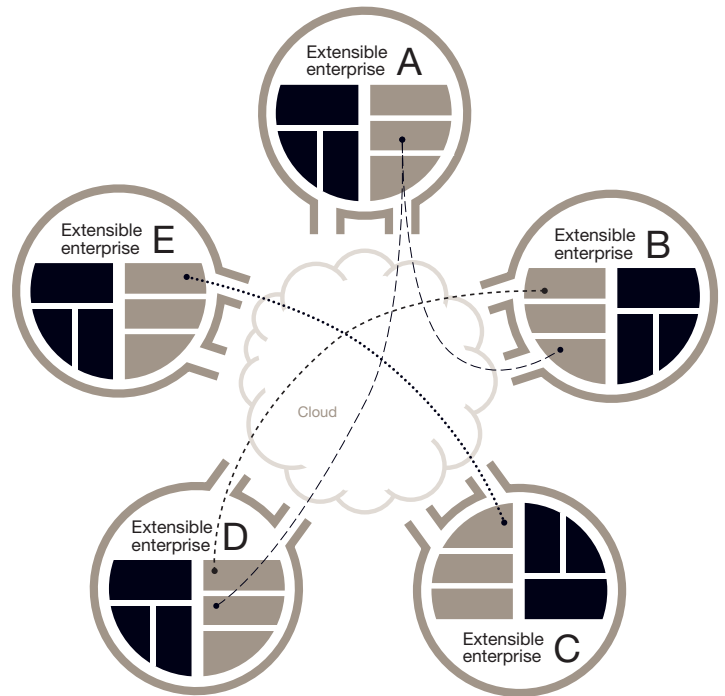


Figure 5: Network of business platforms

Determining which business activities to put in the cloud can be challenging. Look for hidden gems in your processes and data, but don't limit yourself to those. Putting processes and data in the cloud is like flypaper—it will attract thousands of developers who have ideas you cannot anticipate.

Lloyd's of London modularized its insurance services and turned formerly internal actuarial processes into external services accessible in the cloud. Now complex risk data can be visualized and better understood by anyone seeking better engagement with their risk profiles. Although the data itself isn't new, by opening it up and providing it in combination with other sources of data, Lloyd's unlocked new value.²

By definition, deploying in the cloud means the IT infrastructure must follow cloud-computing design and automation patterns. Many enterprises will want to use third parties to deliver the scale and reliability necessary for success.

Finally, senior management needs to understand the potential impact on the existing business model. Turning a business process inside out can have unintended consequences if customers value only one small part of your business. They could walk away from your existing products or services and demand a lower price for a smaller service.

The path to an extensible enterprise requires enterprises to digitally transform their processes more extensively than before. Prior to the arrival of the cloud, the returns from more complete digitization of the business were difficult to document. PwC has developed a robust and extensive methodology for this transformation, and a brief introduction to this methodology is in the sidebar "Digital transformation in the ecosystem."

² *The digital company 2013: Freedom to collaborate*, the Economist Intelligence Unit, 2008.

Conclusion

Cloud computing is the most transformative technology since the Internet became a major C-suite concern 15 years ago. Its promise goes well beyond the ability to improve the IT function. For the CEO, its greatest promise is to drive revenue growth by pursuing the extensible-enterprise strategy. CEOs need to take stock of existing capabilities—including those dedicated to internal clients—and to listen to customers, partners, and potential partners, positioning themselves for a cloud business proposition. Extensible enterprises are likely to offer cloud-based collaboration and a fundamentally new proposition—one that builds value for end customers through interconnected, cloud-based platforms.

The road to a cloud platform will require significant changes in the business itself. A first step is to digitally transform and modularize business processes so they can be dynamically combined on the fly. The second step is to provision digitally transformed services in a cloud-friendly IT infrastructure—to add to and integrate with the cloud itself. Doing so will unlock latent value in the enterprise, which was not possible without cloud computing.

The extensible-enterprise opportunity will unfold as you make your processes versatile and move beyond edge integration to deep integration with business partners in multiple ecosystems. Many technology developments related to cloud computing are making this possible in an automated, scalable way. When you add new business partners on a daily basis without a lengthy up-front investment, then you will have become an extensible enterprise.

For more information on the topics discussed in this article, contact Philip Garland at +1 703 918 4523 or Michael Pearl at +1 408 817 3801.

Digital transformation in the ecosystem

With the Internet representing a new channel to the customer and cloud computing representing a new venue for conducting business, both shaped by digital interactions, every industry faces enhanced expectations from “digital consumers.” For any enterprise, these digital consumers span the ecosystems of individuals, enterprises, vendors, partners, and distributors.

The interactions in the ecosystem, enabled by many emerging technologies, manifest themselves as digital conversations that are frequent, pervasive, real time, and that bring forth transparency not possible in the past. These conversations reach deep across enterprise boundaries as businesses continue to exploit the value of collaborations in the ecosystem. These trends are forcing all enterprises to develop strategies to benefit from the rising importance of digitally enabled, services-based relationships in each of their ecosystems.

Digital transformation¹ is PricewaterhouseCoopers’ (PwC’s) point of view on how enterprises in any industry need to adapt their business models and operations to meet the enhanced expectations of the digital consumers. It is a holistic transformation of an enterprise across four benefits lenses. (See Figure A.)

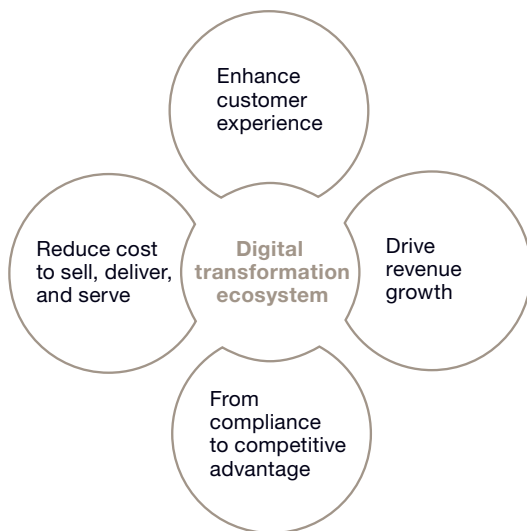


Figure A: Four benefits of digital transformation

1 <http://www.pwc.com/us/en/technology/digital-transformation.jhtml>

These are:

- **Enhance the customer experience**—Growing digital-consumer expectations raise the bar on how enterprises pursue increased customer satisfaction and loyalty, maintenance of the post-sale customer relationship, a seamless and unified customer experience, and the ability to meet customer preferences for choice or channel.
- **Drive revenue growth**—New business models based on digital interactions open up new opportunities for growth by expanding the total addressable market across existing and new capabilities. The extensible enterprise is a key opportunity in this regard.
- **Reduce the cost to sell, deliver, and serve**—The better economics of digital interactions enable approaches that reduce the costs to sell to, deliver to, and serve digital consumers. For instance, service-orientation and policy-driven approaches can promote process automation and self-service while reducing the number of potential touch points.
- **Shift the balance from compliance to competitive advantage**—Today compliance is considered a necessary and important cost to business. Investments in compliance automation and enhanced digital interactions throughout an organization’s ecosystem foster insight that drives competitive advantage by turning risk into opportunity.

Digital transformation and the extensible enterprise

Enabled by cloud computing, the extensible enterprise is an opportunity to pursue a new kind of growth that is distinct from organic or inorganic growth as discussed in the main article. Digital transformation can unlock this new growth and place any enterprise in a virtuous cycle for continued growth. (See Figure B.)

Rapidly evolving cloud-computing technologies present a new venue for interaction with the digital consumers. This new venue can enable growth through versatile processes and ecosystem integration. Digital transformation can help an enterprise take its key internal processes or capabilities and open them up as versatile processes for integration in the ecosystem.

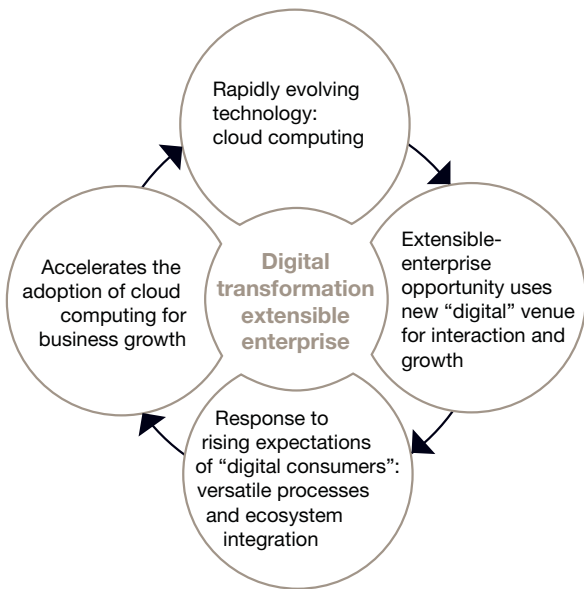


Figure B: Digital transformation and the extensible enterprise

An important part of this transformation is the migration of appropriate capabilities and processes into the digital domain, so that the interactions can be real time, deeper, and flexible. The flexibility stems from the ability to quickly establish and dismantle the appropriate relationships depending on business circumstances.

The pursuit of such growth opportunities will fuel the adoption of cloud-computing technologies across the ecosystem. Furthermore, digital transformation keeps the enterprise at the forefront of the ability to take advantage of future evolutions in cloud-computing technologies. The extensible-enterprise opportunity also brings focus to the end-to-end processes that an enterprise will orchestrate across all ecosystem interactions.

Operational impact of digital transformation

The execution of a digital transformation cuts across many operational functions in an enterprise. (See Figure C.) A successful transformation involves identifying strategic imperatives and then building the appropriate business process architecture along with organization and technology enablers. Winners will enhance the digital-consumer experience while unifying the multiple distribution channels, touch points, and digital venues with ecosystem partners. PwC has helped many clients carry out digital transformations of their key operations and achieve significant benefits.²

² For details on how PricewaterhouseCoopers helped a software company digitally transform itself, please see: <http://www.pwc.com/us/en/advisory/ads/digital-transformation.jhtml>.

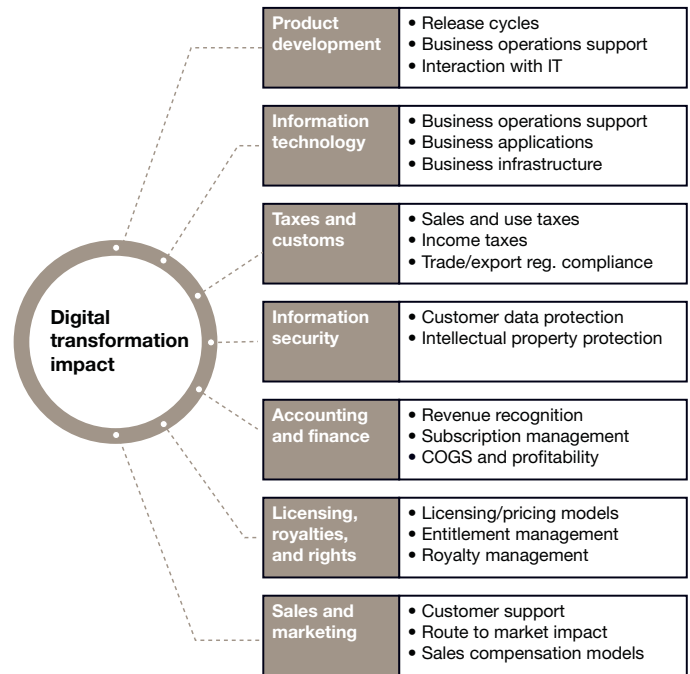


Figure C: The impact of a digital transformation cuts across many operational domains.

Ecosystem integration: A cloud challenge and opportunity

Mike Capone and Jan Siegmund of ADP discuss the importance of integration among ecosystem partners in creating end-customer value.

Interview conducted by Vinod Baya and Philip Garland

Mike Capone is corporate vice president and CIO of Automatic Data Processing (ADP). Combining client-facing operational experience and strong technical knowledge, Capone guides both product development and information technology. ADP's research and development (R&D) organization delivers products that support more than 500,000 clients while its IT professionals are responsible for enterprise security, infrastructure, messaging, and business applications.

Capone is a 20-year veteran of ADP and has held positions in product development, information technology, and operations. Most recently, he has been senior vice president and general manager of GlobalView, an award-winning multilingual, multicurrency human resources outsourcing solution.

Capone holds an M.B.A. in finance from Pace University and a Bachelor of Science degree in computer science from Dickinson College.



Jan Siegmund is president of Added Value Services (AVS) and chief strategy officer of ADP. He joined the company in 1999. Prior to his promotion to his current position, Siegmund served as president of Added Value Services from 2007 to 2009, which includes Tax, Retirement, Insurance, and Pre-employment Services. Siegmund has been instrumental in the development of ADP's new growth strategy, which has resulted in ADP's expansion into a number of important growth markets. He served as corporate vice president of Strategic Development from 2004 to 2007, and as senior vice president of Strategy and Business Development, Brokerage Services, from 2000 to 2004.

Siegmund holds a Ph.D. in economics and an M.S. in industrial engineering.



In this interview, Capone and Siegmund describe how cloud computing contributes to integration in industry ecosystems and the ability to create differentiated customer value.

PwC: Can you give us a broad overview of ADP?

MC: Sure. ADP is a \$9 billion services outsourcing company, primarily focused on what we call employer services—HR, payroll, time and labor—which is the hire-to-retain suite. We also have a \$1.2 billion business focused on automotive dealer services. One of our challenges is that our brand is often associated with payroll, and people forget we're also one of the largest global HR outsourcing companies in the world and a leading provider of integrated computing solutions to auto, truck, motorcycle, marine, and recreational vehicle dealers throughout the world. We pay one in six people in the United States. People tend to think of us as "the payroll company," but we're well beyond that at this stage.

PwC: Jan, as a chief strategy officer, what is important to you and how do you relate to Mike?

JS: From a strategic perspective, I focus on how ADP answers a compelling client demand with a market-leading solution. Also, as we design and invest in those types of products and services, I think about how we can create a differentiated position. One of the ways we do this at ADP is through scale and through differentiated service delivery. This strategic process is supported by our technology to meet our desire to provide a cost-effective and efficient solution to solve a client problem. In my mind, Mike provides scale, and on the service side he provides a reliable service delivery for client demands.

PwC: What are some of ADP's key business challenges?

JS: What drives us is client demand. We think of business challenges as great opportunities to serve our clients. A challenge for us is to identify those demands and have the ability to quickly go to market with our solutions. The challenges with go-to-market speed are the complexities of adjusting to our clients, our R&D

time, the focus of the organization, as well as the classic management challenges of a large organization. Our clients tell us that we more than exceed their business needs, and this is how we successfully grow our business.

PwC: What role is cloud computing playing in your enterprise?

MC: A little-known fact about ADP is that we've been in the cloud business for a long time. We've been processing payroll for clients for 60 years since we've been in business. There was a time when that was all done on paper ledgers. For the last few decades, we've been doing this with everything from mainframe to client/server, and now we've evolved to the on-demand [cloud computing] model. You could argue that from a B2B [business-to-business] standpoint, we're actually the largest software-as-a-service cloud-computing provider there is.

PwC: Most enterprises have struggled in the recent economic downturn. ADP was able to weather it without a revenue decline. What made that possible, and did cloud architecture play any role?

JS: We have experienced a shrinking same-store sales revenue base, but we have also added new business to our product set. We have a complex portfolio of products. Some have been experiencing slower growth rates or negative growth rates, like our payroll business, but they're offset by faster-growing applications. We still grow our beyond-payroll offering—our HR solutions and benefit solutions—some in high double-digit growth rates.

