



Tech Trends 2012:
Elevate IT for digital business
A Federal perspective



A Federal perspective

In 2012, the technology landscape is as compelling as ever. We see individual trends that can significantly enable organizations to empower their enterprises and users, each in its own way. Yet, these trends have manifested and evolved almost simultaneously. When combined, these technologies can be truly transformational.

For government organizations, these trends and technology landscape offer new sets of tools to tackle emerging and persistent challenges. The trends highlighted herein can allow organizations to be more effective, insightful, collaborative, intelligent, and efficient. Some agencies will up the ante to create new capabilities and even new operating models.

Deloitte's Technology Trends 2012: A Federal Perspective report provides government leaders with insights into the top trends around the business of information technology (IT) and its potential to enable and transform how agencies deliver their missions, similar to what Deloitte's original 2012 Technology Trends did for the commercial sector. This report presents a Federal perspective on the distinct challenges and opportunities facing the Federal government and how these technology trends will likely play a greater role in driving real change in the way the government operates and serves constituents.

Agencies are seeking more innovative ways to address continued budget pressures and changing citizen needs. The insights and examples championed in the following chapters are only the tip of the iceberg, representing innovations not only in the business of technology but also in meeting the government's changing mission, goals, and challenges. For example, the recently released Digital Government Strategy is designed to help develop a government-wide mobility baseline and accelerate the secure adoption of mobile technologies into the Federal environment in exciting ways.

Technology sparks both optimism and skepticism. Knowing the difference between trend and real opportunity is a balancing act. Translating innovation into impact takes vision, strong management, and a steady hand at the controls.

As Federal agencies continue to harness the power of change, look for agencies to achieve new levels of efficiency, performance, and service to citizens.

This is just the beginning.



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Preface

Welcome to Deloitte's annual report examining trends in technology put to practical business use. Each year we begin with a wide range of potential topics, and then work with clients, vendors, academics, analysts and Deloitte practitioners to refine the list. We select as trends those topics that have the most potential to impact businesses over the next 18 to 24 months. This year's theme, Elevate IT for Digital Business, examines the broad impacts of five technology forces that have influenced our reports over the past several years – analytics, mobility, social, cloud and cyber security.

It's an uncommon, and perhaps even unique, time to have so many emerging forces – all rapidly evolving, technology-centric and each already impacting business so strongly. Whether or not you have previously thought of your business as inherently digital, the convergence of these forces offers a new set of tools, opening the door to a new set of rules for operations, performance and competition. This is an opportunity for IT to truly help elevate business performance.

Our 2012 report shares ten trends grouped into two categories. Disruptors are technologies that can create sustainable positive disruption in IT capabilities, business operations and sometimes even business models. Enablers are technologies in which many CIOs have already invested time and effort, but which warrant another look this year because of new developments. Enablers may be more evolutionary than revolutionary, but the potential is there to elevate the business game with technology.

Each trend is presented with at least two examples of adoption to help show the trend at work. This year, you'll also find a new section called My Takes, which provide commentary and examples from CIOs, academics and other luminaries about the utility of the trend in business.

Each of these 2012 trends is relevant today. Each has significant momentum and potential to make an impact. Each warrants timely consideration. Forward-thinking organizations should consider developing an explicit strategy in each area – even if that strategy is to wait and see. But whatever you do, step up. Use the digital forces to your advantage. Don't get caught unaware or unprepared.

Thank you for reading this year's report. We welcome your feedback and questions. To the many executives who have provided input into Tech Trends 2012, thank you for your time and insight. We look forward to having more of the essential dialog between business and IT.



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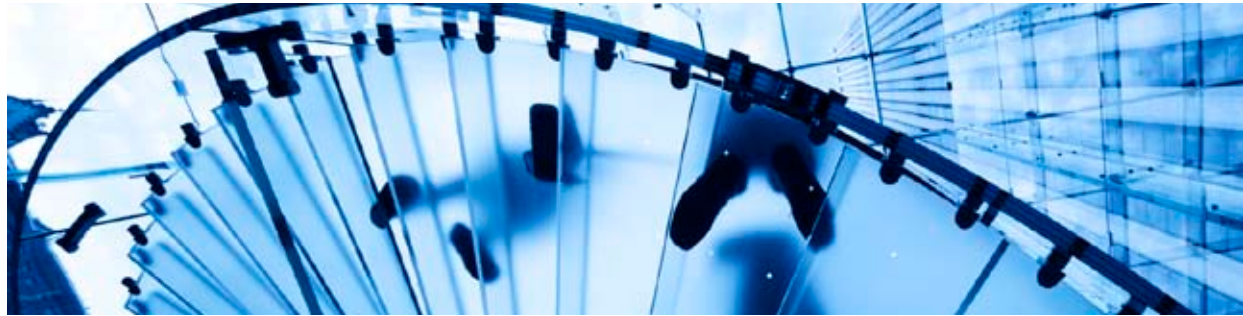
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Disruptors

1 Social Business



Reimagining business with a social mindset

Even today, business leaders may dismiss the potential of social business, either relegating it to the realm of Internet marketing or ignoring the buzz as a passing fad. But that's changing as boomers evolve into digital natives, millennials permeate the workforce and social media becomes a part of daily life. The doors are now open for social business.

Leading enterprises today are applying social technologies like collaboration, communication and content management to social networks – the connected web of people and assets that impact on a given business goal or outcome – amplified by social media from blogs to social networking sites to content communities. Yet it's more than tools and technology. Businesses are being fundamentally changed as leaders rethink their core processes and capabilities with a social mindset to find new ways to create more value, faster.

Forays into social business typically start with an organization's external-facing concerns. Sales and marketing organizations, looking to understand customer sentiment and product positioning, listen carefully to opinions expressed in the social sphere. Similarly, organizations roll out internal micro-blogs that allow employees to broadcast and push interests, ideas and expertise to the enterprise. These types of efforts are excellent entry points, but not the only points of impact in the enterprise. Think across the full value chain. Compose "social" with a key business function such as Social CRM, Social PLM or Social Supply Chain.

Social business can shift an organization's dynamic from isolation to engagement by providing vehicles for discovering, growing and propagating ideas and expertise. This shift requires organizations to take a more active

approach to social. Beyond social monitoring and listening posts, leading organizations are establishing command centers to interact with consumers and the marketplace via the social sphere. Some interactions are transactional, such as customer relationship management, servicing or order management, while others seek to drive loyalty and brand activation. Functional areas such as Human Resources and recruiting are following sales and marketing's lead, with customer service, product development and operations close behind.

Enterprise solutions are moving from communication tools to collaboration suites, white pages, yellow pages and expertise finders, where specialized knowledge can be found regardless of individual connections. Distributed teams can work together on deliverables without worrying about versioning or "over-the-wall engineering." Communities can form and engage around topics based on individuals' common interests – personal or professional, long-running or perishable.

Behind it is a simple truth: *people* are the core of business. The balance of power has shifted from the corporation to the individual. Technology has made it easier to discover and participate in social networks, but it has not changed their currency: content, authenticity, integrity, reputation, commitment and follow-through. Social business allows organizations that share these values to fundamentally reshape how their companies run and serve their markets. A flattened world – allowing direct contact between customers and product developers, between divisional VPs and front-line workers, between salespeople and suppliers – could be inherently more effective and efficient. Companies that align the passions of their people with the interests of their customers hold the potential to capture the marketplace.

History repeating itself?

Social business inherits its associations – and perhaps misconceptions – from previous efforts in collaboration, knowledge management and content management. Similar-sounding terminology – social networking, social media, social computing and social business – only adds to the confusion.

	What were the challenges?	What's different in 2012?
Social media (e.g. LinkedIn, Twitter, Facebook)	<ul style="list-style-type: none"> • Non-digital natives were slow to adopt public social media services, which made business leaders skeptical about their usefulness in a business setting. • Security, privacy and compliance risks were real. Intellectual property could be compromised, competitive plans could be shared, and brands could be harmed by individuals' behaviors. • Companies have invested in technology-centric pilots and systems that mimic the successful use cases of the consumer social sphere. Sometimes a "build it and they will come" approach, they didn't follow the successful pattern: articulate a business objective; map the related social network or graph; implement targeted social technology and media; evaluate results, tune and refine the focus. The most frequently missed step being mapping the right social network in which to act. 	<ul style="list-style-type: none"> • The enterprise market for social collaboration, content and communication tools has exploded over the past 12 months; on-premise or cloud versions of social media tools can help balance openness with acceptable risk. • Public social media sites are viewed as only one part of an overall social business strategy, used primarily as sources for social sentiment signals, vehicles for brand management and external communication, and channels for customer management and sales. • Millennials joining the workforce are wired to use social and mobile channels to bond, socialize and solve problems¹. Organizations that lack internal, governed social media and computing channels may find their younger employees using public tools as a well-intentioned, but risky, alternative. • Businesses large and small are now making focused investments in deploying social technology and media into well-mapped social networks for specific business objectives across the enterprise value chain.
Collaboration and knowledge management (KM) tools	<ul style="list-style-type: none"> • Many organizations confronted the inefficiencies of how work gets done and shared in their shops by implementing collaboration solutions for static or ill-defined groups. These solutions were mainly ERP workflow, or limited to content sharing or messaging. They don't embrace the necessity of allowing communication to evolve into community. They may be limited to one function, geography or job role and unable to tap the breadth and depth of the enterprise. • Previous versions of content and knowledge management tools majored on collecting and managing the content without successfully capturing the context and workflows that transform that intellectual property into business value. KM systems became static repositories or libraries without curation or circulation. 	<ul style="list-style-type: none"> • Social business inside the enterprise can facilitate discovery and connections among employees, real-time collaboration on tasks and documents, and a systematic view of who knows who, who knows what, and how work actually gets done. • New social computing tools can support both collaboration and task execution, so contributors are motivated to use them in executing daily tasks. Context is preserved alongside the content to aid in both discovery and use. • The categorization of knowledge, work steps and relationships can be used to document, mine and find information. Taxonomy discovery can bridge across structured, unstructured and semi-structured sources, finding new relationships between content and offering a way to both discover and create business intelligence. This can be especially important for organizations with aging workforces, where leaders are looking to ease the pain of large-scale knowledge transfer. • The Curator and Moderator join the Librarian in harnessing content, communication and conversation into both long-and short-lived communities around key business issues and opportunities.

Technology implications

Social business taps into the shared interests of individuals to guide communal value. Technology can help make these interactions effective – aiding in discovering new information, sharing content, collaborating on ideas and work products, and potentially allowing parts of transactional systems and data to be used through social channels.

Topic	Description
Social computing tools	Implementation of internal collaboration suites, wikis, ideagoras, expertise finders, enterprise search and prediction markets are not trivial undertakings. Naming conventions, hierarchies, entitlement and privacy rights and archiving can inform the scope and usefulness of each solution. The value of social computing investments can be enhanced by integrating email for traditional correspondence, instant messaging and other converged communication tools, and content repositories for easy access to information that transcends geographies.
Sentiment analysis tools	Social media monitoring tools such as Radian 6, Mantis or Lithium reflect the broader shift in analytics where the mechanics of software configuration are not complex, but still require in-depth industry and modeling experience to help define and fine-tune models to obtain reliable, insightful results. Also, intelligent oversight is needed, because automated systems have trouble interpreting nuance, subtlety or sarcasm. Advances in contextual mining and artificial intelligence sense-making will likely lead to continuous product improvements, but today's offerings require specialized knowledge to set-up, monitor and maintain.
Digital content management	Product information, brand collateral, store/employee data and other content should be consistent across channels: brick-and-mortar locations, web, call centers, mobile, social, kiosks and tomorrow's innovation. This omni-channel world increases the importance of traditional digital asset management (DAM), content governance and stewardship, as well as the need to manage content and communities simultaneously across channels.
Digital identities²	Social business amplifies the potential value of individual personas and relationships, whether they are employee, customer, prospect or partner. Correlation of discrete identities across enterprises (both private and public) requires a federated or brokered digital identity service that should also have the ability to render individual, authenticated, non-repudiated assertions on who an individual is and what they have access to. Within the enterprise, a uniform approach to identity, access and credential management should be a must.

Lessons from the frontlines

Quenching customer insight

Gatorade's mission-control center for social media can demonstrate the potential of social business³. A hub in the company's marketing department tracks tweets, Facebook activity and blog postings that mention the brand, its endorsers, competitors and broader sports-nutrition topics. Detailed sentiment analysis tracks products, campaigns and customers across their lifecycles. Brand attributes are watched, correlated with media performance, and used to reach out proactively to influencers and customers. The results drive strategic marketing plans and product development, as well as tactical activities, such as improving landing pages and content delivery⁴. Initial results are impressive, with claims of a 250% increase in engagement and 65% reduction in early page exits. Social activities likely contributed to Gatorade's U.S. volume sales growth of 10% in the second quarter of 2010, after three consecutive years of slumped sales⁵.

Forging the future of social commerce

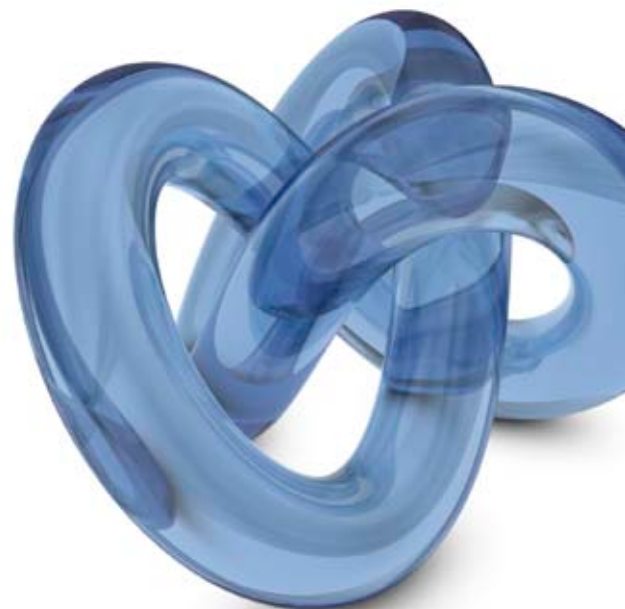
Tesco, the United Kingdom's largest retailer, has been a leading proponent of social business. From early entries into social monitoring and command centers, to ambitious social commerce campaigns, to the acquisition of social marketing firm BzzAgent⁶, Tesco is embedding social sensibilities into virtually all aspects of its business, from loyalty programs to stocking and procurement decisions⁷.

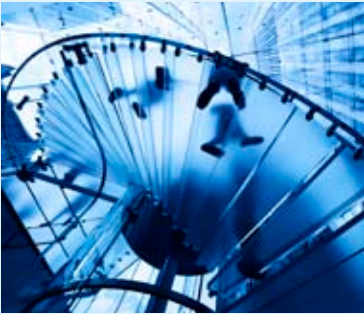
Another large retailer also has ambitious plans for social business. In 2011, it acquired an organization that uses social-sphere signals to deliver relevant ads based on an individual's interests; and acquired a platform for real-time sentiment and social stream analysis. Beyond brand awareness, engagement and loyalty, its goal is to develop intent-based inventory and logistics driven by the buying patterns and signals of local residents.

Breaking down the research and development silos

A leading high-tech firm took a hard look at its software development process. Like many other companies in the industry, departmental stove-pipes and over-the-wall engineering approaches were the rule. The design and engineering teams worked on separate paths, even though their efforts were highly dependent on one another. In a typical scenario, engineering would create technical specifications for weeks and hand it off to design, who would go away and work on treatments and design concepts. They would then come together for two weeks of joint sessions, poking holes in each other's thinking while moving slowly toward consensus. This process would repeat, with the hope that next time would bring shorter cycles and fewer gaps at the end of each round. It was the epitome of sequential collaboration driven by a manufacturing mentality.

To break through business as usual, the firm shifted to an open collaboration platform across project teams, with progress documents openly shared using discussion boards and micro-blogs instead of deliverable review templates and email. Social business started to flourish. Cultural resistance existed at first, driven by fears that interim deliverables would be reviewed using the same criteria as finished products. But team members quickly came to understand the value of the new process, and finished products saw a quality boost and got to market faster. In this competitive sector, shorter product development cycles can have heart-of-the-business impact and, in this case, it was driven by open, collaborative, social business.





My take

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For years I've been working in the field of "connection science" – studying how relationships and personal interactions shape society and business. Social business is a manifestation of that thinking, with companies transforming how they organize and operate based on individual roles, social networks and the power of connections. Social business can have huge potential inside and outside the enterprise, across employees, customers, prospects and business partners.

It's exciting to see the convergence of new social channels and traditional communication channels, where the whole can be greater than the sum of the parts. When social computing tools such as Yammer, Chatter or Jive are combined with established communication channels such as face-to-face interactions, email, phone calls, intranets and even advertising media, we're seeing rapid adoption and elevated impact. There's a halo effect when the passions of stakeholders can be harnessed and aligned with the goals of an organization. Social business amplifies this phenomenon, bypassing tactical constraints of traditional communication: discoverability, scalability, responsiveness and adoption.

Like any emerging technology trend, social business can seem perpetually just out of reach. *Let's wait a year*, the thinking goes. *It's not quite real, not quite ready for prime time*. If that's your approach to social business, you may be overestimating the amount of effort it takes to start putting this trend to work for your organization today.

Here's what I mean: Social business is built on top of social networks, which most organizations already have in place. I'm not talking about social networking technology. I'm talking about the social networks themselves – the webs of formal and informal groups reaching across and beyond your organization every day. That's a huge existing asset – but likely it is only informally mined for the greater good. You should explore explicitly connecting your people and your customers in ways that could be driving performance improvements and growth.

Fortunately, moving ahead is pretty straightforward. Start by finding out which channels are already most important to, and most used by, the people in your organization. From there, the path to rollout should become a lot clearer. Once you begin, the value of social business can spread like a wildfire. The key is to simply get started.

Where do you start?

Social business requires broader thinking than currently found in many organizations, and institutional biases can prevent it from receiving the priority status it deserves. Fortunately, there are some simple ways to help break through dated perceptions and cultural inertia and start the social journey. Pursue an incremental path that builds on experiments that may demonstrate potential.