MC: The cloud architecture certainly helped enable what Jan has shared. Some concepts that people view as new, for example, the internal [private] cloud, is something we embraced a long time ago. During the

“The better and deeper the integration is with respect to the user experience, the more successful the distribution of these products and services will ultimately be.” —Jan Siegmund

last few years, we've really been focused on agility in our IT infrastructure and our data centers—the ability to move capacity around, the ability to add capacity quickly, the ability to shed capacity quickly or reallocate it. So as certain products suffered a little bit during this downturn, we reallocated those resources to other products in our hosted environment. That allowed us to align our costs with our revenue and not have a problem with a lot of fixed costs that we couldn't get rid of, which would have hurt our margins.

Our clients really appreciated us in this downturn, which very much helped us in this economy and speaks to the value of cloud. Why did they appreciate us? Because of the elasticity of our model in how they pay for our services.

PwC: There is a lot of talk about commoditization of IT infrastructure. Do you feel the cloud characteristics are actually making infrastructure more valuable to businesses?

MC: One aspect of commoditization is that you get price/performance out of hardware over time. That's a given, and we've been fortunate that we've been able to drive a lot of our margin improvement just by the simple price/performance around the hardware used to provide services to our clients. That said, IT infrastructure as a whole, I would argue, is not commoditized. We view it as a competitive differentiator for us in terms of how we build out and deploy our IT infrastructure to serve more than 500,000 clients.

One of the most complex topics that people tend to gloss over when you talk about the cloud and about infrastructure as a service [IaaS] and platform as a service [PaaS] is integration. I think it's an extremely daunting subject for CIOs right now. As you look at cloud, as you look at outsourcing outside of your four walls, how do you get all these platforms to work

together in an agile and secure way? We manage more than 130 products inside of ADP, and we really feel that the way we need to design and build our infrastructure is fairly unique in that we must enable the interoperability of all these different products.

PwC: Is this interoperability or integration largely an internal matter or with external providers as well?

MC: It is both. It is with our ecosystem partners and it is within our internal business. It also comes into play in our inorganic growth strategies. We acquire companies and platforms over time. We've done a number of technology acquisitions, and we partner. For example, we just formed a partnership with a company called Cornerstone OnDemand, which is a leading talent management software-as-a-service provider. We've had to integrate with them in a way that lets our client know that it works the way it's supposed to work, and our high levels of security are maintained as we integrate with other cloud offerings.

PwC: Partnerships and alliances often integrate at the edge of the enterprise; for instance, sharing purchase orders, invoices, or inventory information. At the same time, it is possible to integrate at a deeper level, essentially collaboration reaching deeper into the work processes of an enterprise. Is deeper integration valuable in an alliance situation?

JS: When I think about alliances and how we work with our partners in the ecosystem, a primary concern for us is the integration of the services at a deep level, as you describe them, way beyond the data exchange level to the integration of workflows or even to the integration and adoption of the overall user experience. We work

very hard with our partners. I think technology helps us to be more flexible and to make more progress with deep integration. Collaboration is the true conceptual word for me here. As we design the products and service offerings, and if I take the example of our alliance with PreVisor,¹ the better and deeper the integration is with respect to the user experience, the more successful the distribution of these products and services will ultimately be.

PwC: Deep integration in support of true collaboration is often very time-consuming and expensive to establish. Is there value to lowering the cost of collaborating in this way?

JS: I'll give you an example that is right in line with what ADP is doing. About three or four months ago, we began offering a procure-to-pay solution. We subscribe to the vision of dramatically simplifying and accelerating the collaboration of the invoice and accounts payable process. What we found in our evaluation is that collaboration between suppliers requires critical mass and often can be unsuccessful in certain industry types. For us, the supplier networks in the energy sector are very effective, and our clients get a huge return by working the invoices through our supplier network, electronically between their vendors and suppliers.

So we have a very successful collaboration conceptually, because our solutions offer opportunities to pay early and to adjust between the needs of the suppliers and the enterprises that buy their goods and services. For me, this is an example of how technology makes this collaboration possible, and it's delivered to the cloud and has easy access.

MC: Indeed, there is value to lowering the time and cost of provisioning such collaborations. The example that I cited earlier around our recent partnership with the talent management provider [Cornerstone]—we wanted to fill a place in our portfolio. We had HR, payroll, and time and labor. Clients were saying, “We need talent management,” which is a very important topic these days as companies try to do more with less. Companies want to take care of their talent.

¹ PreVisor (www.previsor.com) is a provider of pre-employment assessments and employee selection solutions.

We could have tried to build that, or we could go out to the industry and say, “Who's really good at this?” We found a company, Cornerstone OnDemand, that we felt was really good at it. They're a cloud provider, and we're a cloud provider. We were able to get that integration up and running very, very quickly. In a matter of months, we had clients live on our products and their products, so time to value was phenomenal for both organizations.

PwC: Security has become a key concern in adopting cloud solutions, and you both have mentioned it during this conversation. From your experience, what have you learned with respect to security issues in the cloud?

MC: Most chief security officers will tell you the easiest thing to do is just lock down your infrastructure. If you don't let anybody access it, then you have very few security risks, right?

The reality is that's not how the world does business, and we need to support the business. The most interesting security challenge for us has been with respect to interoperability, where our clients want to integrate into our infrastructure. If you want to do Web services with another company coming into a multitenant environment, which is what we run, that creates security challenges. We've developed ways to deal with these issues successfully.

PwC: Just as servers and storage have been virtualized from the business processes, do you think it makes sense to virtualize security? Do you think that line of thinking has merit?

MC: Yes, absolutely. Not only do I think it has merit, but I think it's going to be critical for the success of the cloud longer term, as you think about how companies

“Indeed, there is value to lowering the time and cost of provisioning such [deep] collaborations.”

—Mike Capone

“A good CIO will figure out a way to leverage the cloud to explore business options much more quickly.” —Mike Capone

are going to do business. Employees, customers, and employees of customers are going to be accessing systems, and they're not going to know where those systems are. Those systems could be inside a company's firewall, or they could be in the cloud somewhere. From a credentialing and a security standpoint, they won't want to maintain different credentials. They won't want to be worried about access rights in various systems. They will want that to be maintained somewhere.

PwC: Does cloud allow you and your CEO and CFO to see new options for the business?

MC: Absolutely. The cloud creates agility. A good CIO will figure out a way to leverage the cloud to explore business options much more quickly. Faster time to market, incubation—the cloud offers all of these things. From a business standpoint, when you want to pursue a new business strategy or try something, you can very quickly get something up and running in the cloud. And then once it matures, you can decide whether you want to continue to grow it in the cloud or whether you want to pull it back in. The cloud doesn't force you into a lot of fixed cost. It allows faster implementation of new business without the burden of fixed costs. If you want to try a new idea, you should always encourage that. But if the idea isn't going to work, you want to be able to figure that out very quickly and move on to the next idea. The cloud enables that.

In an economic downturn, CEOs and CIOs must voraciously protect innovation. There's a tendency to batten down the hatches and say, “Let's just ride it out.” The cloud—both our internal cloud with the way that we manage, and leveraging third parties to do some experimentation—has enabled us to continue to innovate.

As we're coming out of this economic cycle, we believe we've created competitive advantage. As the market picks up, which it will, we're going to be in a stronger position, not only for us, but relative to our competitors as well.

PwC: Centralization of client activity is an inherent characteristic of cloud architecture. Does this create visibility into business that is useful?

MC: Definitely. Our most significant leading business indicator is sales performance. We can also see what's going on in terms of hiring, wage growth, and overtime hours. As we see trends in these areas, we can quickly align our business. If you look at our last fiscal year results, although our revenue was relatively flat to down a little bit in some businesses, our earnings still grew double digit. We very quickly were able to see what was going on and align our costs. We also publish data on employment in the *ADP National Employment Report*.

JS: We have a vast amount of data from our clients that at an aggregate level leads to many insights. We are extremely cautious in protecting the confidentiality and security of our clients' data, particularly because that data is so sensitive. We have a lot of natural constraints around how we use the data. Mike mentioned the *ADP National Employment Report* and how we use our data to create a public good around employment statistics for the US. We do offer that type of data to policymakers, and we publish it on a regular basis. This is an ongoing process, and more data will be forthcoming and put to good use. We continue to develop insights into how the economy and the workforce in US corporations are doing. These are elements that we try to develop while preserving the confidential nature of the information to make excellent use of our interesting client data.

PwC: Does this early warning capability that is a characteristic of a cloud architecture help you run the business more effectively?

JS: Yes. The employment report and the like is the outside view. The inside view is a bit more proactive, of course. The analysis of usage and of pattern helps us to identify client needs in a very proactive manner. For example, a recent product we rolled out is an industry-leading product to help our clients capture the benefits from the HIRE [Hiring Incentives to Restore Employment] Act that the president passed earlier this year. Through our insights about hiring activities, turnover, and eligibility criteria in our database, we very easily understood the scope and the opportunities for such a product. We used that information to design a product within weeks and successfully rolled it out to our client base. This is a good example of very proactive use of the type of information we have.

“The cloud—both our internal cloud with the way that we manage, and leveraging third parties to do some experimentation—has enabled us to continue to innovate.”

—Mike Capone

PwC: Mike, you mentioned that many clients appreciated you in the downturn because of the elasticity of your model. Can you please expand on how the elasticity drives customer value?

MC: Obviously your business model is core to how you drive customer value. Cloud is an enabler in our case, because of the payment model it makes possible. For example, if you do payroll in-house—and if you’re a large company, you’ve bought an ERP [enterprise resource planning] system—you have a lot of fixed infrastructure around that. You have servers, a software license that you’re capitalizing over a period of time, and 18 or 20 percent maintenance costs. With ADP, you’re paying per employee per month. So if this month you had 1,000 employees, you pay for those 1,000 employees. If next month you have 800 employees, you pay us for 800 employees.

We offload the risk from our clients’ organizations, so as their workforce grows and shrinks, they pay as per their usage. As a result, there’s a lot of loyalty in our client base. Last week I was with the CIO of a very large commodity-based company; the company’s workforce shrank by 50 percent in this downturn. You can imagine trying to align your costs in situations like that. His comment was, “I’m really glad that I have these types of arrangements, where I didn’t even have to think about shedding costs around my human capital, because ADP took care of all that for me.” ■

Modular services drive value in the cloud

Adam Selipsky of Amazon Web Services (AWS) describes the origins of AWS and the role modular services play in a cloud-oriented business model.

Interview conducted by Vinod Baya, Bud Mathaisel, and Bo Parker

Adam Selipsky is vice president of Product Management and Developer Relations for Amazon Web Services. He oversees developer support, product strategy, demand generation, evangelism, and marketing communications. Before joining Amazon Web Services in 2005, Selipsky served as a vice president in several areas for RealNetworks. Selipsky was also a partner at Mercer Management Consulting, specializing in business strategy for telecommunications and technology companies.



Selipsky earned his bachelor's degree in government from Harvard College and his M.B.A. from Harvard Business School.

In this interview, Selipsky recounts the genesis of Amazon Web Services and how making internal capabilities accessible in the cloud can reveal new customer value.

PwC: How did Amazon.com come to develop AWS [Amazon Web Services]?

AS: There's this myth that we created AWS to sell underutilized capacity at Amazon.com, but this had absolutely nothing to do with why we built AWS.

It turned out we'd been working on this for a decade without knowing it. We were building a series of Web sites for Amazon.com and its international affiliates, which had to be incredibly scalable, highly reliable, and extremely cost-effective. We learned that to do those three things simultaneously is highly nontrivial. Any two of those three actually becomes a much easier challenge.

At the beginning of the company, a lot of big iron and expensive software were purchased, and a lot of it wasn't very scalable. We tried to buy things that were supposedly super resilient, but guess what? Even the

super resilient things break. Even if they don't break very often, they are going to break, and so you must architect around the fact that they're going to break.

Given the scale at which we operate and the fact that the retail business had to be a very efficient cost structure, we spent years and lots of top engineering talent figuring out how to do this well, because there was no AWS out there to use. So we started very early, before a lot of other companies were working on it, looking very intently at things like service-oriented architecture.

AWS is about bringing that deep technological expertise, which we developed over a decadelong period, to a new market. We started working on this in earnest probably in late 2003. The first services came to the market in early 2006. Our storage service, S3, was the first of the infrastructure services in March 2006.

“It was a big shock to a lot of people around the year 2000 that we applied the [retail service] technology to what is now called our seller business, which is letting other people use our technology to sell stuff, both on their own as well as on the Amazon.com Web site.”

PwC: So at the start of this journey to AWS, you were basically a typical Fortune 500 company trying to make IT work better for you.

AS: Highly typical. We had to provision all this infrastructure group by group, application by application, one project at a time, and we had to figure out how to be good at it. We were frustrated by the slowness and the expense of it all. You have to realize that Amazon at its heart is not a retailer. Amazon at its heart is a technology company, and from day one we were building very sophisticated technology. We first applied it to retailing books—and at the time people thought it was a little bit out there—and then we applied it to retailing compact discs, which was our second business. Now we have more than 40-something retail categories.

It was a big shock to a lot of people around the year 2000 that we applied the technology to what is now called our seller business, which is letting other people use our technology to sell stuff, both on their own as well as on the Amazon.com Web site. So we power Target.com, Marks & Spencer, and others. Again, it's applying the technology base to a different segment—a consumer segment and a seller segment.

AWS is really taking that same technology base, a talented engineering pool, and an understanding of distributed computing systems, and applying that to a third business, which is AWS. It is Amazon's third customer-facing business, for IT professionals and developers.

PwC: What were some decisions made early on as you developed for internal needs?

AS: We started very early, in 1999, 2000, and 2001, moving to a service-oriented architecture, kind of teasing apart these monolithic systems. The end result is when you hit an Amazon.com detail page today, such as a book page, there are between 250 and 300 individual services running inside of Amazon, which dynamically on the fly come together to render that page to you. It's very broken down, very modular, and you can see where this is heading with our building blocks of our Web services.

PwC: Would your ability to deliver your e-commerce infrastructure to sellers have been possible without having that bottom-up infrastructure, the modular business logic?

AS: No, it would not have been possible. We were partially there, and we tried to do it for the first couple of sellers, and then we sort of smacked into the brick wall that was there. As we had conversations with some of the big, early sellers, we realized how far we still had to go. This actually turns out to be hard to do. It's really hard to do something really simple. It was partially through that whole seller experience that we learned which pieces still had to be teased apart and just how modular and self-contained everything had to be—in a way that the rest of the world probably wasn't realizing at the time.

“We make decisions based on what we think our customers want, and we truly believe that we will figure out a way to be appropriately profitable if—over the long term—we do things that customers really want and really value.”

PwC: Why do you think Amazon.com was successful in establishing cloud computing as a viable business proposition?

AS: One of the things that allowed us to get into this cloud-computing business and to be an early leader in it is being absolutely religious about things that we really believe in and that we hold dear. We are a technology company. We build great technologies. We think about things at massive, massive scalability, well beyond the realms of what most other companies think about. We hire and try to nurture the best technical talent in the world. That’s just a thing that we do.

We’re also customer obsessed in a way that very few other, if any, companies that I’ve ever seen or been associated with are. Without a hint of cynicism, we sit and talk about what is good for customers. We make decisions based on what we think our customers want, and we truly believe that we will figure out a way to be appropriately profitable if—over the long term—we do things that customers really want and really value.