- **Start at the beginning.** Social business is about achieving specific business outcomes. Start with reasonable scope in early efforts. Map the individuals in your potential social networks, and know what behaviors you are trying to affect and how you might meaningfully engage these into persistent communities. Use this information to guide the development of tools, roadmaps and roll-out plans – not the other way around. Focus on results that can be measurable and attributable.
- **Deploy the basics.** Certain aspects of social business are nearly universally relevant, such as social monitoring and listening posts for customer sentiment and brand positioning, as well as corporate yellow pages and social networking tools for experience-finding and leverage of intellectual property. These should be on each business' radar – and they can provide an excellent entrée to social business in R&D, PLM, HR, IT and even Finance. After all, "close the books" is an inherently collaborative and repeatable activity with clear business goals, a well-understood network of players and both structured and unstructured content use.
- **Move from sensing to actuating.** With basic monitoring tools in place, social business can move from passive to active. Instead of just listening, establish a command center for social customer relationship management (CRM), social sales and social product lifecycle management (PLM). Move from experience-finding to insight management by using micro-blogging and content management tools to promote sharing and re-use of knowledge and assets.
- **Break boundaries.** The chief marketing officer, chief talent officer and head of sales are typically early adopters of social business. But it doesn't have to stop there. What about a social chief financial officer? How could reporting, classification and audit be transformed by linking finance and control to knowledge streams and trails of how, where and (here's the kicker) *why* work got done? How would a social plant manager run a shop floor differently? With social business, the individual once again matters in performance improvement. At many levels, organizations that align the passions of their people with the interests of their markets can have a strong competitive advantage.
- **Authenticity matters.** Social business is about the individual. An anonymous corporate presence using social channels as a bully pulpit will not likely yield results. In recent decades, marketing or HR has sometimes evolved to mean *what we do to people*, a far cry from the original intent. Social business can bring us back full circle, thriving on personal voice and genuine interaction. Building those authentic relationships requires time and investment.

Bottom line

Social business is still in its early days. These initial waves are about unlocking insights based on people's behavior and relationships, and on supplementing the enterprise's traditional view of markets and employees⁸. Even more value can be gained as companies restructure how work gets done through social engagement – and by customizing messaging, promotions and even products, based on individual and community desires. Social awareness can give way to social empowerment – once again placing people at the heart of business.

Endnotes

¹ Ramde, D. *Beloit College Mindset List: The Internet Is Older Than Incoming College Freshmen*. Retrieved January 15, 2012, from http://www.huffingtonpost.com/2011/08/23/beloit-mindset-list_n_933847.html

² Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", www.deloitte.com/us/techtrends2012, Chapter 8.

³ Ostrow, Adam. *Inside Gatorade's Social Media Command Center*. Retrieved January 15, 2012, from <http://mashable.com/2010/06/15/gatorade-social-media-mission-control/>

⁴ *PepsiCo Video: Gatorade Mission Control*. Retrieved January 15, 2012, from <http://www.youtube.com/watch?v=InrOvEE2v38>

⁵ "Research and Markets: Gatorade Case Study: Using Consumer Segmentation and Social Media to Drive Market Growth," Research and Markets press release, February 4, 2011, on the Business Wire web site, <http://www.businesswire.com/news/home/20110204005653/en/Research-Markets-Gatorade-Case-Study-Consumer-Segmentation>, accessed January 15, 2012.

⁶ Edmund Lee, *Tesco Acquires Social-Marketing Firm BzzAgent for \$60 Million*, <http://adage.com/article/digital/tesco-buys-social-marketing-firm-bzzagent-60-million/227695/> (May 23, 2011).

⁷ "Sharp, Sony and Tesco First to Gain New Insight into Their Social Commerce Strategies Using Reevo's New Analytics Tool," Reevo press release, September 6, 2011, on the Business Wire web site, <http://www.businesswire.com/news/home/20110906005638/en/Sharp-Sony-Tesco-Gain-Insight-Social-Commerce>, accessed January 15, 2012.

⁸ Weigend, A. *The Social Data Revolution(s)*. Retrieved January 15, 2012, from <http://blogs.hbr.org/now-new-next/2009/05/the-social-data-revolution.html>

Leading the way

Social media is built on a foundation of interaction. In general, the more participants who get involved, the more potential for valuable engagement. The U.S. Government Accountability Office reports that all Federal government agencies have established some presence on popular social media networks, and some are now taking “social” beyond the public affairs office¹. Similar to their corporate counterparts, Federal agencies are increasingly using social technologies and programs to drive business decisions, actions, and outcomes. They are moving from social media to “social business” as they recognize the potential to transform how citizens interact with their government and how agencies will achieve critical mission objectives.

Today, agencies are using social business in various ways — from tracking the spread of pandemics, to crowdsourcing solutions for energy efficiency, to fighting terrorism². For the Federal government, that task is daunting. Today’s agency leaders understand they should reach beyond a social media and marketing mindset and push the boundaries of what is possible using social data, tools, and technologies.

What is different for Federal

While Federal agencies have a social media presence, some have leapt ahead with use cases that go far beyond simple push messaging on popular platforms. For example, the U.S. Geological Survey launched its Earthquake Detector program³ to gather “real-time, earthquake-related messages from the social networking site Twitter and [apply] place, time, and key word filtering to gather geo-located accounts of shaking.” Such information can supplement data collected from official sensing sites and can be used to help scientists and first responders alike. Agencies are also using social business to collaborate with multiple stakeholders. When the Deepwater Horizon drilling rig exploded in 2010 and began leaking oil in the Gulf of Mexico, the Department of the Interior and U.S. Fish and Wildlife Service established a collaboration site using Yammer to communicate response information promptly across a variety of agencies.⁴

Many agencies are becoming more effective and efficient by applying social business models and processes to enhance or replace some more traditional methods of conducting business. Federal regulations, however, sometimes limit the ability of agencies to use social platforms or tools in the same fashion the commercial sector does. Understanding security issues, accessibility requirements, and data retention rules are some of the challenges managers face when seeking to weave social into the fabric of agency mission. In an environment where the speed of technology often outpaces policy change, even something as basic as conducting an online survey can be more complex than it is for commercial organizations. New efforts, such as the Digital Government Strategy initiative, seek to spur agencies to address situations in which policy intersects with digital technology, and enable creative solutions that meet regulations, but allow for use of new tools and technologies to provide and “receive digital information and services anytime, anywhere and on any device.”⁵

Lessons from the front lines

- **Make informed decisions.** Learn what new capabilities are out there. Several agencies are exploring ways to use social monitoring from a mission perspective. For example, the Federal Bureau of Investigation earlier this year issued a Request for Information white paper around social monitoring. The request was trying to determine if industry can provide “an Open Source and social media alert, mapping, and analysis application system” and how such tools could be used to scan social networking sites and open source news sites for breaking events, crisis, and threats.⁶
- **Leapfrog traditional processes.** Social data can help agencies become even more effective and efficient. For the U.S. Health and Human Services Department (HHS), this can mean the potential to save more lives. For example, when an individual contracts the flu, he or she may see a physician or go to the hospital. Traditionally, this type of data is reported to local, state, and Federal health departments — a process that takes time. In con-

trast, social tools like Twitter or Google’s Flu Tracker can help health agencies potentially track illness outbreaks in real time even when individuals do not seek medical attention. That is the idea behind HHS’s “Now Trending” challenge, which incentivizes development of applications to use social media to track health trends. By combining and analyzing unstructured social data alongside traditional data, HHS can better protect public health by identifying infectious diseases earlier and fighting their spread.⁷

- **Encourage open conversations.** With social business, agencies can ditch that old suggestion box or even the “email your ideas” model. Through platforms like the Transportation Security Administration’s (TSA) Idea Factory (with code and program facilitation guide available for no charge to any Federal government agency) and enterprise social network tools like Yammer, agencies are facilitating open and inclusive conversations to drive innovation.⁸ Rather than depending on small cross-functional teams to tackle specific problems, social business tools with well-designed user interfaces can help agencies enlist the power and voices of more employees across the enterprise.

Getting started

Today’s forward-thinking agencies are going beyond simply using social media networks to communicate with citizens. They are applying a mission-led and technology-enabled approach to multiple areas of their business — using social tools and strategies in a way that addresses broader mission objectives. With that mindset, what should you consider when thinking about getting started?

- 1. Learn.** Check out the *Open Innovators Toolkit* (WhiteHouse.gov); the Tech at State program (Tech.State.gov); or a variety of General Services Administration’s (GSA) resources on social, mobile, cloud, and more (HowTo.gov). Look to the commercial sector for examples of innovative uses of social technologies and consider how programs or tools could be applied for use at your agency.

- 2. Lead with a strategy and an objective.** In the early days of social media, many organizations thought they needed to be active on most social networks. Do not let platforms or specific tools drive your strategy — start with a clear objective and only then look for the technologies that can help you reach that goal. A Facebook page, Twitter ID, or Google+ page may be fine if you are looking for citizen interaction, but may not be an effective approach to bring together a community of interest around a different type of challenge.

- 3. Understand the risks.** While potential rewards of weaving social approaches into your agency can be great, you should consider how to mitigate risks. Agencies should navigate a complex array of rules and regulations that commercial organizations generally do not have to consider when they build social business strategies. Take cues from commercial examples, but be prepared to adjust your approach to meet the policy challenges Federal agencies face while mitigating risks.

- 4. Embrace data.** One of the biggest challenges agencies face is not simply collecting social media data but how to analyze it. As the volume of unstructured social data increases, so does noise in system. It is not about tracking fans or followers; it is about understanding perception, presence, influence, risks, and opportunities. Some approaches can provide contextual tonality, but it is not the same thing as analytics. Agencies should listen for the applicable information by explicitly defining their goals; search, find, and learn from relevant data; then use that data to improve on ways to meet the goal, transforming the business through innovative use of this new information.

Bottom line

The Federal government is graduating from social media as a public affairs tool to social business as a mission driver. As agencies increasingly realize the power and benefits of social business, they will likely push the boundaries of what is possible. This means agencies should consider institutionalizing new operation concepts to create innovative applications that are mission-led and technology-enabled. In many ways, the development of social business mirrors the start of the dot-com era. Back then, e-business and e-government were relegated to their own separate departments. It took years for the Internet to be integrated throughout an agency's operations. Today, the Federal government finds itself at the same inflection point with social business. Agencies that lead the way can realize significant returns for both employees and citizens.

Federal perspective endnotes

¹ <http://www.nextgov.com/cio-briefing/2012/04/all-major-federal-agencies-now-using-twitter-and-youtube/50991/>

² <http://energy.gov/articles/secretary-chu-launches-first-ever-apps-energy-challenge>

³ <http://recovery.doi.gov/press/us-geological-survey-twitter-earthquake-detector-ted/>

⁴ <http://www.marketwire.com/press-release/US-Department-Interior-US-Department-Fish-Wildlife-Services-Selects-Yammer-1314488.htm>

⁵ <http://www.whitehouse.gov/sites/default/files/omb/egov/digital-government/digital-government.html>

⁶ https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=64c7a3014f6e2944e30c05266eedd9b4&_cvview=0

⁷ <http://www.phe.gov/Preparedness/news/Pages/nowtrending-120320.aspx>

⁸ <http://www.acus.gov/best-practices/success-story/tsas-ideafactory-the-next-generation-suggestion-box-for-the-front-line/> <http://www.acus.gov/best-practices/success-story/tsas-ideafactory-the-next-generation-suggestion-box-for-the-front-line/>

2 Gamification



Gaming gets serious

Gamification is about taking the essence of games – fun, play and passion – and applying it to real-world, non-game situations. In a business setting, that means designing solutions using gaming principles in everything from back-office tasks and training to sales management and career counseling. Game mechanics lie at the heart of gamification. For example, achievement levels, point-tracking and bonuses are ways for desired activities to be recognized and rewarded. Leaderboards and progression indicators can steer individuals to reach the next tier of performance. Quests and countdowns can help shape behavior – the former as a way to structure long combinations of tasks for a larger goal; the latter to motivate a flurry of activity within a finite, specified timeframe.

The “so what” for business is not any single one of these items. Instead, the value lies in finding the right combination of game mechanics that will resonate with stakeholders to drive performance.

One desired outcome of gamification is engagement – getting stakeholders passionately and deliberately involved with your organization. Interaction, collaboration, awareness and learning are related effects, where individuals are encouraged to make new connections and share information. The key is defining a powerful “win” condition that can work across a range of personality types, align with business objectives and foster sustained engagement.

Gamification can also enhance transparency and compliance, since games almost always operate within a well-defined set of rules. When aligned with desired behavior, gamification can help guide awareness and adoption of standard policies and processes, often operating in the background without the user’s conscious effort. Gartner predicts that one quarter of day-to-day business processes are likely to take advantage of some aspect of gamification by 2015¹. That number jumps to 50% for organizations with formal innovation management process².

For businesses working to manage generational workforce shifts, gamification can be especially helpful. Millennials already show a proclivity toward using gaming, social tools and emerging technologies in their day-to-day lives³. Educational systems – particularly elementary and high schools – are also pursuing gamification in learning⁴. But gaming is not just for digital natives. The average game player today is 37 years old, and 42% of game players are women⁵.

The potential of gamification for the enterprise is likely to grow with time. Organizations that embrace the trend have the opportunity to gain loyal customers and find a competitive edge in recruiting, retention, talent development and business performance.

History repeating itself?

Games have been a mainstay of culture throughout history. Indeed, academic disciplines, simulations and even virtual worlds have been launched to understand and harness the power of games. In 2012, gamification moves beyond entertainment to business performance, using intuitive design, intrinsic motivation and the sense of accomplishment that comes from completing activities with clear – and personal – value.

	What were the challenges?	What's different in 2012?
Serious gaming	<ul style="list-style-type: none"> • Simulations, table-top exercises and war gaming have long used sophisticated models to emulate complex behavior, delivered through a game-like interface. These tools are good for testing potential strategies against predicted market conditions, driving situational awareness for executives and field personnel, and shaping behavior through interactive training. But there has been an inherent disconnect between the boundaries of the game and real-world operations, behaviors and business outcomes. They are studies, not systemic implementations. • Heavy business simulations and war-gaming applications have had a high barrier to entry in that serious games are only as good as their underlying rules and models. Social, economic, cultural and interpersonal factors should not only reflect the actual business environment, but also be presented in an engaging manner that drives participation, learning and action. • If the rules are transparent or discoverable, the player experience can be dominated by the micro incentives of the game itself, not the macro implications to the enterprise. 	<ul style="list-style-type: none"> • Gamification applies game mechanics and dynamics to produce results that go far beyond simple entertainment. It embeds these principles into how people work, collaborate and transact business – a systemic change. This is distinguished from serious gaming, where a walled garden with a compelling gaming hook is used to educate, motivate or achieve a secondary outcome. • A number of serious gaming companies have created statistical studies and industry/function-specific repositories of rules and models, along with underlying technology platforms that can be reused across scenarios. This has led to moderate growth in the areas in which serious gaming is applied. It has also fostered effective approaches to help maintain the integrity of, and ongoing interest in, the game.
Cognitive psychology/ behavioral economics/ game theory	<ul style="list-style-type: none"> • Well-established fields in science study how people acquire, process and store information – and how these concepts apply to classic economic theory (e.g., rationality of markets and players) to model real-world conditions⁶. However, most real-world situations have too many variables, players and extenuating factors to be analyzed. Outside of political science, economic theory and social psychology, the concepts have been difficult to apply, especially in day-to-day business scenarios. 	<ul style="list-style-type: none"> • Effective design of game mechanics and dynamics are often predicated on models and research from these fields. In a sense, gamification is the industrialization of these academic concepts – shifting from research and theory to tactical business processes and front-line employees.

Technology implications

Future generations of enterprise systems are likely to have game mechanics embedded in their design. For now, however, most organizations are likely to layer their gamification strategies into established packages and custom solutions. A number of technical building blocks should be considered to realize gamification's potential.

Topic	Description
Enterprise systems	Almost every game mechanic is fueled by activities or events, such as knowing what a player is doing, being able to change the state of the game, or providing appropriate rewards or acknowledgements. The lack of openness of underlying packages and custom systems can be a constraint against driving external gamification elements (e.g., making activities visible, timely and with enough context for the game dynamics) or embedding gamification into the current platform.
Game mechanics platforms	A number of solutions have emerged in the past 12 months that provide plug-ins or third-party services for leaderboards, achievements and virtual currencies and rewards to help motivate and monitor employee engagement, compliance and performance – especially in areas such as education and learning, health and wellness, call center/customer care, and sales and marketing. These same mechanics can also be applied to customer-facing offerings to drive retention, loyalty and advocacy.
Social business	Connectivity, collaboration and knowledge-sharing are key dimensions of gamification. Understanding how communities are connected in a social graph and how games can be linked to social computing and social media tools can affect the ability to meet the goals of the effort.
Mobility	Location-based services fueled by mobile devices allow advanced techniques known as appointment dynamics, where specific actions or rewards are available only if a user is in a predetermined physical place at a specific time ² . More broadly, mobile channels can be natural candidates for the gamification of business processes, especially when anytime/anywhere, short-lived, meaningful touch-points are desirable.

Lessons from the frontlines

Health and wellness is not a game (unless it is)

Encouraging members to live healthier lives has long been a Holy Grail for health plans – not only because of the civic good, but also because of the bottom-line impact. Five hundred billion dollars in annual spending goes to treating largely preventable conditions such as hypertension, diabetes and heart disease – representing 70 to 80% of US health care costs⁸. One provider rolled out Mindbloom's *Life Game*, an interactive platform for users to establish health goals, which uses game mechanics to monitor their progress, and can tap into social channels for extra motivation. In *Life Game*, users can cultivate a virtual tree representing their physical, emotional, financial and spiritual well-being – earning “water” and “seeds” by completing tasks such as taking a walk, eating more healthy foods or putting savings into an emergency fund. In a beta trial, users visited the site an average of 35 times per week, spending about 15 minutes during each visit. These users set out to perform 13 million actions – and performed about three-quarters of them. This represents a 50% increase over prior attempts without gamification.

Cubicle gaming

Several productivity software vendors are using gamification to help train users on overlooked features of their tools. Many are built around cascading information theory, where complicated functions are hidden until needed. Level progression, achievements and points tracking are present (e.g., “+50 points for not using a hint”), guiding users to discover useful new features and build proficiency. The gaming layer can also provide incentives to follow standards – from corporate templates in word processors to coding standards in integrated development environments (IDEs) – helping spur learning, compliance and engagement.

Restaurant service gets gamified

On the surface, Not Your Average Joe's resembles a typical restaurant chain, offering creative, casual cuisine within their 17 locations. Behind the scenes, though, certain restaurants are using gamification to link point-of-sale data and scheduling software – where employee behavior such as up-selling, cross-selling and timely returns from breaks are used to drive achievements and awards. For example, employees with the most sales and tips can earn their desired shifts. The early results include a 1.8% increase in sales and an 11% increase in gratuities throughout the Not Your Average Joe's chain⁹.





My take

Gilman Louie

Partner

Alsop Louie Partners

I love snow skiing. And the last time I hit the slopes, I was thrilled to find that through the magic of RFID, I was able to keep track of my accomplishments on my smartphone – everything from how many black diamonds I had skied to the vertical feet I had traversed over the course of the day. Even more exciting, I was able to share this data with family and friends, and see how well they were doing, too. And, not surprisingly, how I stacked up. Ultimately, we were in a friendly competition to rack up awards and win badges based on our accomplishments and scores.

We were modifying our behavior in direct response to a lighthearted, fun little game. We were taking on slopes that we wouldn't have considered before. Squeezing in a couple more runs before calling it a day. Pushing ourselves to go a little faster and harder. And that's also why gamification is catching the attention of so many business leaders. The ability to change behavior by encouraging personal growth via game-like engagement could be a management bonanza, for obvious reasons.

The concept itself is not new. In fact, my venture capital firm saw a serious gaming/gamification pitch over a decade ago. But the idea didn't take off. I think the renewed interest today has a lot to do with the rise of social business. Before social media tools, one of the biggest hurdles was creating and sustaining a network of players. Without that, there's little hope of a game taking off. By tapping into public social media channels and social computing platforms being adopted in the workplace, serious games can take advantage of existing social networks – inside and outside of the business. This is a natural environment for successful gaming, as the swift rise of social gaming companies has demonstrated. Applying the principles to day-to-day business processes can have great potential.

Having spent much of my career in the gaming industry, there are a few principles of game design that, if followed, could make a big difference. For example, when I first helped license Tetris, I learned the 80/20 rule: 80% of a player's experience in a game should be positive. The rest of the time, players should be barely missing their goals. Basically, everybody wins – at least for part of the time. And when they lose, they understand why – and feel that overcoming whatever obstacle ahead is within their grasp. This should be coupled with constant positive reinforcement and incremental, attainable rewards. That potent combination can make a game addictive.

And yet in the business world, many games only have a handful of winners, and lots of losers. Gamification should not simply be another spotlight on your top performers. If a "player" is dominating the game, the rest of the population is likely to either try to derail the winner, or sabotage the game. Hyper-competition rarely leads to sustained improvements performance – or positive behavior change.

In some ways, gamification isn't really a new trend. It's just one of the latest manifestations of the foundation of business: the desire to compete. The desire to keep score. But don't forget to start with clearly defined business objectives, and align gaming mechanics with metrics and incentives. And remember the importance of fundamental gaming principles. Gamification done well tells an employee: you are doing better than you did yesterday, you are contributing to the goals of the enterprise, and the tools for growth and personal development are in your hands. Game on.

Where do you start?

Gamification is about influencing behavior. At its roots are simple psychological constructs of ability, motivation and triggering¹⁰. “Ability” reflects the individual’s skill, time, attention and mental capacity to perform a task.

“Motivation” describes desire to engage – personal interests, the perceived value of potential outcomes and their willingness to participate. A “trigger” is something to prompt targeted behavior. Triggers can be either explicit (directing the user to take action) or experiential (providing a sandbox where possibilities can be explored). All three factors must converge at the same time to achieve desired results. This basic framing will help inform you where to start:

- **Pick your target.** Establish clear, simple objectives that are well-suited for gamification. Not all business scenarios have obvious triggers where behavior can be influenced. Tasks that are very complex are hard to gamify. Tasks that are very mundane may be immune to motivational influences. Early adopters of gamification have targeted training, back-office processes, sales, marketing and promotions to consumers.
- **Know your audience.** Not every individual will react the same way to game dynamics. Different personality types have different motivations. To this end, Richard Bartle identified four types of game players: socializers, achievers, explorers and killers¹¹. Having a balance of game mechanics – collaborative, collect-and-curate, discovery and competitive – will be necessary. The balance should match the needs of your specific community and desired results.
- **Ride the wave.** Social and mobile players have been early adopters of gamification techniques as means to stand-out and gain traction (e.g., Foursquare, Twitter, Getglue). Businesses that are rethinking their processes to take advantage of mobile and social dynamics can find many opportunities for gamification. From strategy to creative to user experience to engineering, consider the potential of game mechanics to improve engagement and performance. Ride the coat-tails of mobile and social initiatives that the business already understands – and likely has already funded – to start layering in gamification concepts for enhanced business outcomes.
- **Knock down the fourth wall.** Look for ways to use gamification to engage with business partners, customers and the general public. A mobile service provider in the United Kingdom with no retail distribution, no call center, no advertising, and only 16 full-time employees uses social customers and gamification principles to operate their business. They use points and rewards to source service referrals, help to solve customer service issues and even create promotional material for the company. Gamification can help organizations leap-frog into broader social business¹², user empowerment¹³ and measured innovation¹⁴, tapping into external constituents in new and exciting ways.



Bottom line

Gamification is riding three waves. The first is the growing base of workers and customers raised under the influence of video games and consumer technology. The second is the meteoric expansion of mobile, social and cloud technologies across the business. The third is the ongoing efforts to improve business process execution and performance through technology. Gamification looks to embed game attributes into day-to-day business activities – interacting with the next generation in their native language, and tapping into an enthusiastic older generation that has embraced gaming. As the bridge to the postdigital era is being built, organizations are making big bets to take advantage of this transformation.

Endnotes

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- ¹⁴ Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", www.deloitte.com/us/techtrends2012, Chapter 9.

Game on

Gamification is changing the way Federal employees collaborate with internal and external stakeholders to solve complex problems and drive desired actions, such as enhanced participation and learning. Applying elements of simulation, business process modeling and automation with behavioral economics, and gaming mechanics, agencies can gain insights into cross-agency and industry responses and new approaches to solving complex mission problems — problems such as energy planning or emergency response behaviors — in a systematized way. Through social media and other communications tools, organizations are increasingly applying gaming techniques to develop potential solutions to address intractable problems.

The basic concept is not new for Federal agencies. The U.S. Department of Defense (DoD) has long depended on war games and simulations to sharpen strategic skills and anticipate the actions of adversaries. Structuring problems as games and contests can attract greater participation and foster innovation. It can turn open-ended questions into puzzles that beg to be solved with a limited investment — a budget-friendly alternative for already strapped agencies. What is truly new is that gamification allows Federal agencies to ask new design questions to new and upgraded IT systems: How will I engage and reward users? How will I provide changes over time that will allow users to play at the correct “level”? How will I connect users on a system that I do not want used only for a single occurrence but over a potentially substantial period of time? The answer to these questions is often not just a game and that is the secret of gamification. It is a new strategy to bring elements of play and fun to serious work and situations that can help meet the requirements of a specific population.

Many Federal agencies face some barriers — from cultural to legal — in effectively using these techniques. Culturally, even the notion of “games” challenges the notion of real work across the global public sector — some viewing it as non-work, while others relegating it to a before or after study with indirect application. Whereas, for the integration of gamification to a process, a business model, or a mission activity, this means that new levels of transparency and engagement along with a systemic overlay of leading practices are needed — and the outcomes should be measurable across the continuum of the gamified mission aspect. Beyond technology, there is work to be done to

unravel potential legal concerns regarding topics, such as tools, licenses, and mobile device access, as well as the questions of what can be shown and shared around an employee’s, contractor’s, and citizen’s performance and level of engagement.

What is different for Federal

Agencies are beginning to use gamification in ways that go beyond what might even be called “games.” For example, former Federal Chief Information Officer (CIO) Vivek Kundra developed a contest to help create useful applications when he was Washington, D.C.’s CIO — a model that he later applied to the Federal government’s Challenge.gov.¹ Rather than having city employees develop applications, Mr. Kundra earmarked \$50,000 as prize money and invited outside companies, entrepreneurs, innovators, and citizens to submit applications. As a result, 47 applications were developed in 30 days — a process that might have taken months through traditional means at an estimated value of more than \$2.3 million.² Gaming techniques are also being applied in other areas of the Federal government, such as tackling America’s energy crisis in the U.S. DoD or U.S. Department of Agriculture training for large-scale emergency situations. From the White House, through the government, Federal teams are looking for ways to drive innovation and solve complex problems with fresh ideas leveraged from engaging workers and citizens alike. However, a lack of definition and clear standards of conduct and simulation disciplines can cause ambiguity and bring into question the better use of tax dollars. Legislative changes around allowing payouts for competition coupled with well-designed tools and deployments could provide greater insights, demonstrating how moving from traditional simulation and gaming to end-to-end gamification solves the carryover challenge and provides continuous transparency and validation of leading practices in use.

While gamification methods are equally applicable to the public and private sectors, Federal agencies should comply with certain rules and regulations that could affect initiatives. For example, private-sector companies often use gamification to encourage users to rate and reward the performance of subcontractors. In the Federal government, certain regulations and interest groups may derail the concept of rating an individual’s or team’s progress.

As with most systems that invite user-generated feedback, issues of data ownership arise. While the Federal Records Act and other similar laws require agencies to maintain records for future retrieval and eventual public release, agencies are being reminded that communications generated from social media sites fall under those laws. Proper management and planning for the use, reuse, and archiving of the very high volumes of potentially tiny to small “snippets” of information spread across multiple internal and external platforms and toolsets may present new challenges. Some of these challenges start with tracking original and new ownership of data, and their sources of record, and extend through how to properly catalog this collection of structured, unstructured, and semi-structured data in a meaningful and retrievable context. In 2010, the National Archives and Records Administration (NARA) issued a memorandum instructing agencies that the preservation of social media data is just as important as other official messages. In his blog, NARA Director David Ferriero even wrote that “the informal tone of the content ... should not be confused with insignificance.”^{3,4} As the government moves forward on meeting the Open Government Directive, which directs agencies to implement the principles of transparency, participation, and collaboration, it should promote greater flexibility and adoption of gaming.

Lessons from the front lines

- **Focus on solving problems.** Gamification thrives on social media, but it is not just about engagement. It is a means to help agencies meet their mission objectives and address challenges and problems.
- **Use multiple platforms.** At its heart, gamification is about harnessing organizational behavior — changing the way citizens and stakeholders interact to complete a specific task. However, organizations sometimes make the mistake of using a single platform. Federal agencies should recognize that gamification can be most effective when it is used across multiple platforms and in a variety of contexts. For example, an initiative launched on Challenge.gov is usually promoted via networks and relationships through social media sites and person to person. Agencies should approach gamification as a process rather than a specific technology.
- **Build incentive structures.** Why would a developer spend precious time and resources developing a free app for a Federal, state, or local agency? For some, it is the chance to win prize money. For others, it can enhance their reputations or, more simply, provide bragging rights. To effectively use gamification elements of feedback, rewards, challenges, and social connection, agencies should understand and incentivize positive behaviors. It does not necessarily mean you have to add a pot of gold each time. Agencies should think like game designers, create an environment that identifies and recognizes positive behaviors, encourage participants to work across silos, and reward new behaviors. They should also be prepared to adjust incentives or add new features and dimensions periodically to maintain participation and hold interest.

Getting started

1. **Start small.** Agencies should begin with small, focused, and clearly defined business requirements and then work backwards from there to build the structure required to drive specific behaviors in an iterative, agile fashion.
2. **Make it social.** One of gamification’s most effective assets is the ability to use existing social communities to achieve a specific goal. Rather than build new social structures or networks, agencies can most effectively achieve their desired results by reaching out to audiences through existing platforms and strive for new levels of engagement.
3. **Tap effective use cases.** Gamification has already provided several use cases across the Federal government. These include contests and challenges, training and simulation, as well as strategy and idea-creation. By extending from current use cases, agencies can efficiently provide tangible benefits.

Bottom line

Gamification is helping to transform the way the Federal government engages users and nurtures innovation. Beyond the tabletop or point in time war games model, agencies are reaching out directly to stakeholders and citizens to build structured environments that reward collaboration and provide mission goals on an ongoing basis. Agencies should clearly define and align their value propositions in using elements of game design to address specific problems with minimal investment. While some regulatory issues still need to be ironed out, the potential use of gamification will rise as agencies consider a more interactive framework to meet their diverse circumstances and drive continuous improvement. Transparency to and of the mission, insights for complex decisions, and heightened user engagement are just a few of the rewards.

Federal perspective endnotes

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3 Enterprise Mobility Unleashed



Businesses are embracing mobility. Now comes the hard part.

Rapid technology developments in wireless connectivity and mobile devices marked the beginning of the mobility revolution. Next came the apps renaissance, when intuitive, engaging pieces of software, tailored for smartphones and tablets, began to change our day-to-day lives. The revolution has now reached business. Many organizations today find mobile initiatives popping up in every business unit, in every region and in every department. The floodgates have opened. Now what?

For some, the path forward might begin by pushing existing solutions and processes to mobile channels, without blue-sky thinking of how business might change if location constraints disappeared. For others, disciplined experimentation can reveal compelling scenarios, which can lead to doing traditional things differently, as well as doing fundamentally different things. When left to its own devices, each faction – individual, department or organization – will struggle through the learning process towards its own vision of mobile enlightenment.

In this chaotic environment, CIOs face three challenges. First, they need to build capabilities to deliver intuitive, user-friendly mobile applications that can meet or exceed expectations set by consumer technologies. Mobile delivery requires new skills, new mindsets, new application architectures, new methodologies and new approaches to problem-solving. Above all, solutions must focus on usability – design-led thinking with mobile mentalities. Scope should be reined in to create well-defined, elegant solutions that address explicit problems, not broad collections of functionality. User experiences should be mobile-centric, based on touch/swipe/talk, not point/click/

type. Leonardo da Vinci's description of simplicity as the ultimate form of sophistication might be a foreign concept to many central IT departments today, but it is also a prime directive. As mobile becomes increasingly important in customer and employee interactions, the complexity of applications, or apps, will naturally grow with heightened integration, security and maintenance needs.

The second challenge for CIOs is to help the business deliver innovative applications with significant potential for positive disruption. Experimentation can be a good way to show progress and help crystalize opportunities, but many use cases remain uncharted. Until users interact with an early prototype, they may not know what they want, much less what they need. CIOs can become beacons of big-picture thinking and tactical adjudication by embracing the proliferation of mobile initiatives, and accelerating the mobile adoption learning curve across the organization.

The third challenge is that mobility introduces yet another level of complexity that CIOs must manage and support at an enterprise scale. What's an effective way to deal with pressure to get behind each "next big thing"? Should employee-owned devices be allowed on enterprise networks? And if so, what data, applications and services should they be permitted to access? How should IT practices change to support mobile applications? True enterprise-class mobility requires governance, security, privacy and compliance policies – with effective management of mobile devices, enterprise app stores, mobile middleware and more. The trick is to build a solid foundational infrastructure without throttling the business. As you likely know, the business can't – and won't – wait for a fully formed mobile enablement roadmap to be defined and put into place.

History repeating itself?

Mobility has evolved from an issue within a few niche industries and functions (think oil & gas and logistics services) to a potential source of innovation across wide-ranging vertical industries, processes and business models. And while many of the underlying components have been evolving for decades, the break-out potential is only now being realized.

	What were the challenges?	What's different in 2012?
"App for that" backlash	<ul style="list-style-type: none"> • With the explosion of interest in mobile applications came the inevitable wave of ill-conceived, underwhelming releases – confirming skeptics' beliefs that mobile is, at best, a distribution tool and, at worst, a distraction. • Early developers ported existing systems and reports designed for desktops to mobile. The resulting multi-purpose apps proved unwieldy on the small screen, and replicating point/click/type functionality using a touch/swipe interface proved painful. • Developers had a losing choice: deal with the complexity of designing multiple native apps or endure the sub-par user experience of simpler web-based apps. • Most organizations only had a handful of mobile solutions in production, making the required infrastructure and enterprise enablement support seem like overhead. 	<ul style="list-style-type: none"> • Many organizations now understand the importance of design-led mobile solutions that focus on usability and how work should get done. • Early experiments in business-to-consumer and early business-to-business scenarios are leading to more compelling, complex applications across the enterprise value chain, making integration, security and manageability more critical. • Cross-platform, multi-environment application suites and HTML5 implementations have evolved to more credibly offer "develop once, deploy many" approaches to mobile. • As mobility reaches critical mass, the need for device management, product management, application management, security and privacy management, and other enterprise capabilities shifts from "good to have" to "must have," and the vendors are responding.
Specialized mobile equipment and network/carrier infrastructure	<ul style="list-style-type: none"> • Ruggedized, hardened and other fit-to-purpose devices were too expensive to allow mobile use cases to propagate. • Splintered ecosystems across manufacturers and operating environments stymied marketplace innovation. • Devices lacked the horsepower and flexibility to handle divergent tasks, which limited their potential usage. • Advanced mobile solutions had architectural dependencies on carrier infrastructure (e.g., wireless access protocol (WAP) gateways/proxies, authentication, authorization and accounting (AAA)-driven session management.) 	<ul style="list-style-type: none"> • Consumer-grade device prices have fallen, causing some previous buyers of high-end specialized gear to consider switching to lower-cost, easily replaceable devices. • As standards emerge in the mobile ecosystem, device manufacturers are beginning to adopt open platforms (e.g., Android). • Advances in memory, display, computing and peripherals allow portability between personas and use cases moving freely between PC, tablet and handheld. • Mobile networks now enable true endpoint-to-endpoint connectivity, agnostic of infrastructural details.
Asset intelligence¹	<ul style="list-style-type: none"> • Embedded sensors expand enterprise mobility's potential, but compatibility between machinery and sensors was limited. • Sensor prices have been too high for commodity adoption. • Visibility without sense-making led to data proliferation, not insights. 	<ul style="list-style-type: none"> • Machine-to-machine middleware and application logic are improving compatibility in hardware/manufacturer protocols and communication channels. • Prices have decreased dramatically for embedded sensors, communications and onboard compute/memory. • Cost-efficient solutions are emerging for business rules engines to perform edge-based logic, allowing signals to be processed that can initiate actuation, not just data broadcast.