We place a huge emphasis and premium on innovation. We talk about hiring innovators, and we talk about hiring people who are builders, not just managers. People are restless and want to figure out how to build the next thing, and so you take those ingredients. We looked not only at our internal needs, but also at the assets we had. Through that process, it became a pretty good bet to us that there was a business here in innovating an area that really was uncharted territory and building a business. Again, there was no term “cloud computing.” Really, when we started this, it was called Amazon Web Services.

One thing that I think is more a business lesson than something unique to our cloud-computing business per se is that Amazon, as a company, very much believes in developing capabilities that customers need us to develop. We don’t really believe in just saying, “Well, here’s what we’re good at. Let’s figure out what we

can build that maybe somebody will like.” We believe you figure out what customers want, and if you’re not good at it, go figure out how to become good at it. That’s different, I think, from a lot of companies.

PwC: You’ve talked about how you learned from internal customers. What and how have you learned from your external customers?

AS: I think it was 2002 when we exposed an early Web service, which was all about our e-commerce business. It’s now called the Product Advertising API [application programming interface]. We exposed programmatic access to all the information in our catalog—all of the images, all of the prices, all of the SKU [stock-keeping unit] information—and we basically decoupled the content layer from the presentation layer, because the presentation layer is our Web site.

We essentially said, “Here’s the content layer, exposed as a Web service.” It was the first Amazon Web service, but it was and still is all about our e-commerce business. For us it was a way to drive traffic and business for our retail sites. It has become our associates’ business, where people could take that data, use it, and put up their own shoe store, camera store, or whatever. They could access whatever information they wanted, display it however they wanted, and then drive traffic back to Amazon and get affiliate commissions, which they still get today.

There weren’t many affiliate businesses back in 2002. We were one of the first big ones, and I think the company didn’t quite know what to expect. We were surprised, frankly, that there was this explosion of interest from developers who thought this was amazing that Amazon would take all this proprietary internal stuff and expose it for developers to do whatever they wanted. People built serious businesses on it, such as shopping comparison engines and things like that.

PwC: And they were just public APIs, right? You didn't have to ask permission or pay to access the data or anything.

AS: Didn't have to ask permission. The primary purpose was to drive traffic back to Amazon.com. There was no fee associated with using the API, no contract. You had the click-through agreement saying you're not going to abuse it. And I think we got a blinding glimpse of the obvious when we were smacked by the 2-by-4 in the head of all these thousands of developers saying, "Wow, this is incredible."

It was really the combination of all the internal IT pain and the lack-of-agility pain, plus the incredible buzz that developed in the community once we started to expose our assets, that collectively got us thinking and saying, "Well, you know, maybe there's a pony in there somewhere." That's when we started really talking to our internal lead developers and serious architects, having daylong and weeklong off-sites, and saying, "If a company like Amazon wanted to consume this stuff, what would you need?"

It seems totally obvious now to us—storage, compute, database—but it was actually far from obvious at the time. After a lot of thought and effort and internal and external conversations, we ended up with what we sometimes call the primitive services that are the building blocks that you can build applications on top of.

PwC: Does cloud create the possibility for more businesses to operate at scale than in the past?

AS: Absolutely. For small companies, this is such an incredibly powerful resource. One of the many segments we've had strong adoption in is gaming, which has traditionally been ruled by very large companies. If you look at the social gaming companies—such as Zynga, Playfish, and many others—they have accomplished things that I do not think they could have accomplished with traditional infrastructure, because they've had these massive viral effects on Facebook. There's no way they would have had the venture capital in place to build out, whether it's millions, tens of millions, or hundreds of millions of dollars of infrastructure required to achieve the necessary scale.

They could instantly scale up with us, grow the business, and not drop the customer opportunity on the floor. It was an absolute clear example in social gaming, but it really applies just as much, although maybe slightly less obviously at first blush, to all enterprises.

PwC: You leveraged your capabilities in the cloud to create a new business. From a strategic perspective, what can other businesses learn from your experience of operating in the cloud?

AS: It requires a long-term view and some intestinal fortitude. It requires a long-term orientation because it's harder to do new things such as building modular, very primitive components. I think it takes a cultural orientation toward doing something new and hard like that.

Also, I think it takes a deep technological understanding, because a lot of what we're trying to do is to break apart scalability limitations and get to the point where we could build incredibly scalable pieces of technology and incredibly scalable businesses. We took what was big and spent a lot of time breaking it apart.

So, other businesses need to think about the engineering talent and the architecture required to do difficult technical things like AWS. The other important piece of it is having a completely obsessive customer orientation. Why did we do this, and why is this relevant for CEOs of other enterprises? Because, number one, we wanted to roll out features more quickly to our customers and at lower cost. We thought this was a better set of tools—a better set of mechanisms—to allow us to do that. ■

"We were surprised, frankly, that there was this explosion of interest from developers who thought this was amazing that Amazon would take all this proprietary internal stuff and expose it for developers to do whatever they wanted."

Making the extensible enterprise a reality

The CIO should help identify new cloud-based business opportunities and deliver the network of business platforms to support them.

By Vinod Baya and Galen Gruman



Pursuit of the extensible-enterprise opportunity should bring the CIO into the heart of business strategy, an area the C-suite increasingly expects CIOs to help lead.

The extensible-enterprise strategy will require each member of the C-suite to stretch in some way. CEOs will need to grapple with what cloud computing can do for business growth, and CFOs will need to recognize the ramifications of the cloud for governance and risk. For their part, CIOs will continue to be masters of IT but will also need to acquire deeper understanding of the business opportunities the cloud provides when business processes are extended throughout the ecosystem.

This is not how CIOs typically think of the cloud today. Most see it simply as a way to make internal IT cheaper, more flexible, and more efficient. PricewaterhouseCoopers (PwC) urges CIOs to start looking at the cloud from two perspectives: as part of an extensible-enterprise strategy to drive business growth and as a strategy to improve internal IT. (The Summer 2009 issue of the *Technology Forecast* explores the latter, which we call Evergreen IT.)

But these two perspectives are related. In an extensible-enterprise strategy, the business's own internal capabilities are viewed as potential business opportunities. This strategy requires internal enabling platforms—largely owned by the CIO—to function as a business platform that drives ecosystem interactions at much lower cost than previously possible. (See Figure 1.)

As described in the article, “The cloud you don’t know: An engine for new business growth,” on page 04, Amazon.com created versatile processes that allowed it to turn its internal e-commerce platform into a business platform to provision computing resources publicly. And through deep integration, Automatic Data Processing (ADP) leveraged its internal services platform to work with external partners to extend its business into new areas and create end-to-end processes for all of their customers.

Ultimately, a network of business platforms, a baseline IT infrastructure, and a set of services to be used for internal and external provisioning as separate but linked platforms will be enabled in the ecosystem. Just as the Internet is a network of networks, cloud computing will become a network of business platforms.

Pursuit of the extensible-enterprise opportunity should bring the CIO into the heart of business strategy, an area the C-suite increasingly expects CIOs to help lead. To succeed, the CIO will need to maintain his or her competence in the technical side, while becoming more fluent in business matters.

“Cloud computing prompts a different kind of conversation on two levels,” says Sanjay Mirchandani, CIO of EMC Corporation. “First, it is a conversation about how IT can partner with the business and be proactive in driving down costs and improving levels of efficiency. And on the second level, we are building an asset for the company that has longevity.”

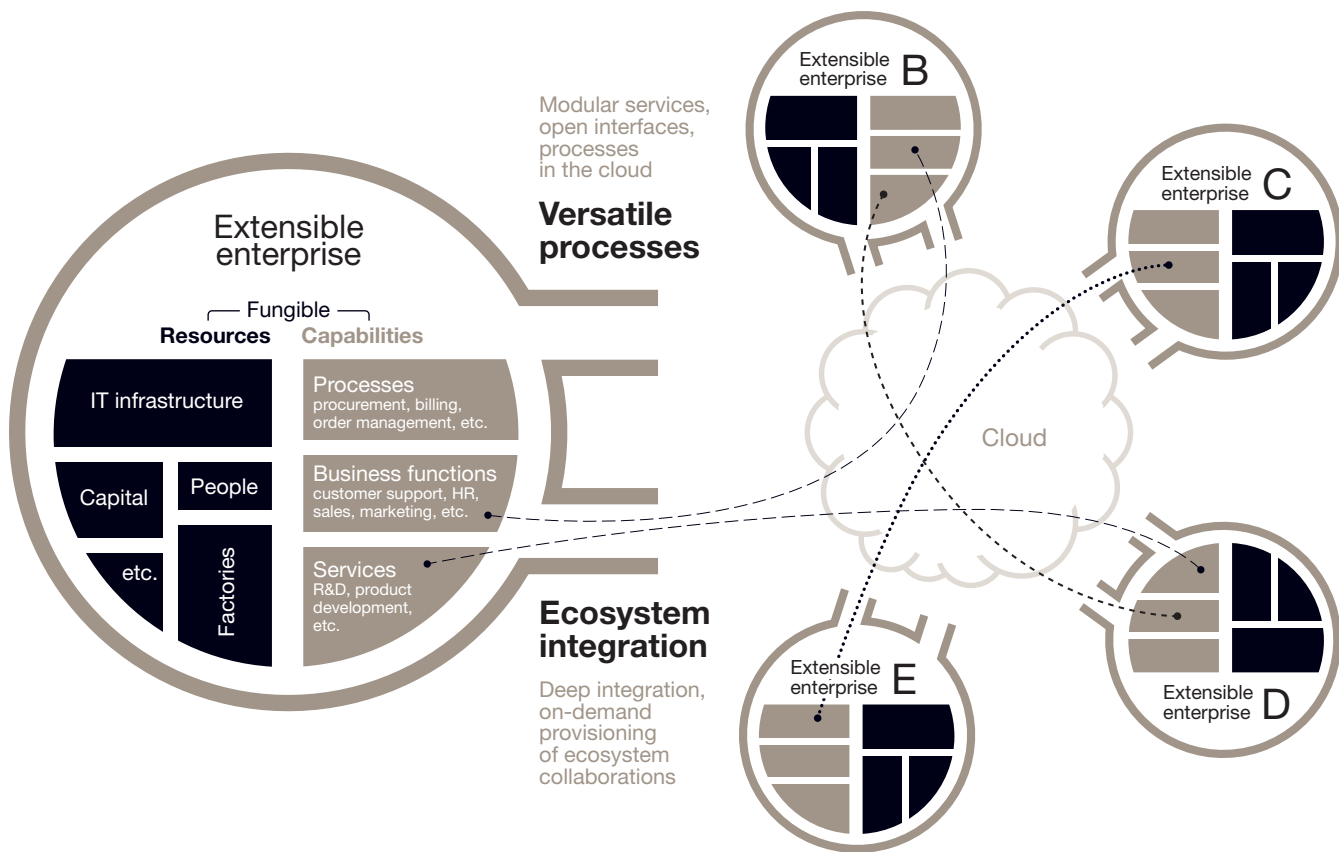


Figure 1: The extensible enterprise is the combination of versatile processes and ecosystem integration that create a network of business platforms.

The CIO's expanding role in business development

In the extensible-enterprise strategy, internal capabilities become business opportunities. With their deep knowledge of enterprise processes and cloud-computing technology, CIOs should be able to bring these opportunities to the attention of the rest of the C-suite—not as a discussion about technology but as a discussion that says: “If packaged properly, these abilities could add a new line of business.”

As noted in the white paper *The situational CIO: IT problem-solver, cost-cutter, strategist*, published by PricewaterhouseCoopers in 2009, many CIOs have

focused almost exclusively on IT operations but are now encountering a C-suite expectation that they become more strategically oriented. CIOs need a dose of business development savvy to help create value through increased revenue, customer loyalty, and other drivers of business growth.

In the extensible-enterprise strategy, internal capabilities become business opportunities.

Traditional CIO roles in traditional enterprises	Additional CIO roles in extensible enterprises
Focus on business process efficiencies	Develop the vision and position in the network of business platforms, and then deliver it
Flawlessly deliver of mission-critical transactions (accounts payable, accounts receivable, order processing, etc.)	Identify new business opportunities based on enterprise ecosystem capabilities and market needs—top-line impact becomes as important as bottom-line impact
Support new business development ideas proposed by line-of-business managers	Actively enable business development through a partnering role with line-of-business managers; possibly also directly propose and/or lead idea exploration
Treat risk management mostly as a CFO problem	Share risk management responsibility with the CFO
Leave user experience thinking to others in the IT department as an execution detail	Actively consider and be aware of user experience in the new view of users as customers
Manage an internal stack of vendors, products, and technologies	Manage both internal and external stacks of technologies and vendors, and the interplay among them
Capabilities and systems are in silos across the enterprise	All capabilities come together to build a longer-term enterprise asset
Focus is largely on cost containment of IT operations	Focus includes driving enterprise growth

Table 1: The extended CIO role in an extensible enterprise builds on the traditional role that is largely retained (though often delegated).

Source: PricewaterhouseCoopers

The operational focus has been a mixed blessing for CIOs. They get an unparalleled view of the entire business’s operations and underlying processes, but they remain in a support role that often means they’re not exposed to underlying business thinking. While this perspective makes the CIO a great enabler, even a refiner of business strategy, the support role can complicate the CIO’s efforts to propose new opportunities.

For example, a drug company CIO’s lack of expertise in pharmacology means that he or she probably is not able to suggest research opportunities, even though the CIO can help the business-identified opportunities be executed more efficiently and capably.

The nature of your company’s business and your specific experience may mean that you can’t realistically identify the business opportunities for which you could develop an externally facing cloud service to add to the top line. On the other hand, many CIOs do understand their businesses well enough to take on that business-opportunity identification role, either as the lead or as a partner to another C-suite executive.

In an extensible-enterprise strategy, the CIO’s role becomes twofold: business development—“what should we do”—and deployment—“how should we do it.” This dual role requires the CIO to become a contributing member of the business development team. The CIO should be the leader of technology deployment, but to pursue the extensible-enterprise strategy effectively, the CIO also must have a business development mind-set so the deployment enables the desired outcome. (See Table 1.)

“We’ve tried to take the conversation more contextually from a business unit–driven conversation to an enterprise asset conversation.”
—Sanjay Mirchandani of EMC

CIOs who perform this new role successfully will also shift internal perceptions of IT. The pursuit to create a long-term enterprise asset changes the conversation with the business from the short-term needs of any particular group to an approach that takes a strategic view and builds an asset for the enterprise. “We’ve tried to take the conversation more contextually from a business unit–driven conversation to an enterprise asset conversation,” says Mirchandani.

Becoming an extensible-enterprise CIO

Being the CIO in an extensible enterprise is not the same as being the CIO in a traditional enterprise. Yes, you will have the same expectations to provide cost-efficient and reliable services. But the value-creating context of an extensible enterprise creates expectations for availability, scalability, elasticity, extensibility, and orchestration that traditional CIOs have not faced.

Outages, planned or not, have an order of magnitude greater impact because they affect your partners and customers directly, and thus your revenues and long-term customer loyalty. And outages or other misfires are immediately public. So you can’t have outages; when demand surges, so must your ability to provide services.

Look at the outrage when providers fail to do that, such as when the ordering systems were unable to keep up with the higher-than-ever volume of iPhone 4 preorders earlier this year.¹ Indeed, during the next few years, the expectation for instant gratification of most consumers and business-to-business customers will accelerate, in part due to the increased surge capacity offered by cloud-based platforms. Gen Yers and Gen Xers,

especially, have become spoiled by what Apple iTunes and iPhone stores have delivered: a fast and sophisticated online experience.

For many CIOs, particularly at large enterprises, the journey to the extensible enterprise will begin with developing and deploying a private cloud. First, CIOs will need to shift their thinking about the time frames in which they respond to customers. “We’re seeing incredible leaps in technology capabilities in short windows of time that allow us to be much more responsive to the business than in previous [technology] cycles,” says Mirchandani.

Next is the shift in how IT is managed. Rather than provisioning IT resources for peak capacities, IT can be managed for utilization and more in line with business cycles. ADP in recent years has focused on the agility of its IT infrastructure—the ability to move capacity around quickly. “As certain products suffered a little bit during this [economic] downturn, we reallocated those resources to other products in our hosted environment,” says Mike Capone, CIO of ADP. “That allowed us to align our costs with our revenue and to avoid a problem with a lot of fixed costs that we couldn’t get rid of, which would have hurt our margins.”

Then there’s the shift in focus toward the IT capabilities that drive ecosystem and end-customer value rather than focusing only on the enabling infrastructure. In the past, application requirements have forced infrastructure decisions. However, as the IT infrastructure of servers, storage, and networks is virtualized from the applications, the focus can shift to modularity and the interoperability of these applications. This interoperability is essential to the extensible-enterprise vision because the applications (as services) enable the business platforms for ecosystem participants to drive new avenues of growth.

¹ http://news.cnet.com/8301-31021_3-20007758-260.html?tag=mncol;txt

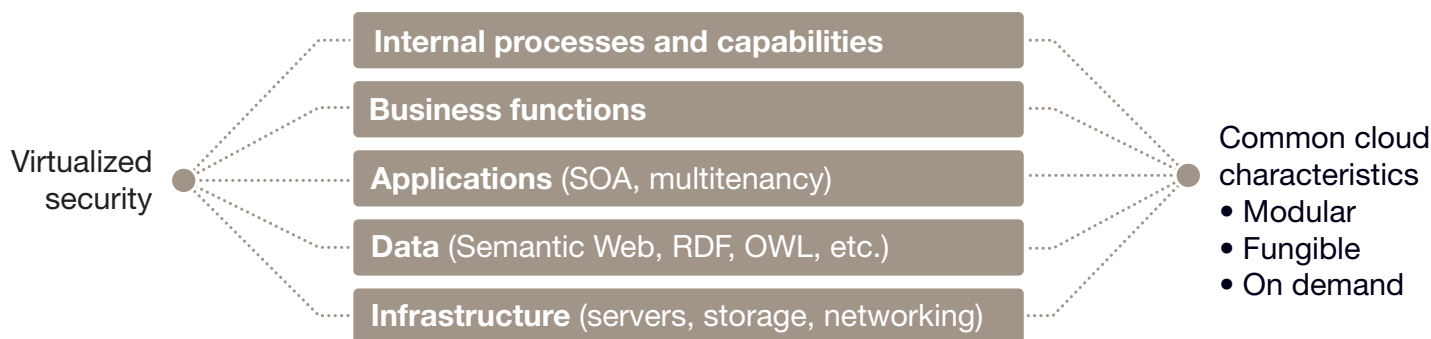


Figure 2: The typical IT stack and the enabling technologies for an extensible enterprise

Perhaps most crucial, CIOs must think about the customer need and experience, so they can orchestrate this network of business platforms successfully. Mirchandani relays the advice he received from a colleague: “Sanjay, you want to think about provisioning the user experience and not provisioning the device.”

Keeping the end-customer needs in mind and provisioning the user experience, not the technology, is pertinent advice for any CIO advancing or pursuing the extensible enterprise.

The technology enablers of the extensible enterprise

As shown in Figure 1, an extensible enterprise is a combination of versatile processes and ecosystem integration. Every organization is different, but some common building blocks of cloud technologies make an extensible-enterprise opportunity real. They may not know it, but many CIOs are already laying some of the groundwork for this opportunity. Those who do so intentionally have the best chance of success as technology leaders and as members of the business strategy team.

An extensible-enterprise opportunity affects all layers of the IT stack. Technology developments at each layer come together to enable versatile processes and ecosystem integration. Figure 2 details some of the concerns at each layer. A common concern across

all layers is to make the relevant IT and business function resources as modular, on demand, and fungible as possible so they can serve the broadest set of uses, current or future.

Fungible, modular, and on-demand IT resources

At the infrastructure layer, the key concern remains the pooling and virtualization of servers, storage, and networking, so that any dependencies between applications and infrastructure are removed. This removal of dependencies leads to Evergreen IT, in which the various layers of the IT stack can be refreshed independently as needed without constraints from other layers. In essence, Evergreen IT makes IT infrastructure fungible to the point that it can be used for any application, which is fundamental to the extensible enterprise. (See the Summer 2009 issue of the *Technology Forecast* for an in-depth discussion of Evergreen IT.)

At the data layer, the concern remains the use of data standards and semantics to give transactional and non-transactional data the same level of modularity expected from the infrastructure. As a result, data also becomes fungible so it can be used in multiple ways without needing to be redefined, reformatted, or otherwise transformed. The key focus becomes creating abstractions of concepts such as process designs, process interfaces, and business rules—so that they can be applied and used across multiple systems and platforms, thereby enabling semantic interoperability.

“Amazon very much believes in developing capabilities that customers need us to develop. We don’t really believe in just saying, ‘Well, here’s what we’re good at. Let’s figure out what we can build that maybe somebody will like.’” —Adam Selipsky of Amazon Web Services

Advances in Semantic Web, dynamic data schemas, and related technologies offer considerable promise in these regards. (The Spring 2009 *Technology Forecast* and *Technology Forecast 2010*, Issue 3, detail many of these technologies.)

At the application layer, the key enabling technology—service-oriented architecture (SOA)—has been available for more than a decade and has had varying levels of use and adoption. Although the term might have risen and fallen in importance, the principle of breaking up a monolithic application into a collection of modular services is core to the extensible enterprise. In many ways, cloud computing will give a new impetus to SOA.

Multitenancy is also a key cloud-based characteristic to consider and include in your extensible-enterprise architecture, because it allows the deployment of customer-facing applications in a way that reduces dependencies that can hinder availability, performance, and reliability. Thus, any reworking of applications should consider making them multitenant.

SOA and multitenancy are the tenets for making applications fungible so they are available for the broadest selection of current and future uses. From an extensible-enterprise perspective, a primary goal is to bring the cloud characteristics of scalability, elasticity, and on-demand access—which are now possible in the IT function—to other business functions as well, such as sales, marketing, finance, and others. Supported by IT, business functions also can flex with demand, scale up or down, and be adapted to changing customer demands.

Turning internal capabilities into versatile processes

From an internal process perspective, the first step to becoming an extensible enterprise is an assessment to understand which existing or new processes represent capabilities that other business partners could leverage to create growth potential, if those capabilities were exposed externally and made available to a broader ecosystem.

The next step is the transformation of the process, so that it can be implemented in a cloud and be versatile. This transformation would entail breaking the process into modular activities, developing standard and open software interfaces or application programming interfaces (APIs) to these activities, and maintaining the process as an on-demand service—whether invoked by software or human.

Such a transformation removes the strong interdependencies among the various activities in the process, so that each can be used independently from inside or outside the enterprise. When an internal capability is accessible from the outside, it can be combined with other services to enable the broadest set of potential existing and future use cases.

Deep integration should be easy

Integration services from vendors such as Boomi and Cast Iron Systems (now part of IBM) can enable technology for interconnecting the various business platforms across public and private clouds. Two considerations should be top of mind when proceeding with business platform integration, however.

First, the integration should support deeper collaboration than was feasible in the past. Integration at the edge can be possible by the mere exchange of data, and that has its value. However, interactions in the ecosystem often occur at deeper levels, reaching within the internal workflows and processes of an enterprise.

For instance, as part of a loan funding process, a credit service that provides a customer's score can be integrated at the edge by using the data that needs to be exchanged. However, the collaboration between a loan agent and the lending institution is deeper and involves considerable and intricate workflow. If the loan funding process was to be a candidate for extension, its transformation to a versatile process should consider the need for deeper integration and how that might be possible both from an architecture perspective and from a data-sharing perspective.

Deep integrations are used today, but they are expensive and time-consuming to provision because of the technical complexities of integrating systems and managing risks when working across enterprise boundaries. Particularly in business-to-business situations, integration is often limited to the edge because deeper integration can be so expensive. For an enterprise to be extensible, the focus should be on lowering the cost of provisioning the deeper collaborations or integrations with ecosystem participants, so the business platforms can work together to fulfill an end-user experience.

For example, rather than being limited to the exchange of ticket inventory information, the Tickets.com business platform allows ecosystem participants to change the information on a ticket. As a result, Givex, a provider of loyalty and gift card technology, created a service to store additional value on tickets whereby they could be used for redemption at concessions and retail stands. The integration had to go deeper to accomplish this capability.

Extensible-enterprise processes should not be confused with mashups. Mashups are an approach to integrating Web services and have recently gained some popularity. They are essentially data presentation integrations that lack workflow or transaction support. They are driven by edge integrations and usually combine data from specific sources into a service that presents the combined data after some manipulation, such as a map that overlays current traffic data to help drivers avoid congested roads.

Lessons from early adopters of the extensible enterprise

In these early days of cloud computing, PwC believes the first companies making impressive progress toward the extensible enterprise are those that already operate in a cloud or services context, such as ADP, Amazon.com, and Tickets.com. (See the article, "The cloud you don't know: An engine for new business growth," on page 04.)

Their businesses are based on using cloud technologies, so it's easier for them to make the connection to external business value than companies for which cloud computing is simply another computing option. However, as all enterprises adopt services via the public cloud or their private cloud, they will have the necessary technical foundation to take advantage of the extensible-enterprise opportunity. The strategic opportunity should be evaluated like any other, with due diligence, competitive analysis, market analysis, and customer research. The learning from the early cloud providers is a leading indicator for all and should be analyzed to evaluate the opportunity.

You don't need to be a cloud-oriented provider to be an extensible enterprise. You can create a cloud-style platform on which you run versatile processes, whether using your own data centers or acting as an orchestrator and aggregator of external cloud services—or, more realistically, through a combination of the two. It's all about how you leverage cloud architecture and capabilities—and the fact that you do so for business value creation.

“Our virtual fabric sits on top of the existing legacy environment and enables secure end-to-end connections—client to server, device to device, or any other combination—without changing or endangering existing infrastructure.” —Jaushin Lee of Imera

To avoid confusing your needs with the needs of your potential customer, it can help to think like the CIO or CTO of a technology vendor. Adam Selipsky, vice president of Product Management and Developer Relations for Amazon Web Services, says, “Amazon very much believes in developing capabilities that customers need us to develop. We don’t really believe in just saying, ‘Well, here’s what we’re good at. Let’s figure out what we can build that maybe somebody will like.’”

In other words, although you may have internal processes that could make great external services, don’t assume that they will and don’t limit your business development thinking to what you have at hand. Instead, consider what customers (internal and external) would strongly benefit from. Then see if you have the capabilities, or can create or access them, to make a successful service.

Understanding the security risks

Although PwC believes the cloud approach is crucial to create an Evergreen IT infrastructure and to enable an extensible enterprise, it’s important to understand that the cloud approach has many risks that CIOs will be expected to address. Among those risks, security comes up in most surveys as a risk that is preventing many from adopting cloud solutions.

CIOs should not use the security risks as an excuse for inaction. Mirchandani says, “In my opinion, you don’t lose your good habits. You evolve them. You take the security best practices you have in your physical data center and you evolve them into your virtual data center. The technology also must lend itself and evolve itself to

virtual environments.” He points out that security vendors are working to address the peculiarities of the cloud, and he expects CIOs to have more tools over time to help them apply good data hygiene habits.

Security risks can be significant for the extensible enterprise as well. One risk is that using your own systems or external systems that connect to your internal systems as part of your network of business platforms opens possible conduits for hackers and data thieves. Cloud services by necessity transit multiple networks and computing systems, so data and services are less controlled than they are in a typical data center.

Another risk is that your intellectual property is exposed to others, potentially reducing its competitive value as they figure out how to reverse-engineer or simulate it.

PwC expects two key advancements in the future to mitigate security concerns in general and to enable the extensible enterprise. First, security must be decoupled from the underlying physical infrastructure. The traditional hardened-perimeter and hardened-conduit approaches simply won’t work well enough once your data, processes, and collaboration are moving across enterprise boundaries. Security must become virtualized just like other infrastructure resources such as servers and storage. As a result, security will be independent of a particular hardware infrastructure and the collection of applications or services that come together to create customer value.

Imera Systems’ cloud security is an example of this approach. It offers a virtual security fabric designed as an overlay for the many-to-many connections among businesses that exchange information. Rather than connect clients and servers to each other through a

complex nest of point-to-point security appliances, the Imera virtual fabric acts as a universal security hub through which all the clients and servers connect, thus making it a virtualized security process. “Our virtual fabric sits on top of the existing legacy environment and enables secure end-to-end connections—client to server, device to device, or any other combination—without changing or endangering existing infrastructure,” says Jaushin Lee, CEO of Imera.

The second role for security in an extensible enterprise is the on-demand provisioning of deep integrations in the ecosystem. Just as cloud computing enables on-demand provisioning of compute, storage, and networking resources, deep ecosystem interactions should be provisioned—and disabled—on demand. Lowering the cost and time of provisioning such interactions is one key to participating in the network of business platforms.

A primary benefit of these advances is to shift the trade-off between productivity and control in securing ecosystem interactions. “Essentially, [the benefit] is the productivity gained in conducting collaboration in the [cloud] ecosystem in a secure manner,” says Lee. Often, more security comes at the expense of productivity loss as employees or applications must go through more hoops and controls. With security virtualization and on-demand provisioning, productivity can be achieved without compromising the necessary level of control.

Conclusion

PwC believes that using the cloud to create an extensible enterprise is an inevitable trend, one that portends growth opportunities. Companies, customers, and providers are all increasingly interlinked through Internet-based services and channels, which make services in the cloud more feasible and more desirable. After all, when the service is expressed in bits, it doesn’t matter “where” it comes from or who provides it, as long as it does the required job well.

Becoming an extensible enterprise also presents all CIOs with an opportunity to take new strategic options to their C-suite colleagues and expand their impact on business development activities. At most companies, the CIO is in the best position to take advantage of this opportunity, given his or her broad overview of key business processes and ownership of many of their means of execution. After all, the CIO is responsible for ensuring that those “bit services” work internally, so why not take the next step and make sure they can work externally?

The best-positioned CIO can do more than lead the deployment of an extensible-enterprise platform based on existing internal capabilities and information. If he or she has strong subject matter expertise in the business, that CIO can lead the identification of the new business opportunities themselves. It’s hard to imagine how a CIO could get any more strategic than that.

For more information on the topics discussed in this article, contact David Stuckey at +1 203 539 4274 or Cindy Warner at +1 313 394 6633.

Using cloud computing to build an enterprise asset

Sanjay Mirchandani of EMC Corporation shares how cloud computing is changing the conversation with the business and can deliver a long-term strategic impact.

Interview conducted by Bo Parker



Sanjay Mirchandani is senior vice president and CIO of EMC Corporation. As CIO, Mirchandani is responsible for extending EMC's operational excellence and driving technological innovations to meet the current and future needs of the business. Mirchandani also leads EMC's network of global delivery centers in India, Ireland, China, Egypt, Russia, and Israel. These centers support EMC's worldwide research and development efforts, as well as provide customer support and shared services.