Technology implications

Enterprise mobility can unleash business transformation from the top down, but it is inherently a technology-driven advance with potential consequences that the CIO should be prepared to manage.

Topic	Description
Bring your own device (BYOD)	Whether or not to allow employees to bring their own devices to work is top-of-mind for many CIOs. It's not clear that mobile device policies and management controls are enforceable, especially across international borders. Country regulations regarding e-discovery and the legality of remotely wiping personal devices with a corporate footprint vary. If BYOD is pursued, data and application containers should be considered to partition user and corporate assets.
Mobile device management (MDM)	Organizations will need an arsenal of tools, policies and back-end scripting to monitor, manage and control devices. MDM can protect applications, patches and security agents that are properly provisioned and can allow data to be automatically backed-up and protected while at rest and in transit. It can also allow devices to be triaged, disabled or wiped clean if compromised. The vendor landscape is crowded. There is the potential for consolidation over the course of 2012.
Security and privacy	Organizations need policies and tools to authenticate users; control devices, applications and data; provide end-to-end encryption while at rest, in flight and in use; run content filtering and malware protection; and allow security event monitoring, logging and response. Security policies and profiles should be tied to specific users and scenarios, focusing remedies on likely incidents, not the infinite range of risk possibilities.
Mobile application management	Deployment of in-house and third-party mobile applications is not a trivial matter; nor is the management of provisioning profiles, entitlements, licensing, compliance and user-access termination. In-house enterprise app stores have emerged, as have tools for administering access lists across internal and external application portfolios.
Mobile middleware	Organizations will need to manage mobile solution integration to on-premise and cloud-based enterprise systems and data, as well as improve data transmission to mobile devices based on layout and bandwidth consumption. This includes management of variability in network connectivity and performance – including tools for enabling off-line mode and ways to deal with frequent air-interface switching between 4G (LTE/WiMax), 3G (EVDO/HSPA), 2.5G (1xRTT/Edge) and Wi-Fi networks of varying signal strengths.
Desktop virtualization	Some organizations may opt for a data-centric approach to mobile enablement, choosing to limit the data actually resident on the mobile device. Relying on virtualized environments allows organizations to provide access without relinquishing control.
Mobile application architecture	Debate continues over the preferred approach to application development. Native application coding allows greater control over operating systems and device features. Cross-platform development allows a “build once, deploy many times” delivery. And new browser-based or web standards like HTML5 hold the potential for easier porting with better functionality.
Mobility testing suites	Emerging services can automate the testing of solutions across devices and operating systems, simulating varying levels of connectivity and network performance – including diagnostic tools to identify data and system dependencies to shrink time-to-deployment while increasing multiple device support.

Lessons from the frontlines

Innovation on the rails

Amtrak is investing in mobility in a big way – targeting conductors and customers – to build on record-high ridership and revenue performance in 2011. Historically, conductors have been saddled with paper-based, manual processes for dealing with everything from ticket collection to service maintenance, but mobility is changing that. A solution combining a mobile app with a magnetic stripe reader is modernizing railway operations – and the industry. Conductors use the app to process tickets, perform prompt fraud validation, prove customer notification of potential scheduling issues, and feed into a sophisticated model that tracks customers and their location on the train. This improves the conductor's efficiency by identifying which doors to open during stops, arranging for the right number of wheelchairs at the right place upon an individual's departure, and providing a sense for the capacity and likely needs for each car. In the past, faulty toilets, damaged seats or broken kitchen equipment would be serviced only at the end of an extended route. With the new mobile app, incidents can be reported in real-time, allowing maintenance to be scheduled at intermediate stops along the way. This functionality led to enthusiastic adoption by conductors in a matter of minutes after deployment, versus weeks of training for IT services that have historically led to poor traction, usage and results.

For passengers, there's a complementary app available that offers scheduling, ticketing and check-in capabilities as standard features – presented with a highly usable interface. The concept has been extended to include gamification principles: customers earn stamps while traveling, link achievements to social networks and see visualizations of their personal travels compared to peer groups or frequent travelers. This information is linked to Amtrak's reward and loyalty program, encouraging customers to pursue new methods of engagement beyond traditional channels.

Faster than a speeding bullet

Disaster recovery and continuity planning are rarely the source of innovation. This has an unfortunate side effect: disaster-response knowledge is often trapped within bulky printed materials sitting inside the very office buildings most likely to be affected during an emergency. Plus, with increasingly mobile workforces, the challenge of tracking and helping your people during a crisis is virtually impossible without technology's help. Bamboo is a service to address these needs by providing a mobile vehicle for reporting incidents, facilitating communication between team members and potential first responders, and allowing individuals to understand what they should do during and after an event. Continuity plans are stored locally, allowing teams to mobilize even if connectivity is lost.

The future of retail

A large retail organization has embraced mobility – not as a siloed commerce channel, but as a means to empower customers and drive loyalty through new services and offerings. Smartphone, tablet and mobile web offerings provide mailings, product browsing, inventory searches, coupons, gift registries and shopping lists. Emerging mobile and e-commerce platforms have generated innovations in interactive advertisements, individualized coupons that can be scanned at the point-of-sale, and integration to their brick and mortar stores. The organization marries digital content with inventory, price and in-store location – down to the aisle and shelf detail – showcasing an omni-channel strategy bigger than the web, mobile, social or storefront individually.





My take

Shehryar Khan

Founder and former CEO
Übermind, Inc.

The mobile revolution is underway. Companies big and small, across virtually every industry, are clamoring to unlock the potential of mobility in their business. At Übermind, we have helped some of the largest and most recognizable brands define and execute their mobile strategy². Our goal is not just to create killer, intuitive mobile apps that are breathtakingly beautiful as they are functional (though we love to do that); it is to help companies transform their business through the use of the new generation of smartphone and tablet devices. And to rethink operating and business models – constrained only by our imagination of how a digitally advanced, always-connected customer base, coupled with a truly untethered workforce, can transform an industry. How business is conducted. How markets are shaped.

Surely in some cases the most effective answer is to build from today's reality – to do what you've historically done, but to take advantage of mobile capabilities to do it better. But what really excites me is when we can help define a new tomorrow – not just doing things differently, but doing different things. And when you are using mobile coupled with other technology-based innovations like analytics, social, gamification, cloud computing and visualization as a Trojan horse for transformative thinking. But this time, realizing how a very sophisticated "always on, always connected, in your pocket" computing device (which some people call a phone) can help empower everybody that engages with your business – be they customers, employees or business partners.

Unleashing mobile has tremendous potential. But to fully realize this, it is important to acknowledge how mobile can impact many aspects of your business – from how your customers can engage with you in new and interesting ways, but also in how you can make a difference in the lives of your employees by equipping them with tools that help enable them to do their jobs more effectively. Keeping an enterprise frame-of-mind is also important, factoring in special considerations and gotchas that come with enabling mission-critical aspects of the business through mobile innovation. Security. Scalability. Reliability. Maintainability. Flexibility. Integrated into back-office systems, data and workflows.

Developing, deploying and supporting mobile solutions is quite a bit different than traditional IT. Doing it well requires a special blend of business insight, deep technical chops and strong design. Companies that recognize this required mix of business, art and science can set themselves apart from their competition and help to reshape entire industries.

Where do you start?

For many organizations, the mobility opportunity is clear. But understanding where to begin isn't as straightforward. CIOs are in the middle of the mix, facing their own concerns about the strategy, infrastructure and delivery capabilities required to meet mobility demand with enterprise-class solutions. To position IT as a driver of business innovation and agility, consider these next steps:

- **Fuel the arms race.** Move mobile toward the top of the CIO agenda. Put together a three-person swat team – designer, architect and developer – and have them rapidly train on a platform of choice. Find the early seeds of mobile opportunities in the business, and zero in on *one* that has clear business value.
- **Build a foundational strategy.** The mobility landscape is moving at warp speed. CIOs need a mobile strategy limited to a six-month horizon. Decide on an initial mobile app architecture. Establish foundational recommendations for management, deployment and support. Create a roadmap of prioritized use-cases and apps. And establish a plan for how to meet demand. The strategy doesn't need to be exclusionary of any specific technology options: choose where to develop natively, where to use a cross-platform enablement tool, and where to build a mobile-tailored web app. Do them all at once, or in rapid succession, and you are likely to buy yourself strategic flexibility for the medium-term.
- **Centralize.** Given the freedom to run, each pocket within an organization is likely to either build skills in mobile app design and development, or outsource it. Even worse, they could establish competing policies with varying levels of enterprise-class features (security, privacy, integration, data management). This could confuse users and jeopardize your brand. Plus, each silo will go through its own learning curve. Having a core group or center of excellence that shares experiences among functions and business areas can accelerate the move from the mobile veneering of existing operations to true innovation.
- **Think differently.** Mobile is a different beast than traditional IT. To achieve your goals, you'll need a unique mix of creativity and design talent that might not be a core discipline within the CIO's shop. Take cues from leading consumer applications, and improve scope, usability and back-end performance to leverage the unique characteristics of mobile.



Bottom line

Mobility is quickly becoming one of the most important battlegrounds for business innovation. Operating models are being redrawn for consumers, employees and business partners alike. This puts enormous pressure on CIOs to determine whether mobile solutions are ready for the enterprise. In the push for usability, however, ideas like reliability, security, performance and maintainability should not be forgotten. Regardless, there's no excuse for not pursuing mobile. The revolution is well underway. Every business should be exploring how it will operate when location constraints are obliterated. Every CIO should have a clear vision of a world in which every customer, worker and supplier is hyper-productive, hyper-available and hyper-engaged.

Endnotes

¹ Additional information is available in Deloitte Consulting LLP (2010), "Depth Perception: A dozen technology trends shaping business and IT in 2010", <http://www.deloitte.com/us/2010technologytrends>, Chapter 11.

² "Deloitte Acquires Übermind; Establishes Lead in the Mobile Revolution," Deloitte LLP press release, January 4, 2012, on the Deloitte LLP web site, http://www.deloitte.com/view/en_US/us/press/Press-Releases/5fa2480b618a4310VgnVCM1000001a56f00aRCRD.htm, accessed January 25, 2012.

Setting a new pace

Are you reading this on a mobile device? Probably so, if you are a Federal government employee. Today, mobility is helping to transform some Federal agencies from the top-down, as seen in the Digital Government Strategy,¹ and the bottom-up, as seen with many mission-oriented pilots happening around the government. These pilots range from apps that can empower citizens and reduce call center volume to tablets that can replace reams of flight charts for Air Force pilots. Furthermore, some agencies are testing deployments in the field, leveraging increased wireless connectivity to help solve crimes, supplying more intelligence in the battlefield, and providing resources so employees can work virtually anywhere. Despite such advancements, there are still only a relatively small number of actual deployments across the Federal enterprise. Demand for mobility is rising and many Federal agencies are diligently — and promptly — trying to find ways to overcome government challenges and capitalize on their limited pilots.

What is different for Federal

Security tops the list in mobile discussions within the Federal technology community — and for good reason. In the past, agencies largely addressed security by limiting functionality in voice, data, and applications. Today, the surge of smartphones and tablets is helping to redefine mobility and can provide government employees and citizens with more services and capabilities. For instance, the Digital Government Strategy includes milestones for developing a government-wide mobile and wireless security baseline and for accelerating the secure adoption of mobile technologies into the Federal environment at reduced cost. Roger Baker, the Department of Veterans Affairs' CIO, noted that today's technology leaders just cannot say no; they must learn how to be yes CIOs or they will soon be yesterday's CIOs.² However, security is just the tip of the iceberg.

Acquisition policies should also change as mobile technology advancements outstrip traditional — and outdated — procurement processes. Budget and funding mechanisms present new questions: *How can we set up workable billing systems for data charges? How can we provide appropriate stipend models to purchase devices?* The government is taking steps to address such issues. Sites like Apps.gov are showcasing Federal ingenuity, while specific government websites — including Whitehouse.gov, USA.gov, and VA.gov — have been rewritten for mobile Web browsers. The CIO Council's "Future First" strategy will likely push agencies to provide even more mobile Web access, mean-

ing websites for mobile browsers may be built first and then adapted for desktop browsers.

Federal agencies should better plan and consider developing mobile apps to provide enhanced functionality. With the release of the Digital Government Strategy, there are now milestones to, among other things, launch a shared mobile app development program and make more of existing customer-facing services for mobile use. These are big changes. The pace and scale of delivering mobile apps will likely be new for most Federal IT organizations.

Lessons from the front lines

- **Know your use cases.** Federal agencies can address security issues by carefully considering and prioritizing their use cases. Consider the U.S. Air Force's March 2012 announcement to purchase 18,000 computer tablets.³ Rather than wait for security accreditation for a tablet's functionality, the Air Force applied it to one specific use case — storing and displaying digital flight charts and manuals. Like commercial airlines, the Air Force recognized the potential savings in weight and portability for flight crews by reducing paper. The tablets will be preloaded with the required information, circumventing the requirement that the devices be fully accepted for network access before use. Agencies can better address security issues by knowing what is and is not required by the end user.
- **Usability matters.** When was the last time you read a manual to understand your mobile phone? What about your agency's enterprise resource planning (ERP) system? Bridging the divide between mobile and traditional computing models may require not just a change of technology but a change in the way agencies should think about interface design and usability. When they build citizen-facing applications, agencies should consider going beyond just functional and utilitarian user interfaces. They should also provide interfaces that are engaging, attractive, and usable. Similarly, employee-facing applications should be intuitive and task-centric to help them improve productivity in more meaningful ways. For example, the U.S. Army's mCare App is designed to help medical teams monitor the health of wounded warriors. Similarly, a joint Bureau of Alcohol, Tobacco, Firearms, and Explosives and U.S. Marshals Service program is designed to provide agents with rapid access to critical data in the field.⁴

- **Think like a product manager.** Many Federal officials often do not think that product management is part of their core mission. Developing effective citizen-facing mobile apps requires the same life cycle management approach that is done in the private sector. This approach takes into account citizen behaviors and use cases, levels of satisfaction, and technical support. Agencies should decide which mobile platforms they want to develop for, which functions to support and leave out, and how often to release new versions. Marketing is an equally important component of product management. For example, the TSA's My TSA app — which is designed to better prepare travelers to go through the security process at airports — has received industry recognition.⁵

Getting started

Mobile strategies should be multidimensional, integrating both citizen- and employee-facing requirements. Several factors can help your organization move forward in adopting enterprise mobility.

- 1. Implement the Digital Government Strategy.** Agencies should evaluate and implement those aspects of the Digital Government Strategy that are relevant to their organizations. Agencies should coordinate their efforts as they establish a governance structure for mobility.

- 2. Identify needed skills.** Agencies should tackle problems they likely have not faced before with mobility. They should have a strategy that identifies the skills required for developing and managing apps at this new scale and pace. Industry is a good place to look for leading practices in product (life cycle) management, software development, and device management.

- 3. Establish pilots with clear use cases.** Finding the tipping point between pilot and full deployment demands clear use cases that can be promptly scaled to provide meaningful return on investment. Many forward-looking CIOs are skipping proof of concepts with the intention of going “live” if the pilot is effective.

- 4. Take a shared-first security approach.** Federal Risk and Authorization Management Program (FedRAMP), the government's cloud security program, is considered a model for efficient security accreditation in the mobile space. Agencies should consider adopting a “build once, use many” philosophy for internal deployments as well. If an app or program has been accepted for use, then it should be available to other Federal agencies.

- 5. Leverage Apps.gov to exchange ideas.** Apps.gov serves as an effective catalog for citizens to access Federal mobile apps. Agencies can publish their mobile plans and invite feedback, increasing the value of the site.

Bottom line

Today, mobile applications, technologies, and an increasingly mobile workforce are transforming the way Federal agencies are meeting their objectives. The Federal CIO Council is taking a forward-thinking approach to develop apps with the launch of Apps.gov. As the Digital Government Strategy is rolled out through 2012 and beyond, it will be up to agencies to embrace mobility as a mission enabler. The use cases speak for themselves, which is why so many agencies already have pilots in place. These pilots are not driven by mandates, but through early returns on investment, potential productivity increases for employees, lower costs, and better services for citizens.

Federal perspective endnotes

¹ <http://www.whitehouse.gov/sites/default/files/omb/egov/digital-government/digital-government-strategy.pdf>

² <http://www.federalnewsradio.com/?nid=697&sid=2290034>

³ http://www.bizjournals.com/dayton/blog/morning_call/2012/03/air-force-buys-18000-apple-ipad-tablets.html

⁴ <http://www.whitehouse.gov/blog/2012/01/12/mobile-opportunity>

⁵ <http://blog.tsa.gov/2011/03/mytsa-app-named-best-government-app-by.html>

4 User Empowerment



The end-user renaissance forces a disruptive shift in IT

In their personal lives, business users are enjoying a technology renaissance that continues to deliver simple, elegant and often innovative technology products. Then they come to work expecting the same experience. To meet those expectations, IT leaders should understand and deliver capabilities that engage each key persona of their users, enabling a given role in the way they actually perform their job. But it shouldn't stop there. The real trick is envisioning how emerging technologies and new form factors can improve how work actually gets done. Enterprise users are clamoring for mobile and social enablement – collaboration, information and insight wherever, whenever. They're looking to leave behind the legacy "point, click, type" world for one of "touch, swipe, talk and gesture," and they won't hesitate to go around central IT to get the capabilities they need. The CIO must envision the digital future and deliver the empowered present.

User empowerment builds on this reality, embodying the tenets of user engagement and embracing free-market principles that are becoming a central feature of today's IT environment¹. Said another way, it reflects the democratization of corporate technology.

End users have plenty of opportunities to bypass IT and procure off-the-shelf or low/no-code solutions that are just good enough to meet their needs. Through mobile and desktop application (app) stores, cloud-based marketplaces and rapid development and deployment platforms, business stakeholders are one swipe of the corporate credit card away from procuring rogue "almost-enterprise" applications to fulfill their unmet needs. As a result, CIOs should consider adopting a design-led, user-centric approach to new application development, while also accepting the inevitability of business users directly

sourcing apps. BYOA (bring your own application) will likely become part of many organizations' solution footprints.

These changes should not be chalked up to nefarious motivations among empowered users. They simply represent market dynamics at play. Users expect intuitive, dynamic solutions now, and corporate IT has historically focused on underlying architecture and completeness of solutions – the foundation and the plumbing, not the decor. IT's success in this area is part of the challenge: while process automation has been generally satisfied, end users have begun to expect something more. In general, they want more than utility, they want elegance – and they are typically not afraid to tap into any channel at their disposal to get it.

CIOs can use this movement to their advantage, but it may require some uncomfortable change. For starters, creative and user experience (UX) talent with a deep understanding of human behavior will likely be required as a core competency. Agile and Scrum delivery capabilities will complement heavier methodologies, supporting rapid prototyping and a design-led iterative approach. Broad integration, security and data management services should be developed – and marketed – along with proactive guidance for business users on how central IT can help in this new user-empowered world. Think service-oriented architecture – not only in the technology stack, but also in how business capabilities are described².

Without succeeding in this shift, a CIO may be treated as an obstacle or viewed as irrelevant to the business vision. That's why it's important for CIOs to guide the business through the inevitable disruption of technology innovations, and to be seen as co-conspirators by their empowered users, enabling – and accelerating – the upward journey.

History repeating itself?

User empowerment in 2012 is the culmination of a journey evolving from the industrial revolution and advancing through the information age. It is heavily influenced by technology and trends that have been guiding consumer product design and branding for decades. It also reflects the disintermediation of central IT – something foreshadowed during prior evolutionary leaps from mainframe to client server to the onset of the Internet.

	What were the challenges?	What's different in 2012?
User experience (UX)	<ul style="list-style-type: none"> • UX is meant to be broad in scope – affecting how a product is discovered, learned and used. It could be applied to any system: physical or logical, informational or transaction. UX saw a resurgence with the web explosion in the early 2000s, but unfortunately became tightly associated with site design and page look/feel, layout and flow. • UX has not been embraced by many IT departments. Some organizations that attempted to develop creative or UX competencies found it difficult to attract and retain the talent they needed. As such, the influence of UX has been limited. 	<ul style="list-style-type: none"> • User empowerment requires UX to be raised beyond ergonomics, color palettes and the placement of web elements. The principles of user engagement require creative and UX disciplines – but there is a more ambitious, transformative agenda at stake. Creating a design-led, creative-infused approach to solutions requires building from a vision of how users <i>could</i> do their jobs. This effort should not be limited by underlying systems, data or constraints of how jobs are done today. • The scope of user empowerment reaches across employee- and customer-facing functions, business processes and channels. • Users expect intuitive interfaces that require minimal training to get up and running – functional simplicity on top of elegant designs. • Composite application frameworks allow a combination of highly usable, engaging form factors hiding the complexity of underlying back-end systems – be they legacy or emerging solutions.
Human factor science	<ul style="list-style-type: none"> • A multi-disciplinary approach was taken to understand and improve how individuals interact with the world. Volumes of research existed, but they were largely theoretical and abstract, so the impact on information systems and enterprise IT was limited. • User engagement employed exacting research with influences from psychology, statistics, industrial design, operations and various branches of engineering. This required a highly specialized skill-set, making it difficult and costly to cultivate talent. 	<ul style="list-style-type: none"> • User empowerment looks to build from the breakthroughs of human factor sciences – but tailors the findings to practical IT solutions. • Advances in big data and analytics lowers the entry barriers for some flavors of insights – with lightweight tools now available to analyze voluminous, granular data describing user behavior and preferences.
Desktop-ware/macros/ almost-enterprise applications³	<ul style="list-style-type: none"> • Democratization of IT occurred in several waves: macros in the early mainframe days; desktop-ware in the early client/server days; departmental web solutions as the Internet went mainstream; and now line-of-business investments in cloud and mobile apps. The delivery model and underlying technology changed, but the pursuit is the same – agility and control. 	<ul style="list-style-type: none"> • Unlike past incarnations, user empowerment is not about enacting control or punishing innovation. It is about reinventing IT as a compelling set of service-based capabilities in line with consumer sensibilities, fluent in emerging technologies and able to guide and accelerate almost-enterprise application adoption.

Technology implications

The sentiment of user empowerment can sometimes feel esoteric and abstract. But, in practice, realizing the vision of design-led solutions that integrate almost-enterprise solutions at the fringes of the business – with legacy systems – is a daunting technical challenge. Fortunately, the required tools already exist. They just need to be effectively applied.

Topic	Description
Composite application frameworks / business process management	These frameworks are designed for orchestrating long-running, end-to-end business processes over a series of steps and discrete systems. They can be used for more simplistic business processes as well as complex ones, and for integrating processes from multiple back-end systems. Tools have emerged to allow a given transaction to be assembled from public and private cloud services, legacy on-premise enterprise systems and data, and manual tasks – by employees, by business partners and even by customers or prospects. Often coupled with business rules engines and messaging layers, these advanced platforms are designed to allow for dynamic routing and composition of services, with steps and services dictated by data in the workload, or by external factors such as supply chain status, traffic updates and customer service interactions.
Agile/Scrum	Adding to your software development lifecycle (SDLC) and operational processes and tools to support an agile approach can be a sizable effort. Release management, configuration management, portfolio tracking, project management and testing standards are likely based on traditional waterfall mentalities – and have become hard-wired in enabling systems and infrastructure.
Wireframing/ prototyping	The ability to rapidly iterate through design concepts and create representative prototypes is necessary for executing any vision for user empowerment. Don't get lost in the weeds trying to choose the right tools. Instead, attempt to standardize in order to help build critical mass in the team.
Next generation development languages	A number of no- or low-code development approaches are gaining traction – including Ruby on Rails, Python, Force.com and Google's Enterprise App Engine. Enterprise standards like J2EE, .NET and COBOL will not be completely replaced, but will likely be coupled with new languages to drive edge experimentation and rapid concept-to-prototype-to-finished-product cycles.
Integration	Back-end system integration is usually a bottleneck in the way of rapid solution build-out. Moving from representative prototypes to stand-alone applications to a critical system with interfaces to legacy systems and data can happen very quickly, especially if user adoption takes off. The most useful apps are those that are fully integrated. IT should build a service bus and integration framework capable of handling tiers of service levels – a spectrum of reliability, performance, transactional integrity and security capabilities. Recognize that user empowerment will likely introduce new integration patterns to support the required flexibility, based on SOA principles. In addition, integration from cloud offerings to the core, and from the core to external services, should be considered – from social platforms to business partner services.
Vendor, contract and asset management	Standardized processes supported by specialized tools should be deployed to track and manage vendors, contracts and associated assets. Asset tracking needs to move beyond physical devices and software licenses to become a services repository – tracking cloud services, application and integration objects, mobile apps, on-premise solutions and other IT resources, many of which may not be owned by central IT.

Lessons from the frontlines

Say cheese

A world leader in cheese manufacturing was seeing rising costs in maintaining its ten plants. Even with veteran skilled technicians, users were struggling – mostly because of aging systems with complex interfaces. Commonplace activities like transferring stock between warehouses, creating work orders for maintenance and interacting with notification events were difficult to complete. Users were making a lot of errors – and getting frustrated with the tools that were supposed to be making their lives easier.

In conjunction with efforts to standardize on a modern ERP platform, a new user interface was created, tailored to how plant workers do their jobs. Simplification was the key – showing only the information needed to complete a task, with visual cues to guide users along in the process. The intuitive front-end was integrated into the complex plant systems and back-office ERP – built upon their back-end processes, data standards and transactional integrity. With the new interface, tasks are completed using 70% fewer clicks. Technician productivity has increased by double digits, and further cost savings have been realized by reducing the need for extensive user training – all because of an engaged, empowered user base.

Your table is ready

A global leader in the restaurant industry, with brands spanning from quick service through casual dining sectors, was looking for new ways to attract and connect with customers – hoping to bolster brand loyalty, increase visits and grow average check sizes. The proliferation of mobile devices and applications, social media and analytics piqued their interest, as did stories of retail and other hospitality sectors adopting these technologies. The company decided to deploy digital technology and social media to create a new “digital experience” for customers – which allowed the business to learn more about guests’ wants and preferences.

A digital interaction platform to enable the multiple channels of engagement was the answer. By giving guests the ability to engage and interact using mobile, web and kiosk applications, the company is looking to gain insight and control over how, when and where guests interact with a restaurant brand. They took the first step by deploying online and mobile app ordering, resulting in a double digit sales increase for that sales channel. The next step will be to allow guests to see the real-time availability of multiple restaurants on a smart phone, determine locations with short wait times and get their names on waiting lists before they get to the restaurant. The restaurant can detect their arrival before they walk in the door – and be prepared with a personal greeting. These empowerment initiatives, coupled with digitally enabled loyalty and reward programs, put the power of the relationship in the hands of the customer. They are looking to their empowered users to define the restaurant of tomorrow.

Empowering the value chain

A high tech hardware manufacturer saw the opportunity to transform how its global sales force collaborated, both internally with engineering and R&D teams, and externally with business partners. The opportunity was driven by challenges associated with new product training, technical support, capturing feedback on new product and feature requests, and simple sales and fulfillment servicing. The culprit? A suite of convoluted technology solutions where each persona and each process had a separate siloed system.

A new platform to facilitate everything from collaboration and activity management to design prototyping and relationship management was created. Capabilities were built around the roles key stakeholders played. Where appropriate, information was visible across organizational boundaries. The user empowerment solution was not a substitute for existing design tools, CRM systems or reporting suites. But it tapped the relevant data and services that users needed to do their jobs, and simplified to the essence of individual roles.



My take

Randy Burdick

Executive Vice President and CIO
OfficeMax

“Why not?” That is my mantra when our business users are looking to adopt some new piece of technology they believe can help them do their jobs better – flipping the burden of proof, and being open to the evolving role of IT. Sometimes there are very good reasons why not, and in those cases we’re quick to say so. These may include security, maintainability or reliability. But these days, we’re seeing a host of commercially available tools that combine ease-of-use with deep capabilities that we could have only dreamed about a few years ago. So, when we’re asked to confirm a new technology, I challenge our team with this question: Why *can’t* we let our people do more on their own? Especially when doing so gives us room to take on bigger, higher-value issues.

This approach has been a positive development for our IT organization, and for our business. But we’ve had to adapt our priorities along the way. A great example is in the information space. As the tools became user-friendly enough to allow the business to play a more hands-on role, we shifted from building reports to building a reporting platform to allow users to create their own information views. Our charter became educating our business users on proper usage, teaching them to be good stewards while we moved on to different challenges. But we stay close, because if we’re not getting value from those investments, we all lose. It’s our job to make sure our empowered users take advantage of the functionality offered by a new tool.

Along with user empowerment, of course, comes the need for stepped-up security. The consumerization of business technology threatens to expose our organization to additional risks. Give everyone the keys to the cloud, for example, and you could be asking for problems – not only in terms of data breaches and theft, but also the unintentional sharing of confidential corporate data. As the lines separating business use from personal use continue to blur, the risks increase for everyone involved. An effective security infrastructure is more important than ever.

User empowerment has also strengthened our focus on process. In fact, this is probably the most important shift we’ve made. It’s easy to overlook the process implications of new, user-friendly technology, given how quickly adoption can happen. It’s not surprising that some users expect new technology to be a panacea for deeper issues rooted in their processes. But simplicity should to start from the business process. That’s where my IT organization can add a lot of value, making sure that our people have specified their needs clearly from the outset – and are planning for the process changes needed to help confirm that new tools deliver the expected value.

This can be frustrating for business leaders, who may think we’re presenting unnecessary obstacles and gumming up the works. But as long as we take the time to explain the thinking behind our approach, it’s easy to get them on board. When that happens, they can be smarter about the technology investments we’re making together, and we’re able to maintain a high level of quality across our portfolio.

Where do you start?

Embracing user empowerment does not require a wholesale scuttling of corporate IT. If done well, it should be a framing force that permeates the entire IT delivery model, positively redefining the brand of IT in the business. Considerations:

- **Begin with the user.** User engagement takes a user-centric, role-based, persona-aware view of your stakeholders. Who are they? How do they do their jobs? (This is especially important for understanding how customers and consumers interact with the organization.) What devices do they have at their disposal? What are their current challenges? And, perhaps most importantly, how could new technologies (think cloud, mobile, social, analytics) and philosophies like outside-in architecture contribute to rethinking how people work? In the end, simplicity is the ultimate form of sophistication. Aim for usability, intuitiveness and focus.
- **Walk in their shoes.** Do a gut check. Take a hard look at how well users' needs are being met, using consumer-facing tools and third-party solutions as benchmarks. Send some of your team to the front lines to get a feel for how work actually gets done – and where IT's capabilities currently miss the mark.
- **Know your competition.** Consumer app stores with enterprise-oriented wares continue to expand, whether cloud-based, desktop-based or mobile-based. Find out which third-party solutions or "almost-enterprise" applications might engage your users, even if they are only "just good enough" architecturally. Adopt a services mentality that allows leading solutions, even if they are sourced outside of central IT.
- **Accept reality.** CIOs no longer hold a monopoly on technology talent in a workplace that is increasingly comprised of tech-savvy workers who can bring programming backgrounds to their jobs, regardless of job function or educational background. The displacement of boomers by digital natives is part of this trend. Widespread adoption of consumer electronics – especially smart phones, tablets and gaming systems – is another. As the internal customer base becomes more technologically capable and open to experimentation, so do the number of channels through which they can circumvent IT and source their own solutions.
- **Productize.** Adopt a product-management mentality. Start with small pilots and create a mechanism for receiving end-user feedback through customer research and competitive scanning. Borrow a page from the business – thinking about IT's services in terms of the four Ps (product, positioning, pricing, placement). Design IT processes to fit better with Agile and Scrum approaches that focus on quick releases and faster time-to-market. Running IT as a business isn't just about efficiency and efficacy – it's also about making sure the perceived value of your offering is higher than the next available offering. That's the way to embrace consumerization, stay relevant in the face of democratization and leave engaged, empowered users in your wake.



Bottom line

The forces behind user empowerment can elicit a defeatist or even scornful response from the CIO. Isn't it enough to keep the lights on? Haven't users gotten the job done with the user experience of ERP and large-scale custom systems? Users may complain – but it still works. Am I really expected to try to create dazzling, engaging solutions?

Well, yes. Expectations for technology have irreversibly changed. Now that the bar has been reset, users are unlikely to accept a stark drop-off in experience from their personal to professional lives. The means are already in place to circumvent core IT. Capital is flowing to mobile application and public cloud provider ventures for each user, each process and each job function – and they're looking to take over more than their share of the IT budget.

CIOs should reimagine IT services, starting with a commitment to the user. Inject creative and design thinking into the delivery model. Move from "thou shalt not" mandates to services that guide and aid the adoption of almost-enterprise applications. Aspire to deliver innovative, intuitive, usable and simple solutions – and harness the power of your empowered users for higher business performance.

Endnotes

¹ Additional information is available in Deloitte Consulting LLP (2011), "Tech Trends 2011: The natural convergence of business and IT", <http://www.deloitte.com/us/2011techtrends>, Chapter 8.

² Additional information is available in Deloitte Consulting LLP (2010), "Depth Perception: A dozen technology trends shaping business and IT in 2010", <http://www.deloitte.com/us/2010technologytrends>, Chapter 10.

³ Additional information is available in Deloitte Consulting LLP (2011), "Tech Trends 2011: The natural convergence of business and IT", <http://www.deloitte.com/us/2011techtrends>, Chapter 2.

(More) Power to the people

Users increasingly expect greater autonomy and freedom as technology is more deeply ingrained into everyday tasks, from buying books to booking travel plans. From mobile computing to ERP platforms, Federal agencies recognize user empowerment as a way to provide better services and meet their mission objectives. To get there, agencies should refocus their efforts on providing users with not only what they want but what they need to finish a task — and that means rethinking and improving user interface design. Competition has helped the private sector excel in this area, but in the public sector, government agencies are usually among the only game in town (think law enforcement or benefits distribution), where process and stove-piped views often dictate design. Agencies usually do not compete with other organizations to provide certain services, so they are less motivated to provide customers with a more engaging experience — but that is changing.

There are subtle ways competition can be introduced. With the proliferation of apps, people are willing to trade up for more convenience. To keep pace with user demands, organizations rapidly develop, prototype, and release apps with the expectation that user feedback will be incorporated into subsequent releases. This model is becoming more common among Federal agencies. After years of designing monolithic systems that do everything, agencies are developing smaller, specific apps with a discrete purpose and then combining them to tackle larger projects.

In 2012, throw out assumptions that usability is only about aesthetics or that systems will require more specialized training. More and more organizations are realizing that usability plays a fundamental role in how users digest and act on information — so that they can easily and effectively use an app to finish their tasks.

What is different for Federal

In a few areas, government agencies have long depended on effective interface design to help users. The Nuclear Regulatory Commission takes great care in reviewing proposals that might change the layout of controls in nuclear power plants. Today, more and more agencies are applying user interface design beyond such critical scenarios. The interagency Federal Web Managers Council, established in 2004, seeks to provide a government-wide focus on improving the delivery of information and services online.