Mirchandani previously served as senior vice president, leading the EMC Office of Globalization. In this role, he identified global growth opportunities and developed the EMC business processes and infrastructure required for global expansion. He was also responsible for bringing new strategic international partners into EMC's Global Alliances program. Prior to joining EMC, Mirchandani was Microsoft's regional vice president, Enterprise Services, Asia, where he worked with the region's largest customers and partners.

Mirchandani earned a master's in business administration from the University of Pittsburgh and a bachelor's degree from Drew University.

In this interview, Mirchandani details the impact of cloud computing in changing the role of the IT function to one that supports business development, innovation, and provisioning the user experience.

PwC: Why is cloud computing taking on so much importance? What is the big change?

SM: In the broadest technology sense, the cloud-computing wave allows the unification of liquid pools of storage, network, and computing.

In a cloud model, these resources are offered back to users as a service that's consumed "as needed" rather than "how built." The result is a compute environment that can be used or consumed like a public utility. Historically, these IT resources evolved much more independently, not as coordinated as we see now. That maturity, along with the microprocessor evolution, is

making this step change significant. We're seeing incredible leaps in technology capabilities in short windows of time that allow us to be much more responsive to the business than in previous cycles.

At the risk of appearing controversial, I'd say this is really the first time where the computing platform—in this case cloud computing—is enabling focus on conversations among IT and application owners, as opposed to applications forcing an infrastructure decision. In addition, it is evolving the roles and responsibilities within IT, allowing them to be pooled and made more efficient.

PwC: Cloud computing actually brings many compelling, non-commodity features to IT infrastructure. Do you think IT infrastructure is becoming a commodity?

SM: Absolutely not. I'm a career businessperson and, more recently, a CIO. More than ever, IT is the business transformation agent. The conversations we have today are no longer about IT being a back-office order taker.

We're now in deep partnership with the business on key decisions. The individuals in EMC's IT organization are asked to run core integration projects, and they're seen as process and subject matter experts. It's been an evolution. We always had those skills. It's now about how we leverage them. For instance, we don't spend all our time today worrying about what box an application runs on, how many gigabytes are needed, or performance issues, as much as what value we are trying to deliver against this. This shift in thinking completely changes the role and significance of IT in the business.

PwC: How is cloud computing changing the conversation with the business?

SM: Cloud computing prompts a different kind of conversation on two levels. First, it is a conversation about how IT can partner with the business and be proactive in driving down costs and improving levels of efficiency. And on the second level, we are building an asset for the company that has longevity. Private cloud computing enables IT to say, "We have this capacity,

and we're not going to add more capacity until we fully hit the points of utilization that we need. "And we're more cost efficient. If I tell my CFO, "I'm doing more with less. I have consistent 70 percent utilization before I buy new assets," he loves that conversation. It's less capital expenditure, it's better utilization, and it's a better return on assets.

Essentially, we've tried to take the conversation more contextually from a business unit-driven conversation to an enterprise asset conversation. In other words, if three business groups within the company are looking at e-commerce or customer touch online—it does not matter which segment or geography—we can deliver and scale out for the enterprise.

PwC: How aware do you think CEOs are about the potential of cloud computing, and in what areas do they need some education?

SM: I think CEOs generally are very aware. There probably are two areas where we need to do a lot of ongoing education. One area is around security. Second, there tends to be some confusion between what the private cloud offers versus what the public cloud offers. Some people think that everything is out in the public cloud, and they are concerned about privacy, security, where their data lives, outages, and availability. You need to have the conversation to make it crystal clear that whether the resources are within the customer's data center or hosted in a third-party service provider's infrastructure, the information itself is controlled by the customer. This is very important.

"We're seeing incredible leaps in technology capabilities in short windows of time that allow us to be much more responsive to the business than in previous cycles."

PwC: Is security just a matter of people getting comfortable with it over time? How will it evolve?

SM: No, I think that would be oversimplifying it. In my opinion, you don't lose your good habits. You evolve them. You take the security best practices you have in your physical data center and you evolve them into your virtual data center. The technology also must lend itself and evolve itself to virtual environments. Managing virtual machines is a little different from managing physical machines, but whether you're using data loss prevention or using any kind of technology for authentication, your good practices don't change. The technology evolves with it. In the virtual/cloud world, we must think of security as built-in, not bolted on.

For example, EMC recently bought a company called Archer Technologies, which offers governance, risk, and compliance (GRC) solutions. The issue is not just security; it's across-the-board GRC solutions for the enterprise. We're finding new and creative ways to integrate Archer Technologies into our core business—IT and beyond. These solutions are particularly useful in moving to the cloud because highly automated cloud environments must be policy based to scale. That's what cloud is all about. It's all about policy-based, service-level-driven IT computing, and those technologies are evolving very quickly.

PwC: How does cloud computing help with innovation in an enterprise?

SM: At EMC, we are finding innovative ways to tackle old problems. I'll give you an example. We had an application that reads a large data set and locks up desktops for long periods of time. Now, with a virtual infrastructure environment where we can serve up VDI [Virtual Desktop Infrastructure] machines running on a Vblock,¹ we're able to provision some of these virtual desktops on the fly so the engineers can spin up, load their data sets, go home at night, and come back in the morning. All of this is happening off the server with the added benefit that much of this is self-service. The engineers' machines are free to do what they want to do, and all of a sudden: new solutions to old problems.

The point is not so much the solution. It's the innovation around how you tackle the problem. The capabilities that a virtual, private cloud infrastructure provides enable us to address problems differently and say, "Let's try that. We'll come back to you tomorrow," as opposed to, "Let me come back to you." There's more of an inclination to dabble and try to innovate and to risk and fail. The only caveat I'll put in that statement is you don't want to lose your good hygiene habits. There's a fear in the minds of many that you can spin things up so easily that you may forget to spin them down, or you get inefficient because you're spinning up too many resources, and you lose your basics on ROI [return on investment] and costs.

PwC: How do you see cloud computing affecting that old pendulum of centralization and decentralization of IT between the business units and central IT?

SM: I don't think it's so much about centralization and decentralization. Naturally, with cloud you want the operational elements more centralized, because you are harnessing the compute power back in the data center. Logically, you'll get a lot more centralization from a technology point of view.

The exciting angle on this is the rationalization of roles. We will see the classic IT silos blur. I am convinced more than ever that the boundaries between systems and security, security and network operations, and network and storage operations will start blurring. There's going to be a natural transition where once you get past the depth needed for designing, building, and deploying a private cloud, you really don't think in the classic IT sense anymore. And you look at root cause analysis in a different way. This new wave of IT is ushering in an opportunity for IT professionals.

"The exciting angle is the rationalization of roles. We will see the classic IT silos blur."

¹ <http://www.emc.com/solutions/application-environment/vblock/vblock-infrastructure-packages.htm>

PwC: CEOs think about the attractiveness of acquisitions and mergers along a number of dimensions, including the difficulties created during the integration of two companies. Will cloud play a leading role in accelerating the integration of companies after an acquisition?

SM: I absolutely believe cloud computing will be a key catalyst for accelerating the integration of an acquisition. If I could take the core tenet of a private cloud, which is multitenancy, and enable that in our virtual data center, we could bring a company into our fold the way a service provider would a new customer—spinning up a new client internally until we do the back-end integration on the systems and everything else we must do to ensure a smooth integration of the companies' IT infrastructures. That would give CIOs the flexibility—at least at the onset of an acquisition—to move faster and definitely at lower costs.

PwC: How will cloud computing change how enterprises relate to their users and the user experience?

SM: Many companies today are using seven-, eight-, or nine- (depending on how you look at it) year-old versions of an operating system and a set of applications that were built around that time; the user experience is tied to the device that is used (e.g., their desktop or laptop); and the experience that most users have when they go home, with aluminum Macs and netbooks, is a little different from what they tend to

get in the corporate environment. A key use case within EMC's own journey to the private cloud is virtual desktops, where Paul Maritz's [CEO and president of VMware] guidance to me was, "Sanjay, you want to think about provisioning the user experience and not provisioning the device."

So we take that as gospel. We think that is just the way to build services. So, how do you abstract a device? Let the device be a lifestyle choice. If you like netbooks and Macs, or if you like something else, knock yourself out. Why should I determine what device you use? I want to give you a consistent, compliant environment that you can work with and that makes you more productive.

Now, that's a big, bold goal, and there are many obstacles in achieving that. But we're convinced, and we're trying to convince everyone within EMC, that the only way we're going to step change the user experience is if we do much of it in a virtual environment. So we can do it faster, more consistently, and less expensively for the company, and it's safer in the way things are managed. ■

"I absolutely believe cloud computing will be a key catalyst for accelerating the integration of an acquisition."

Virtualizing security

Jaushin Lee and Andrew Wahl of Imera Systems share how virtualization of security can lead to on-demand provisioning of deep integration among ecosystem participants.

Interview conducted by Vinod Baya and Bo Parker



Jaushin Lee is founder and CEO of Imera Systems and the visionary architect behind the Imera Virtual Fabric platform, the industry-leading secure virtual infrastructure solution for enterprise computing and communication. He started Imera after a very successful career at Cisco Systems, where he managed the Cisco Network Search Engine (TCAM) and high-speed SRAM programs. At Cisco, Lee was one of the architects behind Cisco TCAM and high-speed I/O development, and he was responsible for driving the technology strategy with the world's leading semiconductor vendors.

He has 18 years of R&D and management experience in networking and computing engineering. Lee holds a Ph.D. in electrical engineering and computer science from the University of Illinois at Urbana-Champaign. He has an M.S. in electrical engineering from Columbia University and a B.S. in electrical engineering from National Taiwan University. He has published 15 international conference and journal papers and has filed numerous US patent applications both at Cisco and Imera.

Andrew Wahl is the CFO of Imera and a managing director at IG Partners. He founded IG Partners, a San Francisco Bay Area management firm focused on helping companies achieve milestones for explosive growth. He is a senior operating executive with 30 years of experience in delivering bottom-line results in companies ranging from startups to Fortune 100. He managed the explosive growth of the seventh fastest growing company in the US between 1995 and 2000 by consistently applying innovative, profitable solutions to complex problems. IGP trains client personnel in all facets of career development.



Wahl started, grew, and sold two businesses; successfully managed structural and organizational changes in startup, growth, mature, acquisition, divestiture, and privatization environments; and continues as a member of advisory and corporate boards. Internationally, he established and directed worldwide operations including research, engineering, production, and distribution in Asia, Europe, and North America.

He received his B.A. degree from Villanova University, an M.B.A. from Rutgers University, and completed Stanford University's Advanced Management College.

In this interview, Lee and Wahl discuss how cloud computing challenges traditional approaches to security, and they discuss how security—like servers or storage—can also be virtualized to support cloud-based business models.

“Current methods of provisioning ecosystem collaboration are intrinsically very high touch and involve distributing specific hardware or software clients for access.” —Andrew Wahl

PwC: Can you briefly tell us about Imera?

JL: Imera was started in 2004 to primarily focus on building a virtualized fabric connecting distributed clients, servers, people, and applications between multiple domains without compromising security or requiring any significant infrastructure changes. As an infrastructure solution, we improve productivity by lowering the barriers to provisioning secure collaborations. Our customers are large enterprises, and we help them connect their virtual resources—not just for internal employees, but also outside vendors and supply chains, customer sales channels, subsidiaries, and other participants in the ecosystem.

When an enterprise connects to all those parties, the security and compliance requirements become critical to protect intellectual property and maintain competitive advantages. Our virtual fabric sits on top of the existing legacy environment and enables secure end-to-end connections—client to server, device to device, or any other combination—without changing or endangering existing infrastructure.

PwC: What challenges are your clients facing that you are trying to address?

AW: Traditional security methods rely on firewalls, VPNs [virtual private networks], and so on, which are deployed on the edge. So the policy typically was set on the edge to focus on and control only internal issues. This is OK when the sharing of resources is limited to a very selective set of partners. Today, seamless agility among and between multiple internal and external domains is the key. Imera developed a solution that is network topology independent, meaning it can

seamlessly work with existing infrastructure and applications or work independently without opening any firewall.

Enabling or provisioning ecosystem interactions dynamically and quickly to meet fast changes in business operations or policies is very time-consuming and expensive. Exceptions must be made or new policies created and manually deployed. Current methods of provisioning ecosystem collaboration are intrinsically very high touch and involve distributing specific hardware or software clients for access. While it ensures control, it is time-consuming and manpower intensive for IT, burdensome for the end users, and collaboration is not as robust and frequent as it should or can be.

PwC: How does what you are doing relate to cloud computing?

JL: As enterprises transition to the cloud—internal or external—they will share IT resources with other business units or other enterprises. At the same time, the cloud is a dynamic environment, allocating resources on the fly as per demand. So that gives security a much higher challenge, because it must segregate those resources inside the very dynamic cloud environment. In traditional architecture, people may be able to use so-called physical security infrastructure to protect the distributed resources. When all those resources fall into a cloud, they are dynamically provisioned together. Then security infrastructure needs to become dynamic and virtualized, resulting in the physical security methodology becoming an impediment to the speed of deployment.

Here is an analogy. VPN is like a bus. It drops you off at the front door, but once you're dropped off, you can get to anywhere inside the building. What we're looking at is more like a DOD [Department of Defense] application, where somebody meets you at the front desk and walks you to a specific office. Now in a cloud environment, this "office" is a dynamically created virtual machine, which needs to be protected against unauthorized access once it is allocated and does not allow user intrusion in other resources in the cloud. That is what is needed in a cloud environment and is what we have built.

AW: Also, in the early days, the firewall was designed as an internal security application for a single enterprise and in most cases a single data center, so one CIO decided the security policy and deployment. Now, if you have a foundry, design center, and fabless semiconductor company working together on a chip design, you have three CIOs deciding what are the appropriate security protocols. It's hard enough to get one CIO to agree that the sky is blue. Getting three of them to agree on the color of the sky is doable, but six to nine months later. That's where the productivity starts to hurt big time. With Imera, the ability to virtually create a secured perimeter provides privacy to all while ensuring each CIO's protocols are maintained.

PwC: What is the business benefit of your solutions?

JL: Essentially, it is the productivity gained in conducting collaboration in the [cloud] ecosystem in a secure manner. Our solution improves the trade-off between productivity and control. From a security perspective, an enterprise wants to control who has access and what is accessed. But users need on-demand access to internal or external data among collaborators to take advantage of the cloud's technology to increase productivity and meet time-to-market requirements. We significantly reduce the time and cost of administration in provisioning these collaborations and thereby increase enterprise productivity.

"We significantly reduce the time and cost of administration in provisioning collaborations and thereby increase enterprise productivity." —Jaushin Lee

PwC: So you're saying that just like cloud computing can provision server, storage, and other resources on demand, you can provision security on demand for internal or external collaborations in an ecosystem?

JL: Indeed. Imera allows provisioning of security on demand, and in fact we can transition these actions into becoming self-service. Users don't have to call IT to add somebody to a secure conference, or wait a week in many cases for IT to respond. IT implements business policies and users can add/delete collaborators on demand.

PwC: What technological innovations are part of your solution?

JL: The major breakthroughs are in two areas. The first one is the networking layer. The virtual fabric is decoupled from the underlying infrastructure, so it does not need to open existing firewalls to work. We do not want to touch any firewalls, VPNs, and good stuff in the physical layer. The second innovation is security on the server side to eliminate data leakage. We developed a virtual firewall that is software based and can be dynamically and on-demand provisioned to support end-to-end lockdown.