Another factor pushing agencies to improve interface design is the large, expensive, and difficult-to-procure ERP systems, which require extensive training to operate and can be difficult to use for many Federal employees. The government is shifting to lighter and more agile deployments, such as task-centric mobile applications. For example, the Air Force is providing service members with mobile tools to perform work in the field rather than return to the base to finish work.

Yet, we have only just scratched the surface with respect to what could be achieved. In spite of recent advances, policymakers and stakeholders still have not grasped the importance of usability. Consequently, Federal agencies should promote examples that demonstrate the effectiveness of usability and strengthen the business case. Agencies will need to understand the benefit of providing a more effective user experience. These benefits can include less time in answering citizen questions or in problem resolution and more efficient interaction with the public in general. For internal systems, good user interface design can lead to less training, fewer errors, and more efficient work by employees, not to mention higher levels of satisfaction. Additionally, procurement policies should change to encourage officials to consider usability, and promote it as a valuable attribute.

Lessons from the front lines

- **Engage the user.** In the past, Federal agencies leaned on the judgment of developers and program managers to design user interfaces. As a result, they created highly functional products that were challenging to operate. Instead, agencies should directly engage users to better understand and address their pain points as well as make use of experienced professionals that have designed quality user interfaces. This will likely lead to a new perspective that can help agencies better automate work processes, deliver tools, and provide more value. This process involves greater collaboration across the organization, but agencies will see bigger returns on their investments by providing users with the relevant information on their terms at virtually anytime.
- **Embrace mobility.** Mobility is increasingly playing a larger role in user empowerment. With effective tools in their pockets, users can provide rapid feedback to agencies, allowing agencies accordingly to respond more promptly with newer releases. Apps are the very substantiation of the Federal CIO Council's call for agile development. An app usually begins as a solution to a very specific task or challenge and then grows in functionality through frequent updates that address user circumstances. Agencies are rapidly deploying applications to citizens and stakeholders alike, available on Apps.usa.gov. The Federal Digital Government Strategy can only accelerate this trend as it is designed to engage citizens and improve services for them, enhance employee productivity, and lower costs.¹
- **Leverage internal competition.** Just as smartphones have led to new efforts and alternative ways to provide more substantial mobile support in the consumer market, government catalogs and storefronts for applications can help drive improvements in the Federal program and help CIOs decide whether to build or buy. As tools from commercial providers and offerings from GSA's Apps.usa.gov become more available, it will likely become easier for program managers to consider alternatives and help CIOs better direct investments when more custom approaches are required. CIOs will broker existing frameworks or build new ones only as needed to more directly help the requirements of users.

Getting started

1. **Shift from functional to useful.** To help the user, agencies should understand what is useful for everyday citizens and their employees. Many systems undermine effective results. It is not because they are inelegant or poorly designed, but they just do not help people do their jobs well. Agencies should start with the user and work their way backwards. For citizen services, ease of use can lead to effective self-service, reducing repetitive tasks and delays while also improving positive customer experience and metrics.
2. **Make it obvious.** Newer generations of employees are used to intuitive applications, minimal training times, and faster development cycles with more frequent updates. Whether it is about desktop productivity or device functionality, users want it to be intuitive at some basic level — with more intense training for power users. For example, an important aspect of designing a smartphone app involves the look and feel of the icon. Developers draft dozens of mock-ups in an effort to make the exact functions of their app obvious on first glance. Agencies should design their systems with that same attention to detail.
3. **Prompt answers count.** *How many clicks will it take me to navigate an agency Web page? How many clicks will it take to send an email?* Employees want to do their jobs effectively and efficiently and may consider such questions when choosing applications. In this context, agencies should measure, for example, how many clicks it takes to perform even the most basic function on their ERP systems because each additional click is a potential speed bump — or roadblock — for users. Agencies should reexamine these aspects because reducing useless drop-down menus and confusing pop-ups is not just about aesthetics — they are about increasing efficiency.

Bottom line

User-centered design focuses on helping the user become more effective and the agency fulfill its mission — not just on providing a pretty interface. Empowered users, both citizens and employees, can better finish tasks that they could not do before when they have an effective interface to work with. The U.S. Department of Veterans Affairs' Post Traumatic Stress Disorder (PTSD) app is a leading example of what can be achieved. Through this app, veterans and service members get critical mental health information and resources anytime, anywhere. Agencies recognize that barriers to achieve this kind of meaningful empowerment are not as high as they used to be. The PTSD app did not take tens of millions of dollars to develop or several years to deploy; it was created through rapid agile development and responsiveness to real user circumstances. By embracing these examples and making more informed decisions about what kind of technology will have greater impact on users, agencies can increase their value to citizens and employees.

Federal perspective endnotes

¹ <http://www.whitehouse.gov/blog/2012/05/23/roadmap-digital-government>

5 Hyper-hybrid Cloud



Adoption moves from *cloud* to *clouds*, and hybrid emerges as a dominant model

As cloud offerings added vertical business capability offerings to the horizontal IT capacity services, the adoption question changed from “if” to “when” – and the answer is frequently “now.” Along the way, leading organizations moved from cautious exploration to the reality of multiple individual cloud offerings handling critical pieces of their business operations – and sourced from multiple public and private providers. In each instance, these offerings needed to be connected back to the core of the business, often through traditional data-driven on-premise integration solutions. Advance one step further, and the organization is managing both exception and routine workflow across a growing range of disparate cloud offerings with point-to-point links to legacy systems and data. This shift from “cloud” to “clouds” provides new opportunities, but it also brings challenges beyond just integration – security, data integrity and reliability, and business rules management for business processes that depend on enterprise IT assets composed with one or more cloud services. Welcome to the world of hyper-hybrid cloud.

Integration, master data management and enterprise architecture have historically served as the linchpins in modern IT shops – a role that has only become more important with the adoption of multiple cloud solutions. As more functional business leaders independently subscribe

to cloud offerings outside of the trappings of traditional IT, underlying business processes can become riddled with multiple cloud players that the organization itself must integrate and orchestrate. As a result, much of the “IT-free” value proposition can dissipate at the enterprise level.

A true cloud broker may eventually emerge, delivering bundled, composite business capabilities that are meaningful to the end subscriber, while hiding the complicated integration, orchestration and rules management plumbing. But today’s reality forces enterprise IT to fulfill these services. Leading CIOs will do so in terms the business can understand – outcomes, value, assurance and service levels – to create the next level of IT services catalog.

The debate around “to cloud, or not to cloud” is beginning to subside. As adoption becomes more widespread, businesses are increasingly willing to deploy multiple applications and infrastructure services on cloud platforms. For large corporations, efforts remain focused on “edge” applications such as sales, services, marketing and human resources. As usage grows, however, ambitions will likely follow. Enterprises will source more capabilities – leading to custom extensions, more interfaces back into the core, and a growing mix of cloud-based solutions to fulfill business needs. CIOs need to build the foundation for a hybrid-cloud future today, and use it as a stepping stone towards tomorrow’s outside-in architecture¹.

History repeating itself?

Though cloud is still emerging on the business technology agenda, the underlying technology is built on long-established principles of distributed computing, automated provisioning, high-speed networking and virtualization technologies. And, like other technology maturity curves, the cloud marketplace has already seen multiples waves of fragmentation, consolidation, big bets and commensurate hype.

	What were the challenges?	What's different in 2012?
Capacity clouds	<ul style="list-style-type: none"> • Early cloud offerings were focused on delivering capacity efficiency for the traditional layers of IT – infrastructure, platforms and software packages – often commoditized, isolated resources delivered at scale, within attractive sourcing and pricing models. Infrastructure-as-a-service was a fixture of this wave, offering subscription-based compute, storage and network resources. Even early platform and software plays were capacity-driven, providing logical environments or licenses per software seat. • Primary buyers were IT departments and niche functional owners whose needs directly aligned with individual platform and software offerings. • Siloed cloud services with relatively contained scope led to modest initial investments in integration, orchestration, security and policy management services – inside the enterprise trust zone and frequently data-driven operational data store (ODS) approaches. 	<ul style="list-style-type: none"> • Increasing investments in infrastructure cloud offerings must integrate with broader Software as a Service (SaaS) application environments. • Cloud procurement is becoming accepted, and in some cases is standard practice, across the business and IT. • Business use cases are growing more complex. Previously isolated cloud workloads require integration with each other and with core back-office systems. Dependencies on security, data correlation and service lifecycle management have also grown, requiring specialized disciplines for delivery and maintenance. Trust is extended beyond the enterprise, and integration moves from data-driven to service-driven, or even event-driven. • The evolution to capability clouds brings with it new buyers across the business and IT². The business case is still found for cloud to provide capacity-efficient layers of the IT cake, but business users are looking for the capability-oriented slice of layer cake.
Capability clouds	<ul style="list-style-type: none"> • The move from horizontal IT capacity layers to vertical slices of cloud capability services with higher business value became a leading practice. But the speed of adoption led to challenges in the ability to support integration, correlation and security requirements – limiting the pace of adoption and reducing the value provided to the business. • Proprietary workflow platforms between capability cloud providers and subscribing organizations constrained the ability to offer combinations of multiple cloud services to solve a higher-order business problem. End-to-end business processes entailing multiple services had to be managed explicitly, sequentially and point-to-point. 	<ul style="list-style-type: none"> • Cloud vendors are investing in software to provide more sophisticated application program interfaces (APIs) and service control points for multi-cloud/multi-provider environments. In the meantime, organizations are required to build out integration, data management and security services to allow hybrid-cloud capabilities with shared policy and management platforms. • Cloud brokers are emerging that aggregate and orchestrate cloud-to-cloud transactions as-a-service, subject to enterprise-class service level agreements (SLAs). • As-a-service business rules engines are likely to emerge in the cloud that will allow routine processes to flow across composite services from heterogeneous providers, with only exception conditions returned to the subscriber "hub."

Technology implications

Many organizations are adopting a hybrid-cloud approach that combines on-premise enterprise assets with multiple cloud-based services (both private and public). Managing the underlying technology requires an enhanced set of technology disciplines.

Topic	Description
Federated identity	Identity, credential and access management becomes essential when multiple cloud offerings are integrated and applications coordinated. As industry standards such as Security Assertion Markup Language (SAML) emerge and are adopted, federated identity solutions will mature. This will allow strategies to manage user roles and facilitate enterprise single sign-on between cloud providers and traditional enterprise technologies.
Cloud-based integration	Cloud-based and cloud-aware integration offerings continue to evolve, accelerating interface development and data translation between various public cloud services, and offering lightweight orchestration for processes involving multiple cloud environments. Feature sets are still in the early stages of development, but independent software vendors (ISVs) are aggressively extending products to manage composite cloud-based applications.
Operations Support Systems (OSS) / Business Support Systems (BSS)	In much the same way that capability clouds introduced new needs, hyper-hybrid cloud adoption requires management capabilities from deployment to usage, management of pricing across a number of cloud services, and automated provisioning of business processes from a range of sources. Hyper-hybrid clouds also require new services to order, provision, manage, monitor usage, bill and remediate these services, with control points at the infrastructure, application and business levels. Standalone cloud services bring plenty of complexity on their own. With hybrid clouds, the complexity is multiplied.



Lessons from the frontlines

What, me integrate? Cloud service brokers emerge

Mohawk Fine Papers was looking for a way to manage their hyper-hybrid application footprint, with several cloud solutions at the infrastructure, data, platform and application level³. They bypassed the internal build-out of integration and orchestration services, choosing instead to partner with an aggregator and orchestrator of cloud services that managed the relationships and interdependences required. Any back-end complexity is transparent to Mohawk, which simply contracts with its partner to manage service levels that are informed by business objectives.

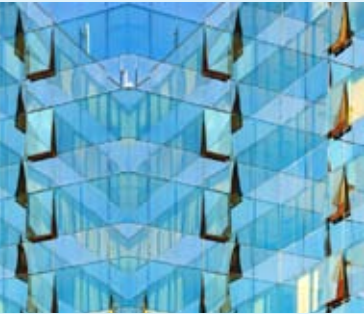
Moving from data pipes to cloud fabric

Enterprise mobility services are experiencing explosive growth⁴. Mobile solutions are increasingly dependent on a variety of cloud services for everything from content streaming to distributed computing, creating even more hyper-hybrid scenarios for businesses. For example, a multinational telecommunications corporation plans to monetize this combination of trends by creating a commercial service delivery platform built on cloud-based infrastructure to give external developers access to their core wireless network APIs. These APIs include location, messaging and subscriber charging. The goal? To create an ecosystem of application developers – leading to new revenue sources for the carrier and increased customer retention.

Human capital in the cloud

A leading insurance firm began investing in public cloud offerings to improve its human resources processes. One initiative targeted resume sourcing. Another investment went after background checking. Yet another was focused on employee performance management. Each initiative required interfaces into legacy ERP systems for functions like payroll, time tracking and benefits planning. Because the various cloud services were discrete offerings from different vendors, the organization and the CIO were on the hook for managing the different point-to-point interactions. The chief talent officer had been aiming for simplicity by looking to cloud services, yet new complexity across her hyper-hybrid “hire-to-retain” process was the unexpected result. The company handled the first wave of interoperability needs through traditional data-driven interfaces. Now they’re looking to take advantage of cloud-based integration frameworks to ease development and maintenance – and to make the architecture more flexible for wherever the next round of investments takes them.





My take

John Seely Brown

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Many CIOs are rightfully wrestling with the technical realities of growing cloud adoption. Security. Integration. Distributed data management. Workflow and orchestration. Now that the hybrid model of cloud services has become common, those issues are compounded with multi-cloud and cloud-to-cloud complexities. But beyond the IT stack there is a challenge on which many organizations haven't yet focused: what does it mean to rethink my business as a collection of services? Business services that can be consumed internally or externally, independently orchestrated, provided in-house, via an external cloud – or most likely a hybrid of both. Tackle this question head-on to get results in a hyper-hybrid world.

Cloud is about services. So, the first step in exploiting the power of cloud involves "services thinking." That's about defining operating models, business processes and technology components as services – within and beyond the enterprise. And it demands that companies develop a disciplined set of control points for an emerging services grid - control points with policies in place that flow up and down the stack. Unfortunately, getting a clear handle on the policy layer is often more easily said than done. Policies are often embedded across multiple layers of enterprise software, making them difficult to see, let alone orchestrate. It takes focus and resources to dig them out and make them fully explicit.

When there is a clear vision for a services grid, with progress defining and deploying business control points, then integration, workflow and the services grid itself can reach outside a single enterprise. In fact, the disruptive potential may be most significant in more dynamic expressions of the business across hyper-hybrid cloud services, and contingent workflow planning should be brought into the fabric of the architecture, shared between parties. In short, the outside-in mentality⁵.

Go past cloud point solutions. Don't assume cloud automatically results in an effective services-oriented (business) architecture. And keep in mind that it's nearly impossible to execute a coherent cloud strategy without addressing social, mobile, big data and visualization. These are coupled as long-term socioeconomic, global factors increasing pressures on firms in an environment of constant, and disruptive, change – the focus of our Big Shift and annual Shift Index research⁶. In my view, you should look at how these trends are converging from the outside in to appreciate the enormous potential – and challenge – ahead of us.

Whether your organization will shift to cloud services is unlikely to remain an open question. The question now becomes *how* that shift is likely to happen. Will your approach add complexity to your technology environment – or will it bring elegance and simplicity? The choice is yours.

Where do you start?

IT investment should start with clear business objectives, a well-defined business case and outcomes that can be measured and evaluated. This is equally important for cloud services. Deliberate considerations were true for standalone cloud tests and rapid innovation pilots, and become even more crucial as the scale, scope and cardinality of cloud services grow. Specific tactics may differ based on your current level of cloud maturity. For many companies, CRM, sales, HR, payroll and collaboration are among the first functions to move to a cloud. These are obvious points of entry for organizations that want to introduce changes that will feel familiar to many in their workforce.

Cloud greenfield

Organizations in the early stages of their cloud computing strategy should first determine if cloud services models are well-suited for their business problems and technical environments. The following five attributes (derived from the NIST definition⁷) should be assessed. If all five are relevant, cloud is a potential fit.

- **Predictable pricing:** Subscriber incurs a charge only when consuming resources, based on subscription and usage, not on perpetual licensing or allocation
- **Ubiquitous network access:** The service is available wherever and whenever the network is available – enterprise network for private cloud, Internet for public cloud
- **Resource pooling and location independence:** Multi-tenant, with shared resources that the subscriber cannot explicitly partition or specify
- **Self-service:** Users can directly access the service, provisioning is on-demand, and services are readied in near-real-time
- **Elasticity of supply:** Ability to scale up or down to meet resource demands, with seemingly limitless upper bounds

When preparing to move ahead, start by articulating the business goals, identifying key security, risk and compliance considerations, and investigating potential cloud and traditional solutions. Speed to solution through rapid, low-risk implementation can be a benefit of cloud computing: get ready to think big, start small, fail fast and scale soon. The path to hyper-hybrid will likely lead to custom extensions of initial cloud services, increased interfaces to core back-office systems and data, and the pursuit of SaaS application capability cloud offerings.

From cloud to clouds

Organizations that already have sizable cloud footprints should evaluate how well these solutions are meeting the original business intentions and business cases. Further integrating non-performing cloud services can only increase technology dependencies and complicate future migration strategies. Consider creating shared platforms for identity, access, data correlation and business rules – separating these crucial policy services from specific cloud-based functions or traditional on-premise integration hubs. Consider cloud-based integration platform-as-a-service solutions to complement enterprise integration layers or service buses. These platforms can manage the interactions between in-house enterprise apps and associated cloud services. Forward-looking organizations can initiate conversations with early-stage cloud service brokers, helping to drive the emerging market around cloud endpoint orchestration, aggregation, remediation and billing.

Bottom line

Today, hyper-hybrid clouds are an advanced form of cloud services in the early stages of adoption, but the approach is rapidly becoming the norm for cloud services architecture. All types of organizations are trending towards hyper-hybrid clouds. Start-ups have a cloud-first mentality, since spending is prioritized towards market-facing products and services, rather than capital-intensive data centers, infrastructures and on-premise licensed software. In fact, these organizations are setting the standard for the hyper-hybrid environment, using it to guide both new operating structures and IT delivery models. Larger enterprises are seeing cloud services extend and enhance their ERP and large legacy system investments. Core in-house systems can form the foundation upon which emerging technologies can be deployed, without sacrificing business compliance and controls. Organizations that can bridge hyper-hybrid clouds with their core systems will be at the forefront to elevate business performance with the next wave of digital innovation.

Endnotes

¹ Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", www.deloitte.com/us/techtrends2012, Chapter 10.

² Additional information is available in Deloitte Consulting LLP (2011), "Tech Trends 2011: The natural convergence of business and IT", <http://www.deloitte.com/us/2011techtrends>, Chapter 10.

³ Gartner, Inc. "Case Study: Mohawk Fine Papers Uses a CSB to Ease Adoption of Cloud Computing," Benoit J. Lheureux, July 19, 2011.

⁴ Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", www.deloitte.com/us/techtrends2012, Chapter 3.

⁵ Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", www.deloitte.com/us/techtrends2012, Chapter 10.

⁶ Additional information is available in Deloitte Consulting LLP (2011), "The 2011 Shift Index: Measuring the forces of long-term change", http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/us_tmt_2011shiftindex_111011.pdf

⁷ Peter Mell and Tim Grance, *The NIST Definition of Cloud Computing*, <http://www.nist.gov/itl/cloud/upload/cloud-def-v15.pdf> (October 7, 2009).

Mission multiplier

Forces from the consumerization of IT to the emergence of mobile computing are driving a greater adoption of cloud computing across the commercial sector. Many Federal agencies today are also exploring and adopting single and multiple cloud options — some are planning a private infrastructure-as-a-service environment, some public options, still others one that is intended to accomplish a specific task (that is, one task, one workflow, one cloud). However, the hyper-hybrid cloud model, where workflows and mission capabilities often span multiple systems in a complex and very large value chain with multiple cloud offerings involved, can potentially be more transformative than either capacity or capability clouds in large enterprises like the Federal government.

As IT demands move from single clouds to multiple, isolated clouds to hyper-hybrid clouds, they will be able to envision new concepts of operation, beyond the expected benefits of lower costs, faster service, and greater capacity. Mission programs and CIOs will also be able to choose from the many shared services centers and cross-component services that will emerge in this new environment. The hyper-hybrid cloud model can offer agencies the opportunity to look at their operations and business in new ways because business process and workflow will span cloud services, and individual cloud services can interact with and be built upon each other rather than stand as isolated functions or capabilities. The result, a coherent business solution built across more effective functional cloud offerings.

So, what is the tipping point for agencies to migrate to hyper-hybrid clouds? The trend is already underway, albeit in the early stages.

What is different for Federal

So far, Federal agencies have largely used cloud computing for email, collaboration, disaster recovery, development, and testing environments. As they move beyond the initial phase of cloud adoption, agencies will likely transition *more critical functions to hyper-hybrid clouds — and look to transform their businesses.*

Even as more opportunities emerge, there will also be challenges, such as security, budgeting, coordination with acquisition and suppliers, and collaboration with other agencies and departments. The Federal Cloud Computing Initiative is tackling some of these issues, although in piecemeal fashion. Additionally, agencies could face other issues, such as coordinating standards among multiple cloud environments and sharing information across stovepipes — including data exchange between internal and external clouds. Some Federal programs and efforts are addressing these matters and could determine the future effectiveness of hyper-hybrid clouds. For example, the FedRAMP is a joint effort among agencies and private industry to provide a standardized approach to assess security approaches for cloud services and products, while the National Institute of Standards and Technology is developing security, interoperability, and portability standards.¹ Similarly, service centers are collaborating unlike before to leverage information across domains.

As they gain familiarity and experience, Federal agencies can increasingly interface their systems and capabilities with private, public, and now community clouds operated or sponsored by other government shared services centers. In this changing environment, agencies should think differently about their boundaries and that may mean reexamining their policies. Some agencies may choose to extend core IT capabilities into a shared services model for components inside the organization as a way to reduce redundancies and focus resources. Others may seek industry's help with research-based innovations through funded pilots, such as sharing geospatial information. This will allow an agency to explore a specific capability and see what policies may be needed.

Lessons from the front lines

- **Avoid the “custom” trap.** Compared with other models, hyper-hybrid clouds can be more economical and perform better with a high degree of standardization and repeatability as the interfaces allow for business process and workflow to be coupled across services. Using a building block approach and selecting service components from the provider(s) that better meet the requirements is a shift to better value and agility versus fit. When Federal agencies procure IT services, they generally tend to push their own special architectural requirements onto the provider, which not only often results in substantial engineering and planning efforts but may create tailored systems that are more complex to reuse, share, and maintain. Instead, agencies should survey their future IT requirements and require similar capabilities and a cloud delivery model — whether it is across multiple components inside the organization or government-wide. With standard core capabilities and a building block approach, teams can become more agile and responsive. With a “least-common-denominator” approach, agencies can connect their cloud resources and gain more effective services over time.
- **Adopt a service approach.** Shifting from a systems approach to a service approach is challenging, particularly since the concept of buying IT on a per-use basis is new. IT and acquisition teams may have steep learning curves, especially when dependencies and service level agreements across multiple cloud providers put the government in the integrator hot seat. Agencies should find ways to drive interoperability for data and business processes if standards do not exist.
- **Look for the “new.”** Innovation is often the (re)application of an idea to a new business problem. The Federal Cloud Computing Initiative is encouraging agencies to rapidly transition existing services to the cloud, but when these initial steps are finished, IT departments should search for new opportunities or innovative ways related to cloud computing delivery models. It is not just about cutting costs; the hyper-hybrid cloud model could significantly improve an agency’s ability to meet mission goals in new and interesting ways. By looking for the “new,” CIOs and programs can lay the groundwork to collaborate across multiple service centers and information domains, which was inconceivable in the past.

- **Discuss policy, not just technology.** When it comes to the hyper-hybrid cloud model, policy barriers are often greater than those involving technology. Current technology issues are manageable since hyper-hybrid clouds will depend on the same kind of infrastructure as existing services. Agencies should consider transforming their culture to promote the kind of collaboration that hyper-hybrid clouds can facilitate. Just look at how the intelligence and law enforcement communities expanded information sharing over the last decade. These communities removed policy and cultural barriers to change the way they collaborate. Hyper-hybrid clouds can take it one step further — from information sharing to services sharing.

Getting started

- 1. Build on experience.** As an agency gains more experience with cloud computing, it will be in a better position to take advantage of the hyper-hybrid cloud model. CIOs and chief technology officers should pay particular attention to the challenges they had to overcome in the early years of cloud adoption. Many of those same challenges will be revisited and revised as cloud computing evolves into cloud services. As agencies deploy private and community clouds, new ways of connecting data and services will likely emerge naturally.
- 2. Focus on the mission.** CIOs and IT departments did not need to consult with program managers when email services were transitioned to the cloud. However, with hyper-hybrid clouds, they should work hand in hand with mission leaders to understand their requirements, the potential for new workflows, and new opportunities. Cloud enables inexpensive research-based innovation that can affect the mission.
- 3. Refresh your cloud strategy.** Agencies should consider developing and refining their internal cloud strategy. Agencies already have a strategy that had to be prepared and submitted to the Federal CIO Council, but that should not be the end of it. Agencies that have a clear and flexible “living” strategy will not be distracted by things that should not be delivered through the cloud. It will help them focus on areas that will materially affect mission performance.

Bottom line

For Federal agencies, moving to a hyper-hybrid cloud model is as much about navigation as it is about preparation. Look for hyper-hybrid clouds to flourish first in shared services centers where agencies get comfortable with new concepts of operation with an eye toward transforming mission delivery. Law enforcement and national security agencies are likely candidates for early adoption as their fusion centers already serve a similar function. Although the public sector leans on contractors and integrators to deliver on its strategy, the broader public sector ecosystem is responsible for getting up to speed across multiple dimensions — from strategy to IT to acquisition. As agencies overcome issues like security and take larger steps toward planning around the greater good of their shared mission, the hyper-hybrid cloud model can present more opportunities to combine capabilities, share data, and ultimately revolutionize service to the citizen.

Federal perspective endnotes

¹ See page 7 of the 25-Point Plan: <http://www.cio.gov/documents/25-Point-Implementation-Plan-to-Reform-Federal%20IT.pdf>

Enablers

6 Big Data Goes to Work



The competition between big data and traditional enterprise data is over: they both win

Just as businesses start to appreciate information as a strategic asset, they are overwhelmed with big data – from growing volumes and increasing complexity to the proliferation of unstructured data sources and a surge in external data streams. Internal and external, structured and unstructured. Volume. Variety. Velocity. But where's the fourth V for Value?

The potential of big data is immense. Remove constraints on the size, type, source and complexity of useful data, and businesses can ask bolder questions. Technology limitations that once required sampling or relied on assumptions to simplify high-density data sets have fallen to the march of technology. Long processing times and dependencies on batch feeds are being replaced by on-demand results and near real-time visibility. Processing becomes focused on flows vs. stocks of data. External and unstructured data have moved from indecipherable black boxes to sources rich with insight. Web logs, social media streams, RFID and other sensor data, click-streams and a host of other sources can be used for practical business advantage. This transformation changes the questions that can be asked, but it also requires new tools and techniques to get to the answers.

Technology has risen to the occasion, though solutions often differ from those found in many traditional relational, structured enterprise information footprints. NoSQL frameworks, in-memory column-based databases and database appliances have advanced to answer the explosion of semi-structured and unstructured data. Visualization tools have matured. And traditional business intelligence and data warehouse tools have added support for big data inputs to their models. This last piece is especially important. Big data complements existing information disciplines, tapping new sources and providing

new insights to extend the value of long-standing operational reporting and analytics programs.

"Forecasts such as 200 billion intelligent devices by 2015 and 275 exabytes per day of data being sent across the Internet by 2020 – and the growing desire to leverage email, documents, audio and video – are indicators of looming challenges."¹ But big data is not about becoming a librarian of this content explosion; it is not about cataloging, cleansing and finding a home for the entirety of the data deluge. The business focus of Big Data should be on signal detection and sense-making – determining what information is valuable, storing what is relevant and bringing valuable new knowledge to the enterprise. A small percentage of external unstructured data may drive huge insights. The trick is figuring out where to focus.

Similarly, the ability to take advantage of big data does not require a fully realized analytics capability. It may be tempting to sit out this new wave until your information house is completely in order, but big data opportunities are real today. A delayed response may only widen competitive gaps. A more effective approach may be to consider pursuing big data in parallel with investments in enterprise information management, descriptive analytics and advanced analytics².

While big data tools and techniques continue to evolve rapidly, the biggest impediment to capturing value from big data is talent. Technical resources are scarce. Even more precious – and rare – are the skills and experience to know which pieces of the big data puzzle can be applied to specific crunchy questions that can drive effective action and measurable results. This challenge calls for business analytics architects who can scope business problems, facilitate the underlying model build-out and turn insight into action. That's what it means to put big data to work.

History repeating itself?

Big data is an evolution of long-standing information disciplines. It expands the range of data sources, the amount of data that can be processed and the speed with which answers can be derived. But what separates big data from conventional approaches to information management?

	What were the challenges?	What's different in 2012?
Operational reporting, business intelligence and data warehouses (BI/DW)	<ul style="list-style-type: none"> Many organizations have long-standing information management programs, with the expected trappings of data warehouses, business intelligence suites, reporting platforms and relational database experience. Unfortunately, the tools and techniques that guided us through transactional, structured, relational data are not all well-suited for the deluge of big data – where signal intelligence is more important than transactional integrity, distributed performance trumps consistency needs, and unstructured external data combines with internal data at the heart of many valuable analyses. Relational databases and traditional data warehouses allow modest compression, typically 3:1 or 4:1 ratios. When coupled with pricing of ~ \$20K per terabyte, large volumes of data lead to high costs – even if the majority of unstructured data does not require durability, integrity and consistency³. 	<ul style="list-style-type: none"> Big data is well-suited to complement existing information assets – running specialized algorithms on massive data sets and feeding the results into traditional BI/DW solutions. Instead of “rip and replace,” think “augment and enhance.” ACID⁴-ity of the traditional information techniques is kept for reporting and conventional decision support, but it is enriched by the scope, speed, availability and scale of big data inputs. Big data technology is designed specifically for volume, variety and velocity – with columnar databases, in-memory platforms and the ability to distribute complex jobs across nodes – internally or in the cloud. Just as most data warehouses are ill-equipped to deal with large volumes of unstructured data, big data platforms are not preferred for well-structured scenarios requiring transactional integrity. Not surprisingly, a new hybrid class of database management system is emerging to bridge structured and unstructured management in one platform.
Analytics	<ul style="list-style-type: none"> Structured, transactional data within the organization has been an all-consuming labor. Analytics efforts were not intentionally nor deliberately ignoring semi-structured and unstructured data, but the magnitude of traditional information challenges were the dominate focus. 	<ul style="list-style-type: none"> The fundamental concepts of core data disciplines (stewardship, data management, data quality, governance) and the potential of descriptive, predictive and prescriptive analytics⁵ are even more relevant in the big data era. But, they should be selectively applied for each data source, extended for the unstructured and semi-structured sources, and guided by desired business outcomes.

Technology implications

Big data not only introduces new database and analytics platforms; it also leads to new database management, coding, querying and tuning tools and techniques. New technologies should be deployed, integrated to existing assets and managed. Some of these include:

Topic	Description
Data architecture	Many tradeoffs are included in the design of the information architecture to support storage and analysis of big data. Commodity or special-purpose hardware? Relational versus non-relational data stores? Virtualized on-premise servers or external clouds? In-memory or disk-based processing? Store the data in uncompressed format to speed up access, or compressed format to minimize storage costs? Should tables be split by row and distributed across multiple servers (a practice known as sharding) to improve performance? Do column-oriented or row-oriented operations dominate the processing? Enterprises should decide whether to create a hybrid platform – combining existing assets with new solutions and extending legacy architecture – or building and connecting new green-field solutions and supporting architectures.
Column-oriented databases	Relational databases are inherently row-based, with a single entry containing the related attributes for a logical item. This can be most effective for transactional systems, which are typically dealing with multiple facets of entities such as customers, products or warehouses. But relational databases are not well-suited for tasks such as comparing a single attribute across a large universe of rows. Column-oriented databases store content by grouping similar attributes together. For example, instead of zip code being one field of many in thousands of customer records, there is a record containing virtually all of the zip codes – and other records for each of the other customer attributes. The benefit is rapid, selective querying with significant compression advantages based on the homogeneity of columnar data.
In-memory databases	As the name suggests, this refers to database platforms using CPU memory for data storage instead of physical disk. By reducing the number of disk input/output (I/O) calls, complex queries can be executed at much greater speeds than conventional databases requiring discrete cycles for data retrieval, aggregation and processing.
NoSQL	“Not Only SQL” is an alternative to relational database systems designed to accommodate semi-structured and/or inconsistent, sparse data. It is not a replacement for structured data. Rather, NoSQL looks to provide a foundation for various types of content. It does not require fixed table schemas, avoids join operations, and can scale horizontally across nodes (locally or into the cloud). There are many flavors of NoSQL, with both open-source and licensed alternatives, many built to meet the needs of leading social and web platforms. Some examples are Hadoop (Google, Yahoo!), Cassandra (Facebook), Dynamo (Amazon), Project Voldemort (LinkedIn), Riak, CouchDB and MongoDB.
Database appliances	These are self-contained combinations of hardware and software to extend storage capabilities of relational systems or to provide an engineered system for new big data capabilities such as columnar, in-memory databases. Some examples include: Oracle with Exadata and Exalytics; SAP with BW Accelerator and HANA; IBM with Netezza; and the EMC Greenplum appliance.
MapReduce	This technique is for distributing computation on large data sets across a cluster of commodity processing nodes. Processing can be performed in parallel, as the workload is reduced into discrete independent operations, allowing some workloads to be most effectively delivered via a cloud-based infrastructure.

Lessons from the frontlines

Boosting marketing IQ

A leading Internet marketing organization uses a combination of big data and traditional analytics to drive marketing effectiveness studies. Torrents of clickstream data are combined with social media profiles, location data and web campaign data. MapReduce analysis is used to determine which web sessions were relevant to a given ad campaign, with the results fed into a conventional data warehouse for segmentation and predictive analysis. The number of impressions increased and click-through rates grew via improved targeting, and the results are fueling algorithms for future advertising placement decisions.

Business as usual? Not exactly.

A car rental company was trying to stay in touch with customer opinion through the thousands of pieces of feedback it receives daily across their 8,000 locations in the form of web surveys, email commentary, text messages and feedback cards. But the geographic dispersion of their business and the unstructured form of the content made it tough to put to use. Big data changed that. Previously unwieldy data volumes were able to be processed centrally – with consistent rules, metrics and analysis. Insights were uncovered regarding potential service improvements, addressing staffing issues at specific sites during specific times – which led to measurable gains in customer

Booking with big data

Orbitz Worldwide has collected 750 terabytes of unstructured data on their consumers' behavior – detailed information from customer online visits and browsing sessions. Using Hadoop, models have been developed intended to improve search results and tailor the user experience based on everything from location, interest in family travel versus solo travel, and even the kind of device being used to explore travel options. The result? To date, a 7% increase in interaction rate, 37% growth in stickiness of sessions and a net 2.6% in booking path engagement⁶.



My take

Barry Libenson

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Land O'Lakes

Like any other large business, our company has amassed enormous amounts of data over the years – most of which was generated in a fairly structured environment. But today we're gathering new kinds of data from a wider range of sources, including in-house customer information, meteorological data, supplier data, census information, other government sources and even the "digital exhaust" from social media. It's virtually all focused on two business imperatives: growth and performance.