The reason we are able to virtualize security is that our solution operates at Layer 4 and Layer 5 of the OSI [Open Systems Interconnection] stack. Firewalls and VPNs frequently use Layer 2 and Layer 3 technologies and are very dependent on the physical infrastructure, which is Layer 1. By operating at Layers 4 and 5, we achieve the maximum agility while ensuring Layer 2 and 3 protocols remain undisturbed.

PwC: How do you see the role of CIOs changing in the future?

AW: CIOs get to change security from an expense center to a profit center. As a CFO, the one thing I've always tried to teach people is that if I'm the person trying to stop the defalcations [misappropriate use of funds] based on a review after the fact, it is almost impossible. You need to put the controls in front, and the operating people must help because going through enormous amounts of documents after the fact can never result in 100 percent accuracy.

I need to get the operating officer to realize that his budget is going to be thrown out of whack if he doesn't watch his own expenses—that it's not an accounting issue; it's an operating issue. Imera ensures the CIO and the CISO [chief information security officer] are covered by establishing and locking down the appropriate policies, procedures, and protocols. Then it allows the users to actually perform their own daily maintenance, because they can't touch the policies and procedures set by IT.

The CIO knows policies and procedures are going to be met, because the users can't change them while delegating the daily mundane ACDs [add, change, and deletes] of individuals who need access to files and applications] to the end users. This change translates into immediate user access, faster deployment, and a greater customer satisfaction with response time. Now all of a sudden you have a redeployment of tech people inside the CIO's office to do productive "profit-adding" work as opposed to maintenance "expense" work. This reallocation of maintenance work is critical because the CIO doesn't get much credit from users or senior management for time spent on maintaining systems.

PwC: How can collaboration in the ecosystem be profit adding?

AW: Mandatory capex [capital expenditure] is almost never a profit-adding situation and collaboration can often require mandatory capex. For instance, we had one potential customer who has experts here in the United States and their equipment is located in fabs in Asia. Neither suppliers nor customers are allowed to remotely access the systems in Asian fabs for security reasons.

That meant this OEM [original equipment manufacturer] needed to fly its experts from Silicon Valley to Asia every time there's an issue or problem that required the company experts to collaborate with employees of the fab and share information about the equipment and processes. The travel budget just for CEs [customer engineers] was \$38 million a year. In using our solution, they calculated an ROI [return on investment] in days because the fabs let the company's experts in the United States use Imera technology to securely access information from systems in Asia, resolving problems without flying anybody anywhere. They could reduce a 24-hour turnaround time to 2 hours. The company was

looking at increased customer satisfaction, decreased response time, and an immense savings on travel costs by enabling collaboration as needed between the company in Silicon Valley and the fab in Asia.

PwC: Are there other areas where virtualized security contributes to the enterprise?

AW: Take Sarbanes-Oxley [SOX] as a compliance issue, for instance. When you acquire a company, you have 90 days to make them SOX compliant. So when you talk about M&A [mergers and acquisitions], you have the ability to wrap them quickly under the virtual fabric and then take the time to go back and figure out how to do the longer-term integration with adequate time and analysis. Otherwise you have to say, "We meet SOX except for this last acquisition that we're working on," and you do not want that footnote in your financial statements.

In today's ever-changing environment, the ability to segregate and secure access to information on a time-critical basis when considering an M&A improves the privacy of personal information and allows third parties to engage in design or troubleshooting. Imera offers a solution that can be implemented in a matter of hours—not weeks or months—allowing faster integration of acquisitions at reduced cost and frustration.

PwC: Why do you think a CEO should care about cloud computing and the solutions that you provide?

AW: A CEO is never as interested in an expense center as he is in a profit center. As soon as you change the dynamics so that security and IT become potential profit-adding applications, you change the positioning of the CISO and the CIO. Now the CEO is interested because he sees an EPS [earnings per share] change. If you can show that the Imera solution is profit adding by reducing operating expense, which it does; it improves the user experience, which it does; and it quickly and securely opens you up to the supply chain and the customer base, now all of a sudden you have a reason to be in front of the CEO like you've never had before. And he will listen, because it's all based on operating efficiencies and profits. ■

How CFOs should audit the cloud balance sheet

Cloud computing offers CFOs new opportunities to help the enterprise grow, but presents new challenges around governance, risk, and compliance.

By Vinod Baya and Randy Myers



Cloud computing could become the most transformative technological innovation since the Internet.

Cloud computing is mature enough to be generating billions of dollars of revenue for Automatic Data Processing (ADP), Amazon.com, salesforce.com, and other well-known companies, yet young enough to be misunderstood by many in the C-suite, including chief financial officers (CFOs).

The grace period is just about over.

Initially viewed simply as a way to create more agile, efficient IT organizations, cloud computing is fast becoming the means for a new type of growth based on an opportunity that PricewaterhouseCoopers (PwC) calls the extensible enterprise. (See the article, “The cloud you don’t know: An engine for new business growth,” on page 04.) Not just agile but also versatile, the extensible enterprise sits at the core of a deeply interconnected ecosystem in which customers, vendors, and business partners drive mutual growth via a network of business platforms, as shown in Figure 1.

In this way, cloud computing could become the most transformative technological innovation since the Internet. Business leaders who fail to leverage this potential may risk forfeiting a competitive advantage to those who do.

This article examines the CFO’s role in creating the extensible enterprise and delves into the risks and bottom-line challenges he or she must manage. These challenges include the need for a faster and more expansive model-to-market mentality to match the speed and agility of the extensible enterprise. An array of governance, risk, and compliance (GRC) challenges also are associated with cloud-related operations and the security of corporate data. (See the sidebar “Cloud-computing-related challenges for the CFO.”)

A fundamental idea that CFOs—indeed, all C-suite members—must thoroughly grasp is how an extensible enterprise (by definition) requires exposing formerly internal capabilities to others in the company’s ecosystem and taking advantage of the services offered by others. Because this idea impinges heavily on many decisions CFOs will need to make, the next section examines it in more detail before looking at how CFOs can play offense and defense in an extensible enterprise.

Cloud-computing-related challenges for the CFO

The extensible enterprise will create new responsibilities for the CFO, including:

- The basics: understanding how finance and business units can use internal and external clouds to speed deployment of new IT projects and applications, and reduce IT costs.
- Supporting the CEO’s growth agenda with appropriate financial modeling and analysis of the network of business platform-oriented, cloud-based initiatives.
- Mastering the new metrics necessary to compare the true cost and returns of cloud computing and exposing new services in the cloud to the cost and returns of traditional IT projects.
- Understanding how the shift to the extensible enterprise enabled by cloud computing will affect income and cash flow statements, and the balance sheet.
- Managing the governance, risk, and compliance issues that arise when moving sensitive operations and corporate data to the public cloud.

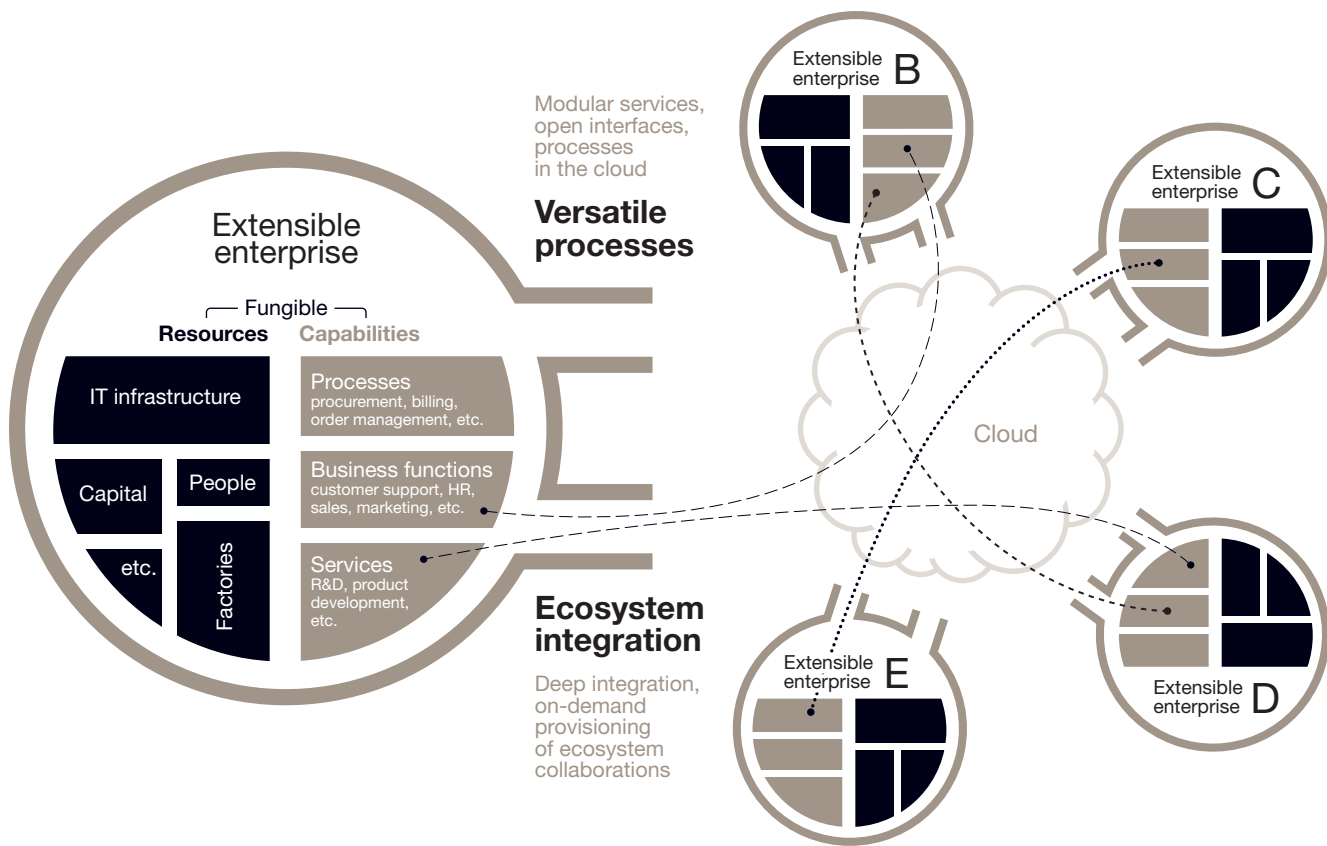


Figure 1: The extensible enterprise is the combination of versatile processes and ecosystem integration that create a network of business platforms.

Public and private clouds; user or provider

For any enterprise, cloud computing can be viewed along two dimensions, as Figure 2 shows. The first dimension is the source of the IT capabilities and resources that provide the cloud services. These can be dedicated or shared. When dedicated—for an enterprise’s use only—they are known as “private cloud.” When shared with other enterprises, they are known as “public cloud.” Many extensible enterprises will use a combination of public and private cloud resources as they share at least some processes in the public cloud.

The second dimension is the role an enterprise plays with respect to services enabled in the cloud. Those who offer services for others to use are “providers.” Those who use services offered by others are “users.” An extensible enterprise straddles the roles of both user and provider of cloud services. In the case of public

clouds, the user and provider would be separate enterprises; in the case of a private cloud, the user and provider could and often would be the same enterprise.

PwC anticipates that many companies will deliver their cloud-based value propositions by deploying the software on cloud service provider infrastructures that are already part of the public cloud, such as Amazon AWS, Microsoft Azure, salesforce.com, and others. There are several reasons for this, but the knowledge and expertise of these service providers in building highly resilient, scalable, and inexpensive infrastructures is hard for internal IT to match.

Some companies—perhaps those that have the largest internal IT infrastructures and are becoming expert at deploying and managing internal, or private, clouds will be in a position to offer their business value to others on their own infrastructures. At that point, the processes and value they support become part of the public cloud.

Public and private as well as user or provider are distinctions that have crucial implications for many decisions CFOs of extensible enterprises need to make, as examined in the following sections.

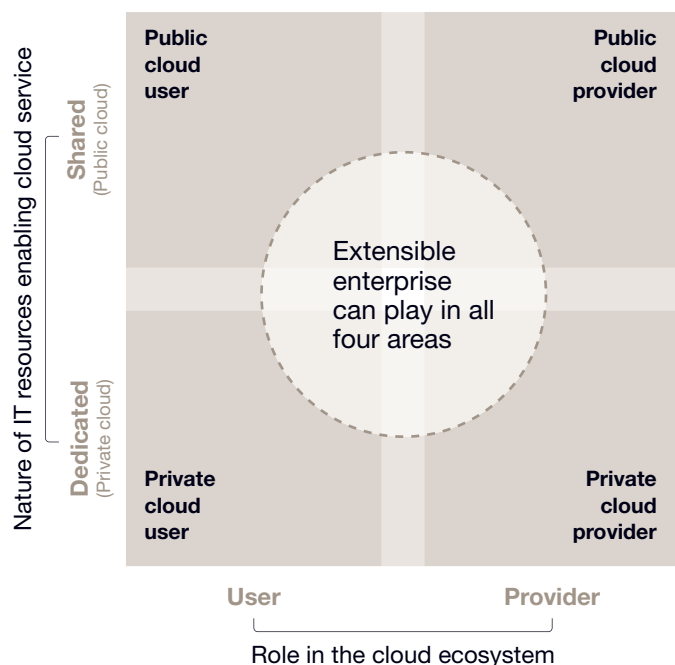


Figure 2: An extensible enterprise spans the roles of user and provider of cloud services. It can use either dedicated or shared IT resources to enable its service. A private cloud user and provider could and often would be the same enterprise.

The CFO on offense: Leveraging the cloud to grow the business

The extensible-enterprise opportunity does not suggest that old ways of doing business are passé. The extensible enterprise will complement rather than replace them, and thereby represents an entirely new growth opportunity. Amazon.com, for instance, extended its business by using internal capabilities around its product catalog and IT provisioning to create new businesses. Its retail system became a platform for other sellers to use, and its IT infrastructure became Amazon Web Services—both of which complement the revenue the company generates directly from its own online retail operation.

Andrew Wahl, CFO of Imera Systems, which develops security infrastructure for the cloud, says one of the biggest challenges for the CFO is to translate this business growth potential into projections that grab the CEO’s attention—for example, revenue growth and earnings per share estimates.

“If you can show that the Imera solution is profit adding by reducing operating expense, which it does; it improves the user experience, which it does; and it quickly and securely opens you up to the supply chain and the customer base, now all of a sudden you have a reason to be in front of the CEO like you’ve never had before,” Wahl says. “And he will listen, because it’s all based on operating efficiencies and profits.”

Additional characteristics for financial models

The pursuit of such justifications for the extensible enterprise will require new competencies from CFOs and their finance organizations. CFOs have always been responsible for vetting new growth initiatives by modeling their likely impact on revenues, profits, asset utilization, and the like—and will retain that responsibility in an extensible enterprise. Now, however, they must be prepared to also consider the following characteristics in their financial models—characteristics that are unique to the extensible-enterprise opportunity:

- Model deeper interactions in the ecosystem—** An extensible enterprise is more dependent on its ecosystem, and the interactions will need to be deeper and go beyond data exchange to include integrated workflow and richer collaborations among employees and systems. Integrating within this ecosystem is more complex than integrating at the edge of the enterprise. Methods of revenue sharing, product liability sharing, dynamic pricing, intellectual property ownership, and investing for massively scaling operations up or down need to be modeled and analyzed for their impact.
- Model the impact of many smaller ideas rather than a few big ones—** Cloud computing enables the provisioning of deep integrations and IT resources at greater speed and lower costs. As a result, extensible enterprises will need to be able to explore and exploit many ideas simultaneously—much the way a venture capitalist might—rather than limit their testing to a sequential parade of a few big ideas. Gary Hagmueller, CFO of Zuora, which develops an

online subscription management platform for the cloud, urges two things in regard to modeling. “You definitely should create a process where your approval threshold for investments adjusts to what you’re looking at. One reason [for such a process] is because you’re placing a lot of small bets all over the place. The second reason is because you want to make sure you understand the long-term implications of the cost characteristics, which can be very difficult,” he says. To keep pace, CFOs will need to streamline their established controls for vetting new business initiatives. A proof of concept that will cost \$10,000 will not justify the same level of return on investment (ROI) analysis that would be required for one that costs \$10 million.

- Model not just for forecasting but for monitoring and managing operations**—Organizations often develop financial models to support a business decision and then relegate those models to a file cabinet once the decision is made. In an extensible enterprise, where many new business initiatives will be driven by software interactions, it will be possible to monitor and measure activity at a more granular level, so that personnel can more easily identify what is and is not working and can correct midcourse. As a result, the models will need to be embedded in monitoring and operational systems for ongoing use. For instance, Amazon.com constantly tests new ideas, features, and products on its live site and then tweaks them as it learns what drives customer value and business impact.
- Model unintended consequences**—Exposing assets and capabilities to the outside world on a cloud platform runs the risk of unintended consequences. It may, for example, allow customers to pay a smaller amount for unbundled services, reducing their total spend. The music industry learned this lesson the hard way when consumers moved away from buying CDs to purchasing individual songs unbundled online. The finance organization will want to work closely with business unit leaders to identify and model the impact of possible unintended consequences. The potential use cases are likely to be numerous and all cases, whether they add to or cannibalize existing business, should be analyzed.

Planning and provisioning cloud services involves a larger number of variables than traditional IT efforts. Variables include the estimated number of users, minimum baselines usage for each year, peaks and valleys of the usage, and so on. From a modeling standpoint, CFOs should be active in the provisioning and service level agreement (SLA) development and not just in the economics of the outcome of the effort.

Modeling cloud-based initiatives in the extensible enterprise will be much like modeling traditional IT-based initiatives, but faster, broader, deeper, and, in many cases, more focused on handling unintended consequences and an uncertain future.

The impact of cloud computing on financial operations

In cloud computing, financial operations is one area where the user-provider distinction noted earlier comes into play, with impacts on both roles. (See Figure 3.)

Nature of IT resources enabling cloud service	Shared (Public cloud)	Public cloud user	Public cloud provider
		Variability of expense Increased free cash flow IT costs deductible in the year of use	Working capital impact Utilization of assets Capacity planning and financing
	Dedicated (Private cloud)	Private cloud user	Private cloud provider
		Depreciation	Depreciation
		User	Provider
		Role in the cloud ecosystem	

Figure 3: The key impact on the financial operations of users and providers of cloud services

Modeling cloud-based initiatives in the extensible enterprise will be much like modeling traditional IT-based initiatives, but faster, broader, deeper, and, in many cases, more focused on handling unintended consequences and an uncertain future.

For those that use services offered by others, cloud computing will affect the existing processes finance organizations use to invest, monitor, and depreciate IT assets. The more you use public cloud-computing services, the more you replace capital expenditure (capex) with operational expenditure (opex), making IT costs deductible in the year they are incurred rather than depreciable over time. Enterprises using private clouds will continue to incur IT spend as capex that is deductible over time.

By obviating the need for huge up-front IT investments, the use of public cloud resources can boost cash flow for companies at times when they otherwise would be spending money on capex-intensive IT initiatives. As free cash flow becomes an increasingly important metric at many companies—especially in the wake of the current cautious financial climate—this characteristic of cloud computing becomes more valuable.

Here is a caveat, however. Use of cloud services will typically result in more variable costs because they depend on usage, unlike a traditional IT environment; the predictability and modeling of these variable costs could be a bigger challenge. Despite the high up-front cost in traditional IT models, there is comfort in the sunk cost and lack of surprise. Therefore, CFOs will want to create and enforce controls and processes to ensure the use of cloud services does not exceed the cost of a traditional IT purchase—for example, paying for so many user licenses in a software-as-a-service (SaaS) deal that buying the software would have been cheaper. Finance should aim to help guard against runaway cloud-computing costs by negotiating price breaks as usage exceeds predetermined thresholds.

For those that provide services to others through public clouds, CFOs need to recognize the financing consequences of building the infrastructure for offering cloud services. Without an up-front infusion of revenue from users, as in a traditional IT license or product sale,

the capital available to fund existing or new initiatives may not be available to providers right away. In cloud projects, the working capital comes as a monthly subscription fee—great for cash flow, but providers might be able to invest only incrementally.

For all enterprises, investments in cloud operations or online businesses will have a significant impact on IT architecture, budgeting, and cost allocation processes. The key challenge facing both finance and IT management will be to create an effective budgeting and reporting framework that systematically and accurately charges costs to the appropriate online business or activity. The focus should be to establish consistent reporting metrics across all online businesses and to link IT cost structures to the business drivers and IT resources. For example, data center costs could be linked to kilowatt resource capacity, and allocated to an on-line business based on the kilowatt consumption by its production servers. The lack of a consistent framework can lead to inconsistencies in budgeting or allocation processes across reporting units, resulting in conflicting internal measures of profitability, improper capital investment decisions, and a lack of consistent, logical benchmarking across business units or industry groups.

The potential implications for audit processes (both for internal and external auditors) stem from IT processed becoming more automated and capable of handling dramatically expanded diversity and volumes across a network of data centers and facilities. Increasingly, auditors will not be in a position to audit the physical location or trace a transaction back to a particular data center or physical location. Instead, they need to adapt their audit procedures to test and be effective in a virtual environment. Process controls also should migrate from manual to more streamlined and automated, thereby providing lower cost and greater coverage opportunities.

Even when companies no longer have direct control over their IT systems, they remain responsible for ensuring that services outsourced to third-party providers meet performance and stability targets and that these services remain in compliance with all applicable laws, regulations, and contracts.

The CFO on defense: Managing governance, risk, and compliance

While CFOs must play a role in helping their companies realize the potential of cloud computing, they also will be responsible for ensuring that their companies meet the GRC challenges—especially when contracting with a public cloud provider or leveraging any type of cloud environment, public or private, to create an extensible enterprise. Even when companies no longer have direct control over their IT systems, they remain responsible for ensuring that services outsourced to third-party providers meet performance and stability targets and that these services remain in compliance with all applicable laws, regulations, and contracts.

At PwC, we have observed that many early adopters of cloud computing have not adequately addressed these issues, exposing themselves to significant risks. Some have not taken time to think about who owns the policy and oversight of relationships with cloud vendors, including relationships established by far-flung business units. Others have not given sufficient thought to emerging best practices that retain the agility created by using cloud services while enabling the oversight that prevents compliance and regulatory disasters—such as hackers attacking customer data on a vendor’s disk drives.

The challenges and responsibilities come in two varieties: those triggered by the simple act of purchasing cloud services—applications, data storage, a computing platform, even an entire IT infrastructure—from third-party providers, and those that arise from exposing the company’s own cloud-based business platform to members of its ecosystem in pursuit of the extensible-enterprise model. Most of these challenges revolve around controlling data security and costs and ensuring interoperability between disparate IT systems.

Vendor performance and controls

At companies that contract with public cloud providers and especially at companies where IT reports into the finance function, the CFO will be responsible for vetting the financial strength and competitive sustainability of the provider. The CFO also must ensure that there is an exit strategy should the provider fail to deliver on its (SLAs), go out of business, get acquired, or fall behind the capabilities of its competitors. Many enterprises have experience with SLAs with IT outsourcing service providers. This experience will be helpful, but developing the SLAs for a cloud service will be more complex.

To remain in compliance with Section 404 of the Sarbanes-Oxley Act, the CFO also must be able to vouch for the security and integrity of any company data residing in the public cloud that could impact the company’s financial statements. CFOs should make certain their organizations address risk controls and governance issues during, not after, negotiations with cloud providers. That is when they will have the most leverage. The CFO and CIO will need to address many issues by working closely together. Table 1 includes some of the most important issues.

Security issues are amplified when a company embraces the extensible-enterprise business model. The company must establish controls to manage the flow of data not just between itself and, where applicable, its cloud provider, but also among members of its ecosystem. The more access that is built into the IT environment, the greater the security risks. “When an enterprise connects to all those parties, the security and compliance requirements become critical to protect intellectual property and maintain competitive advantages,” cautions Jaushin Lee, CEO of Imera.

	Governance	Compliance	Operational risks
User issues	<p>What tools are available and allowed to monitor security in my cloud?</p> <p>How is my data tracked and stored?</p> <p>Who can access my data when it is at rest or in transit on a provider platform?</p> <p>What type and level of encryption are employed during the transit and storage of data? Who controls access keys?</p> <p>What types of controls or procedures are in place to restrict privileged users within the cloud from viewing or modifying sensitive data residing in the cloud provider's infrastructure?</p> <p>What measures are employed to segregate my company's data from the data of other clients to prevent data loss or leakage, or intellectual property theft?</p> <p>What rights and abilities do I have if a breach occurs (e.g., the right to audit, the ability to perform forensics investigations)?</p> <p>What reporting obligations does the provider have to notify users of security breaches (e.g., indemnification for breaches)?</p> <p>What actions has the provider taken to prevent attacks?</p> <p>How will the cloud provider ensure the integrity of usage metering and billing?</p>	<p>How will I maintain compliance before, during, and after a move to cloud?</p> <p>What third-party assurance (e.g., SAS 70, WebTrust, SysTrust, etc.) documentation is necessary for compliance?</p> <p>How can I track the physical location of my data to ensure compliance with laws prohibiting data from being stored in certain countries?</p> <p>How will the cloud provider identify, respond to, correct, and disclose data or incidents that negatively affect my company and other customers?</p>	<p>How much uptime can I expect?</p> <p>Is there a guaranteed service level (e.g., who monitors it, what reimbursements will occur if not met)?</p> <p>Now that I access all services over the Internet, do I have enough bandwidth for all my employees (e.g., does my provider have enough power and bandwidth to serve our needs)?</p> <p>Can my service be interrupted based on the activity of nonrelated cloud users (e.g., hard drive subpoena)?</p> <p>Has the cloud provider implemented and tested disaster recovery and business continuity plans sufficient to ensure compliance with service commitments?</p> <p>What provisions are made for the retention and recovery of my data?</p> <p>How can I monitor the load and performance of my cloud?</p> <p>How can I accurately measure the cost-benefit of switching to cloud?</p> <p>What are my disaster recovery and business continuity plans now that we have a cloud infrastructure?</p>
Provider issues	<p>How will I reliably demonstrate and communicate my company's security procedures to my users?</p> <p>How much ability will I give to my users to perform their own assurance procedures, such as security scanning or audits?</p> <p>How will I handle overlapping or contradictory interstate regulations on data privacy?</p> <p>How will assurance be provided to cloud users regarding billing integrity?</p> <p>How do I quantify the cost savings of my services versus traditional or other cloud services?</p> <p>Will I allow user auditors to audit at our centers/sites?</p>	<p>Beyond just data security, what documentation will I provide to my users that will allow them to maintain compliance with requirements such as Sarbanes-Oxley?</p> <p>Am I prepared to maintain internal controls and compliance to the levels required by all of my customers?</p> <p>At what point am I providing too much information to my consumers regarding internal controls and procedures, and endangering our business?</p> <p>Do I comply with all applicable local laws and regulations?</p> <p>Should I be ISO certified or offer SAS 70 certifications?</p> <p>What SLAs can I realistically commit to?</p>	<p>How will assurance be provided to cloud consumers over availability?</p> <p>Am I responsible—fiscally, legally, or otherwise—for lost business as a result of user services?</p> <p>How do I differentiate my business model from competitors?</p> <p>Have I priced variable cloud services appropriately to cover my investment and maintenance costs?</p> <p>Have I evaluated the enterprise risk associated with a potential security breach or privacy violation?</p> <p>Have I optimized my tax exposures by strategically locating my IT centers?</p>

Table 1: GRC issues at a glance for the CFO. Financial managers of organizations buying or selling software as a service and other public cloud-computing offers face a myriad of governance, risk, and compliance issues. This table highlights some of the most pressing issues for CFOs.

For instance, duplication of data for redundancy and business continuity could create a taxable presence in other countries, and keeping intangible assets at a third-party provider could create tax burdens not applicable when the assets are on the user's premises. Enterprises will want to avoid any surprises that could result in restatement or embarrassment. The burden is on the CFO to anticipate the potential tax implications of providing or using cloud services.

The role of third-party assurance

The CFO and CIO must work together to make sure these topics are addressed in ways that protect the company at a reasonable cost. Unfortunately, because cloud computing is still in its adolescence, many providers are not yet able to offer the assurance users want in all areas. To date, there is no single standardized report that covers all of the inherent risks. Even where providers do offer assurances—such as the Statement on Auditing Standard No. 70 (SAS 70)—the results may be inadequate. For example, SAS 70 applies to a cloud provider only when that provider is hosting applications or systems that are used to process transactions relevant to the user's financial reporting. It does not extend to operational, compliance, or performance criteria.

To identify best practices and close any gaps, cloud users may want to look to a third-party assurance provider that can offer advisory and assurance services consistent with either the American Institute of Certified Public Accountants (AICPA) Consulting Services standards, AICPA AT 101 standards, or both. Such services should include a risk and readiness assessment and a general-use attestation that encompasses risks unique to cloud computing. These include the risk that sensitive data is not segregated from other users' data, which could lead to unauthorized access by other cloud users; the risk that sensitive data is not adequately secured or encrypted; and the risk that a cloud provider is unable to identify and correct harmful incidents that affect the user. (Full disclosure: PwC offers third-party assurance.)

Third-party assurance can be useful for providers of cloud services, too. By using a qualified third-party assurance provider, cloud service providers can better pinpoint gaps and weaknesses in their compliance programs and ensure their control environment is sufficiently mature before issuing an attest report.

They also will have a report detailing their compliance with known and accepted standards, which they can distribute to their clients to help accelerate the sales cycle, reduce the cost of customer acquisition, and potentially attract new customers from competitors that are not similarly prepared. Because this information will also be available to satisfy regulator requests for information, providers may be able to streamline audits and reviews.

Managing tax consequences

Tax implications arising from providing or using cloud services can create risks. Cloud providers face material income tax or indirect tax implications depending on the cloud infrastructure and revenue model employed. The nature of cloud-based global sourcing and global delivery models can raise international tax jurisdiction issues. Cloud users can encounter unforeseen and at times significant income and sales tax variations, depending on the type of cloud services they're purchasing.

States are beginning to modify their statutes to tax digital products, and more than a dozen states have already updated language aimed at cloud computing. Other states are considering taxes on "digital goods." Early initiatives have been aimed largely at SaaS providers, in part because they were among the earliest iterations of cloud computing. The state of Washington, for example, now taxes SaaS providers for sales/use tax and business and occupancy tax purposes. And the New York Department of Taxation and Finance has ruled that SaaS hosted on out-of-state servers is subject to New York tax if the related software is accessed from a New York location. Providers of cloud services are paying close attention to these and other state rulings, which can influence where they decide to locate their data centers. See Table 2 for more examples.

While cloud tax law is in its infancy, users of cloud services will need to keep a close watch on tax developments, which ultimately may factor into decisions about where they purchase cloud services and from which vendors. Different countries have different tax regimes, so the choice of the geography where a company sources the cloud services would need to be understood and analyzed for the potential tax impact.

State	Sales tax policy as of June 2010
California	State senate passed “Amazon tax” bill, but Governor Schwarzenegger threatens to veto it.
Louisiana	The state imposes sales taxes on software and stored data on servers located both in- and out-of-state. The state defines tangible if it is perceptible by sight and sound.
Massachusetts	As of April 2006, prewritten software sold to a customer in Massachusetts or purchased for use in Massachusetts shall be deemed a transfer of tangible personal property subject to the sales or use tax regardless of the method of delivery, including transfers by electronic means such as the Internet or “load and leave.” The development and sale of prewritten software shall be considered a manufacturing activity for purposes of certain corporate excise provisions, regardless of the method of the delivery of the software.
Missouri	SaaS is not subject to tax.
New York	SaaS hosted on out-of-state servers is subject to New York tax if the related software is accessed from a New York location.
North Carolina	The state enacted provisions that tax digital products with service-like characteristics, such as access to data and data processing.
Utah	SaaS is taxable if the server is located in Utah.
Washington	The state taxes SaaS providers for sales/use tax and business and occupancy tax purposes.

Table 2: States seek to collect sales taxes for SaaS. It may be called a service, but many states have begun taxing the delivery of software as a service. Table 2 is just a sampler, as this area is rapidly changing.

Sources: PricewaterhouseCoopers and media reports

Conclusion

Cloud computing has already changed the way many companies think about meeting their IT demands. With its potential to create extensible enterprises that can grow revenue by increasing the size of a business ecosystem, cloud computing is for many no longer a go/no-go decision but a matter of when to do so.

CFOs must understand and support the top-line growth potential of the cloud-based extensible enterprise and its ability to drive the bottom line. At the same time, they must appreciate the possibility of unintended consequences affecting traditional business lines, and they must invest in new GRC

measures. Such measures are increasingly important to safely deploy this business model and to address issues relating to the capabilities of cloud providers and the integrity and security of data residing in their systems. To do this effectively, CFOs will need to fully grasp the distinctions between private and public cloud, and between using and providing cloud services—and the implications in their business environment. While it will be dangerous to ignore the potential of cloud computing, it will be equally dangerous to underestimate its challenges.

For more information on the topics discussed in this article, contact Sharon Kane at +1 203 539 4080 or Stephane Berthier at +1 408 817 3721.

Cloud opportunity and risks

Gary Hagmueller of Zuora details the company's journey to create a billing service in the cloud.

Interview conducted by Vinod Baya and Stephane Berthier

Gary Hagmueller is the CFO of Zuora and has an extensive background in subscription management, billing, and financial operations. Hagmueller has held executive roles in a variety of software, telecommunications, and e-commerce companies. Having helped raise and manage nearly \$100 million in venture and debt funding, he has been a frequent presenter on topics such as financial best practices for emerging technology firms, subscriber valuation, fundraising for startups, and growth-company business planning.



Prior to joining Zuora, Hagmueller was CFO of KnowNow, a Kleiner Perkins–backed enterprise software firm where he raised more than \$17 million in funding, managed the firm's general and administrative (G&A) functions, and drove corporate development. In the past, Hagmueller was also the director of corporate development for NorthPoint Communications, and he held various business and corporate development roles at GTE, Verizon, and Pacific Bell.

Hagmueller received an M.B.A. in finance from the Marshall School of Business at the University of Southern California, where he was named Sheth Fellow at the Center for Communications Management. He also holds a bachelor's degree with honors in business from Arizona State University.

In this interview, Hagmueller describes the opportunity that Zuora is pursuing by moving the billing process in the cloud and the opportunities and risks for the company's customers.

PwC: Can you please tell us about Zuora?

GH: Zuora is the first subscription billing and payment management system for the cloud and software-as-a-service [SaaS] entities. We empower companies to build new billing and payment models, and drive their businesses to differentiate, grow, and be successful—enabled by our platform instead of being hindered by their billing systems. Although we focus on subscriptions, our model extends to any type of billing and payment model that involves a longer-term customer relationship. For instance, media businesses often use a pay-for-content model, and that is something we support. Essentially, we enable any business that has a recurring relationship with its customer.

PwC: So in some sense you have taken the billing process that is typically inside an enterprise, supported by commercial or homegrown systems, and made it available in the cloud? How did you go about doing this?

GH: Yes, that is right. The first thing was to realize that billing processes are really complex, because there are so many different permutations and use cases. We built a very dynamic, very malleable product catalog. That gave us a great degree of flexibility, and we will continue to invest in it. Probably our single biggest investment is making sure that the product catalog and all the capabilities around it remain fresh, especially because every month I see a new use case that's just marginally different from the one that was there before.

“We are conscious of the deep-integration angle and worked a lot on it during the last year.”

PwC: Once you have the process in the cloud, what is the process of onboarding a customer?

GH: If it's just a simple new product, we've had customers go live in less than a week. They configure the models as they need. They add their offerings into the system. If there's no Web site integration or other things like that, it's simple. They can be sending bills in less than a week. It could be two days if they have a concentrated effort.

It starts to get a bit longer and more complex when we need to integrate our service to lots of different systems at our clients—such as Web site integration. Then you're touching elements of the internal operations, and the project becomes more involved. Sometimes there is a need for customization, and then we rely on professional services. On the back end, sometimes there's also the desire and need to integrate with GLs [general ledgers], and we've become skilled at building that.

PwC: It sounds like sometimes you must integrate deeply with the internal operations of your customers. Is cloud doing anything to make such deeper integrations easier?

GH: We are conscious of the deep-integration angle and worked a lot on it during the last year. Our deep integration, to use your lexicon, is much easier than it was. We've done this in multiple ways. First, we've built an API [application programming interface]

infrastructure that is publicly open. You could go to our site right now and figure out everything that you wanted. It's very easy and adaptable. Second, we've also partnered with others who offer integration services in the cloud environment.

The other thing we've done from a deep integration standpoint is understand our customers' front-end integration requirements and then prepackaged those capabilities to be off the shelf. Many of our customers require integration with their Web site and a lot of other systems to be able to process transactions. We've built a pre-canned offering that you can quickly integrate with. This is our Z-Store product.

PwC: What have you learned through your experience of making the billing functionality available in the cloud?

GH: Billing is a universal problem for companies big and small. Nearly all companies that have a cloud-based offering built recurring relationships with customers. Similarly, nearly all were unable to find a cost-effective and robust platform to manage these relationships. We also learned that the market for our offering extended well beyond firms you typically think of as subscription firms. In reality, anyone that sold something to customers on a repeated basis had big pain that was not being addressed by any other solution in the market.

“This is a growth enabler. It is a way, at a very modest investment, to create an innovation engine within your organization.”

PwC: From a CFO standpoint, we are curious how financial modeling should be different in pursuing cloud-computing-related opportunities. For instance, do you need to model deeper integrations?

GH: Interestingly, we do. Let me explain the pricing model, and then maybe that will help. We basically have three elements, and two of them are recurring. One is a platform fee for access to the platform itself. A second element is effectively the transaction volumes, because our system is a transaction system and, obviously, the more you put through, the higher the cost and the higher the value. So those elements are recurring.

A third element is not recurring. That's generally the professional services, which gets into the deeper integration piece. Here, we've variable-ized [sic] our costs as much as possible, and now I also have some predictability—if I have a deal worth X on a recurring basis, what will my likely non-recurring professional services look like? We need to model and analyze all these in support of our business.

PwC: Cloud computing does lower the financial barrier to try new ideas. Should enterprises be modeling the ability to place many small bets rather than a few big ones, as happens to be the case now?

GH: I would definitely say yes. Two things that I would suggest should go into the modeling. You definitely should create a process where your approval threshold for investments adjusts to what you're looking at. One reason [for such a process] is because you're placing a lot of small bets all over the place. The second reason is because you want to make sure you understand the long-term implications of the cost characteristics, which can be very difficult. As you pointed out, because the bets are so much smaller, collectively they could be sizable if your controls are not adequate.

A director can sign off on something that is \$50,000 or \$100,000. It's barely going to rise to the level of the CFO. So your FP&A [financial planning and analysis] functions must get more involved at an earlier stage in the analysis of the systems and the investments that are being made, because the scrutiny is not the same. It's a challenge from a governance and control standpoint. That would probably be the biggest modeling issue.

PwC: What are the risk issues that you face or that your customers raise to you?

GH: Sometimes our customers have the risk of integration. That's something we can see and address. Do they have the staff internally? You can get this thing up and running in a week, but to keep it running, you need people who understand how to deal with SaaS. We try to mitigate the risk as much as possible by providing enhanced support. We proactively look through our usage metrics and say, “They're not doing what they thought they'd do. Let's reach out to them and retrain them as needed.”

We have the enduring risk with respect to security and privacy as we transact with sensitive information. That's probably the lion's share of the risk that really comes up. We take strong steps to mitigate that. For instance, we invested heavily in maintaining the highest level of PCI compliance, Service Provider Level 1 PCI DSS [Payment Card Industry Data Security Standard] certifications, a SAS 70, regular audits, and an internal initiative that makes security something everyone thinks about every day.

Disaster recovery is also a risk, because we're operating in the core of our clients' and partners' systems. If we go down, we take them down. So we've invested in multiple disaster recovery systems, programs, and sites as well as a lot of other things to ensure availability.

PwC: Cloud computing has certainly gained favor with CIOs. What would you want to tell CEOs of other companies about the opportunity with cloud?

GH: I'd tell them what some of our current customers have told us and have seen. This is a growth enabler. It is a way, at a very modest investment, to create an innovation engine within your organization. It's a way to create something that will allow you to test new initiatives and services. We've had one customer who's tried three different things; the first two not so good, and then they found some other solution that stuck. So they're driving that business, and it's taught them a lot about packaging. The original thing was this, but then they broke it apart, captured a new market, and drove that forward.

PwC: What impact you have delivered to your customers that a CEO would pay attention to?

GH: Aside from increasing revenue and enabling innovative products, there are some strategic transaction benefits as well. We have a customer that has a particularly enlightened CIO who realized that his industry is going through frequent investment and divestiture activities—selling a division, adding a property, and so forth. He realized that some of the associated transaction costs could be mitigated by a system such as ours. He could buy something, integrate it very easily, and lower his integration costs.

Conversely, and we spent a lot of time on the contract on this, it also lowered the divestiture costs. Because now he can sell the entity with a billing system that's complete, operates, runs, and can actually integrate with other systems within the potential acquirer's organization. This lowers the transaction cost of the outbound deals as well. Our service became an enabler for them as they've done some M&A [merger and acquisition] activities, and it turned into a business development opportunity for us.

PwC: By being a provider of a cloud service, what have you learned about your customers?

GH: In contrast to a lot of traditional software players, we've needed to be extremely close to the way our customers think, feel, and act. We've really needed to be proactive about customer service in a way that's much greater than you need to be in the perpetual licensing world. Your customers will abandon you in a subscription model if your services don't work and you don't serve them properly.

It forces you to be honest. In our model, you must have a much better and open dialogue, which means you bring in people who have different skills to keep your customers happy.

Also, when you deeply integrate, as you call it, your customer interface is actually more relationship oriented. And you're mutually dependent. We have a culture that regards all of our customers as partners. For example, we frequently try to do co-marketing and other activities with our customers—not just because we need press and other things like that, which, of course, everybody does, but because it is a great way to interact with them and learn about their issues. ■

“We have a culture that regards all of our customers as partners.”

Acknowledgments

Advisory

Sponsor & Technology Leader
Tom DeGarmo

US Thought Leadership

Partner-in-Charge
Tom Craren

Center for Technology and Innovation

Managing Editor
Bo Parker

Editors
Vinod Baya, Alan Morrison

Contributors
Galen Gruman, Larry Marion, Bud Mathaisel, Randy Myers, Bill Roberts

Editorial Advisers
Thomas Archer, Stephane Berthier, Cara Beston, Brian Butte, David Edelheit,
Tom Pucci, Jonathan Reichental, Terry Retter, Pinaki Roy, Stephen Singh,
Cindy Warner, Christine Wendin

Copyedit

Lea Anne Bantsari

Transcription

Paula Burns

Graphic Design

Art Director

Jacqueline Corliss

Designer

Suzanne Lau

Illustrators

Donald Bernhardt, Tatiana Pechenik

Online

Director, Online Marketing

Jack Teuber

Designer and Producer

Scott Schmidt

Reviewers

Philip Garland, Sharon Kane, Michael Pearl,
David Stuckey, Mike Willis

Marketing

Bob Kramer, Gita Gupte

Special thanks to

Majid Iqbal; Lisa Kim, ADP; Kay Kinton, Amazon AWS;
Lesley Ogradnick, EMC Corporation; Robert Woods

Industry perspectives

During the preparation of this publication, we benefited greatly from interviews and conversations with the following executives:

Mike Capone, corporate vice president and chief information officer, Automatic Data Processing (ADP)

Gary Hagmueller, chief financial officer, Zuora

Sanjay Mirchandani, senior vice president and chief information officer, EMC Corporation

Jaushin Lee, founder and chief executive officer, Imera Systems

Adam Selipsky, vice president of Product Management and Developer Relations, Amazon Web Services

Jan Siegmund, president of Added Value Services (AVS) and chief strategy officer, Automatic Data Processing (ADP)

Richard Mark Soley, chairman and chief executive officer, Object Management Group (OMG), Inc.

Andrew Wahl, chief financial officer, Imera Systems, and managing director, IG Partners

pwc.com/us

To have a deeper conversation about how this subject may affect your business, please contact:

Tom DeGarmo
Principal, Technology Leader
PricewaterhouseCoopers
+1 267-330-2658
thomas.p.degarmo@us.pwc.com

This publication is printed on Coronado Stipple Cover made from 30% recycled fiber; and Endeavor Velvet Book made from 50% recycled fiber, a Forest Stewardship Council (FSC) certified stock using 25% post-consumer waste.



Recycled paper

Subtext

Extensible enterprise

An enterprise that uses cloud computing to extend its capabilities to ecosystem partners to drive growth. It represents the transition from the slow, one-off ecosystem partnering and customer acquisition processes of the pre-cloud era to the massively scalable partnering, service delivery, and customer acquisition made possible by the cloud.

Versatile processes

Processes provisioned in the cloud in a manner that supports the broadest range of use cases, and hence the broadest set of ecosystem collaborators. These processes use modular services with standard interfaces and can be scaled on demand.

Ecosystem integration

The ability to combine capabilities provisioned in the cloud between different ecosystem participants for creating end-customer value. A cloud architecture allows such integrations to be provisioned on demand and at a substantially lower cost and in a shorter time.

Security virtualization

Making security independent of the underlying IT infrastructure and the collection of applications or services, such that security can be provisioned and managed on demand by policies.

Network of business platforms

When enterprises put platforms of services in the cloud and connect to other cloud-based platforms, they are building a “network of business platforms.” It is a many-to-many-to-many architecture where linking among platforms is theoretically unlimited.

Comments or requests? Please visit www.pwc.com/techforecast OR send e-mail to: techforecasteditors@us.pwc.com

PricewaterhouseCoopers (www.pwc.com) provides industry-focused assurance, tax and advisory services to build public trust and enhance value for its clients and their stakeholders. More than 155,000 people in 153 countries across our network share their thinking, experience and solutions to develop fresh perspectives and practical advice.

© 2010 PricewaterhouseCoopers LLP. All rights reserved. “PricewaterhouseCoopers” refers to PricewaterhouseCoopers LLP, a Delaware limited liability partnership, or, as the context requires, the PricewaterhouseCoopers global network or other member firms of the network, each of which is a separate and independent legal entity. This document is for general information purposes only, and should not be used as a substitute for consultation with professional advisors.