Demands for better information and more insights come from the business: finance wants profitability reports; the dairy business asks for improved forecasts; the seed division needs better information for the salesforce. You get the picture. We're even analyzing satellite imaging data about individual farms and fields, and combining it with geological data to help farmers make seed choices that can improve their yield. But the picture isn't entirely rosy. Bottlenecks are virtually everywhere. In some cases, a business leader may not realize what kind of questions he could be asking. Technology hurdles are real, especially in a diverse landscape like ours. And the talent needed to deliver big data and advanced analytics is in short supply. From technology platform experience to statisticians to business analysts, it's difficult to hire and develop our people fast enough to stay ahead of our information needs.

However, taking advantage of big data isn't primarily a technology issue; it's more of a mindset issue. Big data has given us the opportunity – and the need – to start thinking in new ways.

That said, we do have an expanding suite of tools for business intelligence and analytics. One of my top priorities is to standardize around a common toolset that can meet our dashboard and reporting needs – and also handle the growing amount of unstructured data flowing through our enterprise.

How do you quantify the value of being able to do this? It's easy when you're focused on the right outcomes. For example, by examining seasonal buying patterns among our largest customers, we were able to take three days out of butter inventory. It required a massive amount of analysis – and it was worth every penny. In some cases, we're even monetizing our analytics capabilities by selling information to large customers and distributors.

Bottom line? If we can use big data to help a farmer go from 160 to 180 bushels per acre, we're doing something really valuable. When our customers can deliver more yield, we can all win.

Where do you start?

Big data is not an all-or-nothing affair. Companies today can consider a multitude of new data sources with volumes, varieties and complexities that would have been unfathomable just a few years ago. It is easy to get lost in the possibilities and become overwhelmed by the enormity of the implications. To stay focused, find practical entry points to big data that are digestible in scope, and that can enrich your current analytics journey. Along the way, keep the following in mind.

- **Crunchy questions.** Start with highly specific questions and total clarity around the business problems driving the journey. Those – and only those – data sources deemed important and linked to the business objective should receive care and feeding. That way, big data can go to work generating the desired results that inspire broader potential initiatives to pursue.
- **A 15-degree view of the customer.** Attempting to inventory, cleanse and manage the breadth and scale of big data is impossible. The answer is not a single, unified, canonical data store across virtually all sources and types. Instead of trying to take broad view, determine the two or three discrete items that can shed light on the targeted crunchy questions. Fiercely protect scope around these areas, leaving the other 345 degrees of visibility untouched until needed.
- **Nimble governance.** One of the challenges of big data is the need to be agile. The structure of incoming data is often not known in advance, or it can change over time. New data sources may be added. Different business outcomes require data at different levels of accuracy, granularity and availability. Tradeoffs must be made in cleansing and de-duplicating data, models and analyses – quality versus responsiveness. Standards and stewardship can play a role, as can transparency of the source and visibility into confidence levels about data accuracy and quality. The artistry comes in fine-tuning the rigor of governance with the need for agility.
- **Co-existence.** Avoid religious arguments between conventional analytics teams and big data advocates. Most leading organizations can use both. Some education may be needed to establish an understanding of the most effective applications for each domain. Just like the debate between OLTP and OLAP, the answer will likely be mutually beneficial co-existence, at least until hybrid offerings make the argument moot.
- **Avoid vendor churn.** The vendor landscape around big data players is huge, with the potential for consolidation possibly years away. Credible, compelling offerings may exist at each tier – from the biggest players to start-ups. There is no specific answer, though there are important differences in technology, approach and delivery models. Balance cost, needs, the ability to leverage existing vendor relationships and contracts and the appetite for experimenting with open-source or cloud-based solutions. The big data world is rapidly changing. Prioritize rapid experimentation over drawn-out vendor comparisons, especially when getting started. Wait to make more strategic, binding vendor decisions until the goals and significance of big data are understood.



Bottom line

The explosion of big data was likely inevitable. What once was the stuff of science fiction has become an everyday occurrence. Exabytes. Zettabytes. Yottabytes. Sensors, asset intelligence, mobile devices and constant streams of unstructured communications have created digital exhaust that can capture who we are and how we live, work and play. Powerful new insights can be gleaned, with the most value realized by those who learn to detect signals from the noise, derive meaning from the signals and turn meaning into action. Focus on specific crunchy questions tied to well-defined business problems and attributable results. Organizations that put big data to work may pursue a huge competitive edge in 2012 – and beyond.

Endnotes

- ¹ Gartner, Inc. "Information Infrastructure and Big Data Projects Key Initiative Overview (Research Note G00214426)", Ted Friedman, July 22, 2011.
- ² Additional information is available in Deloitte Consulting LLP (2011), "Tech Trends 2011: The natural convergence of business and IT", <http://www.deloitte.com/us/2011techtrends>, Chapter 6.
- ³ Doug Henschen, *Big Data: Introduction*, http://www.internetevolution.com/document.asp?doc_id=233926& (October 1, 2011).
- ⁴ Theo Härder and Andreas Reuter, *Principles of Transaction-Oriented Database Recovery*, <http://cc.usst.edu.cn/Download/5b953407-339b-46c3-9909-66dfa9c3d52a.pdf> (December 1983).
- ⁵ Additional information is available in Deloitte Consulting LLP (2011), "Tech Trends 2011: The natural convergence of business and IT", <http://www.deloitte.com/us/2011techtrends>, Chapter 6.
- ⁶ Schaal, D., *Orbitz CEO plans to revolutionize hotel sort — holy Hadoop*. Retrieved January 15, 2012, from <http://www.tnooz.com/2011/11/18/news/orbitz-ceo-plans-to-revolutionize-hotel-sort-holy-hadoop/>

Navigating the not-so-new frontier

Big data is a reemerging trend — not just due to technology advances but also sheer necessity. Data is growing — including structured (information in a database) and unstructured (documents, emails, tweets, images, video, etc.) — as technology and devices proliferate — capturing, storing, and sharing data from almost anywhere. As a result, we are creating data faster than we can extract value from it. The question is: What are you going to do with it?

If agencies can decode this growing mass of new information faster, it could open the door to increasing mission effectiveness. New big data analytical tools can help answer known questions more effectively, uncover patterns, and reveal game-changing insights that would otherwise have remained buried if only manual resources were used.

In the intelligence and defense sectors, big data has played an ongoing role, helping agencies analyze large information sets to keep America safe. However, these early applications depended on costly tailored solutions to solve very specific problems. With advances in open source tools and modeling techniques, cheaper storage, better skilled personnel, and more effective computing, the landscape is changing. These new capabilities can help agencies pluck useful information beneficial for both employees and citizens — from providing more effective weather forecasts to anticipating the spread of viruses to identifying financial malfeasance.

As agencies make do with smaller budgets, big data can offer them a mechanism to solve some of their most intractable problems faster, smarter, and more efficiently. No longer the domain of esoteric or well-funded corporations, big data is — for the first time — within reach of Federal agencies of wide-ranging missions and resources.

What is different for Federal

Driven by compliance, many Federal agencies are required to collect data that is relevant to their missions. For example, the Department of the Treasury must collect reports on suspicious activities in the financial sector. Rather than just store such information, as has been done in the past, agencies can tap into this data to extract meaningful insights with new analytical tools. They can promptly scale data applications using new, lower-cost, and readily available computing capabilities delivered via traditional and cloud computing IT models.

Meanwhile, new Federal policies and mandates, like the Open Government Initiative and Data.gov, are encouraging discussions about how data can be delivered to citizens. Yet, there are still challenges, such as security and privacy implications and the need for skilled resources, to take advantage of these new tools and capabilities.

Lessons from the front lines

- **New tools, new skills.** Big data requires more than just new tools and cloud computing; it also requires new skills. Many Federal agencies have not invested in economists, statisticians, data miners, and other skilled personnel who are needed to assess raw data and build new analytical models. Without this talent, agencies will likely have a tougher time leveraging these data sources. However, applied analytics is an alternative. Using applied analytics, agencies can operationalize skill sets by breaking down complicated tasks into manageable processes. For example, a Federal employee using applied analytics does not necessarily have to know how regression analysis works to process results. In some cases, the employee may simply need to analyze multiple data-set results to triangulate new answers and insights. Down the road, agencies may still need chief analytics officers and may invest in the core skills needed to frame analytics initiatives. In the meantime, smart approaches like applied analytics can give agencies an early jump on results and insights.

- **Weigh the costs.** With big data, Federal agencies can potentially boost mission effectiveness and agility — such as rooting out waste, fraud, and abuse — using fewer resources. Other agencies using big data may find potential targets, which could be analyzed through human intelligence, for investigations. Overall, agencies should carefully weigh costs and projected benefits of big data analytics that could potentially reduce current budget shortfalls and better meet their mission goals.
- **Leverage interdependencies.** As agencies transition to new computing models, they should address many of the security and privacy issues they see now in big data. For example, commercial cloud-based services could store and provide personally identifiable data rather than the government having to collect this information, which has raised some privacy issues. Additionally, programs such as the FedRAMP can help accelerate cloud security accreditation, potentially shortening the time it takes to build this capability. Likewise, developments from the Open Government Initiative, such as Data.gov and the Department of Veterans Affairs' Blue Button Initiative, help to address privacy and data management concerns. Agency officials who are looking to build momentum around big data should review these and other initiatives that can help them tackle many of the same challenges.

Getting started

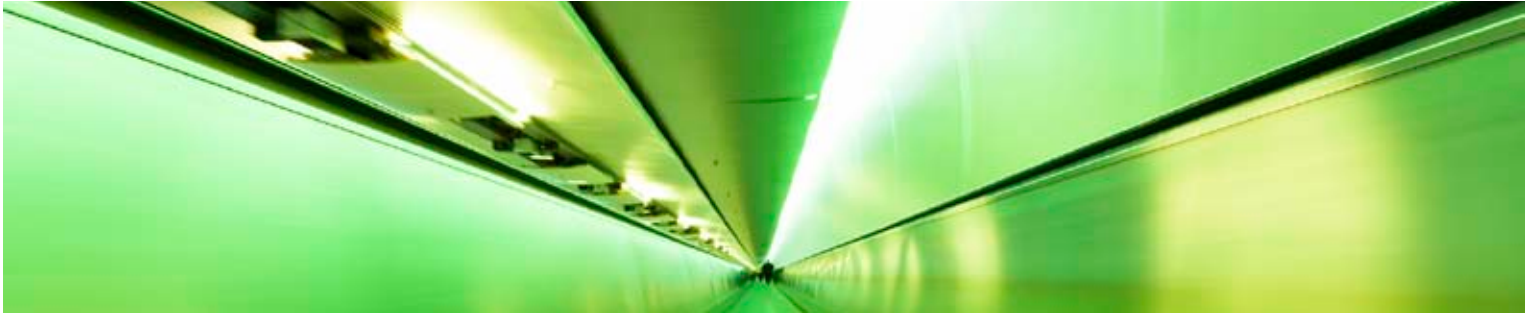
- 1. Rethink what is possible.** Just a decade ago, big data analytics was a costly and complex effort that required a significant investment of time and resources. Today, advances in tools and computing represent a quantum leap in new possibilities. Agencies should reframe their expectations and rethink how big data can help fulfill their missions.
- 2. Start with existing problems.** First, look at how big data can be used to address existing requirements. Then, consider how to extract the value of big data analytics by focusing on mission drivers.
- 3. Follow the use cases.** Virtualized and cloud computing models and multiple analytics platforms provide a host of new options and capabilities. Agencies should base their implementations on specific use cases. As a result, outcomes will likely be shaped by mission requirements, not by chance or vendor recommendations.
- 3. Be bold.** Not all big data activities are tried and tested. Agencies should take bold steps to try something untested — even risky. These new tools and services may not necessarily require large up-front investments. Agencies should learn as they try, be optimistic about the upside, and be open-minded about surprises.

Bottom line

The Federal government has been a leader in big data from the start, beginning with intelligence and defense applications and now progressing across a wider range of missions — from social services to regulatory agencies. Some Federal agencies might regard big data as new or foreign territory, but leaders should consider that they already depend on big data daily. Big data is the kernel of online search, including many of the search bars used on Federal agency Web pages. Just as search redefined the way people access information online, big data will likely help redefine how agencies can analyze and interpret information to provide better services to citizens. With the applicable talent and readily available tools, data sets, and computing resources, agencies can bring these capabilities to fruition and turn big data into real insight.

7

Geospatial Visualization



Where matters

The human brain is naturally wired to process visual images by recognizing patterns, inferring relationships and discerning features. Analytic visualization connects these perceptual and cognitive strengths with modern statistical computing capabilities and can enable decision makers to pull significant results quickly out of tremendous volumes of complex and diverse data. In turn, connecting this data to geography is key to building compelling visualizations from diverse information sources.

Time and place underpin everything that happens in our lives and everything we know and learn about the world. Today's technology allows us to collect information about nearly all of these events, fueling an explosion of real-time, location-aware data. Some of the many sources feeding this torrent of geospatial information include:

- New structured data from mobile devices (e.g., phones, GPS-assisted assets, tablets)
- New streams of georeferenced sensor data from traffic sensors and stream gauges to RFID readers
- Geo-tagging and geolocation of existing enterprise structured data (e.g., using address information to add longitude/latitude attributes)
- New streams of location-aware unstructured data (e.g., Twitter, Facebook, Foursquare, Flickr)

Geospatial visualization marries the broad insights available through visualization with specific types of analysis that can be performed on location-related data. Tobler's first law of geography has never seemed more relevant:

"Everything is related to everything else, but near things are more related than distant things." Its power comes from exploring both quantitative and qualitative spatial relationships within large data sets of structured and unstructured content represented geographically. Correlations based on these relationships normally provide a useful way of organizing large volumes of data and often reveal fresh insights that might otherwise remain hidden among rows and columns of data without the interpretive combination of analytical integration and our visual cortex.

In the past, only a handful of Geographic Information System (GIS) analysts in specific industries (oil and gas, governmental agencies, transportation and logistics firms) invested in using location as an organizing principle for advanced analysis. New tools and access to data are now allowing the power of location to be unleashed across many more business areas and to a much broader base of users. The benefits can be many. Geospatial visualization can enable the human mind to process and detect patterns hidden among huge volumes of information. Spatial analysis provides quantitative evaluation of subtle relationships. Time-based animation and other forms of interactive visualization reveal long-term trends and subtle events. Geospatial analytics combined with visualization can drive new ways of doing business: once a model has been developed and deployed to describe ongoing business performance, real-time visualization can help drive better decisions on a daily or even hourly basis.

Perhaps most importantly, geospatial visualization's familiarity and intuitiveness make it one of the most accessible manifestations of analytics. In this age of information automation and competitive positioning based on deriving insight from big data, the potential of visualization is essential. Geospatial visualization provides both a compelling and widely usable form of these insights.

History repeating itself?

For decades, the oil and gas industry has used geospatial visualization in resource exploration and extraction analysis. Geospatial capabilities can allow the healthcare industry to track infectious disease outbreaks and evaluate the equitability of health care delivery. The federal government has used these tools to analyze population shifts, resource utilization, impacts of regulatory changes and much more. So what's different in 2012?

	What were the challenges?	What's different in 2012?
Early spatial modeling tools	<ul style="list-style-type: none"> Tools required proprietary knowledge and advanced training to import data, build explicitly geographic data models and create cartographically valid visualizations. Specialized resources and software were required, limiting who could participate in discovery and analysis and how the results could be embedded into decision-making processes. Location-aware data was scarce and expensive, limiting the potential insights available from spatial modeling. Typically models were based on laboriously processed historical batch data disconnected from transactional systems, providing few opportunities for performance management and real-time operational reporting. A printed map was often out of date as soon as available. 	<ul style="list-style-type: none"> More and more data now includes geographic components, especially from mobile, social and sensor-based sources. It's hard to underestimate the impact of ubiquitous GPS readings. Techniques are now available to geocode or geo-tag non-location-aware data, allowing visibility and analysis into historical geospatial performance, coupled with new data to understand trends and patterns. Spatial tools and analytics have become much easier to use, apply and communicate. Today's platforms can allow complex data to be transformed into intuitive, interactive, descriptive views ready for exploration, discovery and decision-making. Smart-phones, tablets and other mobile devices have made geospatial visualizations readily available almost everywhere that people work and make decisions.
Mash-ups	<ul style="list-style-type: none"> Google, IBM, IDV Solutions and a myriad of open source developers had provided tools for analyzing and disseminating geolocated information, but they didn't go far enough to provide actual analysis data to enable users to make decisions that aren't somewhat binary in nature; they lacked additional context and consideration attributes needed to be effective. 	<ul style="list-style-type: none"> Advanced tools can provide the ability to move beyond static, single-dimensional "push pin" views – allowing correlation of several sources of high cardinality data, with visibility of trends and changing relationships over time.

Technology implications

Effective geospatial analysis and visualization requires tools and computational power for handling massive data volumes, rendering complex visuals and disseminating contextual geographic maps widely through the Web. The most advanced visualization and analytics tools are useless without good data – tested, correct and current. Reliable, scalable enterprise information management techniques and core informatics disciplines are critical.

Topic	Description
GPU-based processing	Systems based on graphic processing units (GPU) are improved for techniques at the heart of geospatial modeling: RASTER algebra across points, lines, polygons; processing of high resolution imagery collected from satellites and airplanes; executing change detection of individual pixels (determining if a value at one location/time differs from a separate image in different point/time). Organizations are likely to need more computing power. GPU-based systems can perform geospatial modeling calculations over 100 times faster than general purpose CPUs ¹ .
Master data management	Relationships depend on identity, and linking distinct entities across enterprise systems and external feeds continues to be a critical challenge. Without correlation of master data, subtle associations could be missed or wrong decisions could be made based on bad data. Spatial testing can actually be a valuable addition.
Data quality	Visualizations are only as good as the source data. Incomplete or incorrect location information compromises geospatial analyses. When external feeds from social media or other sources are incorporated, even organizations with broad data stewardship programs will have sources with dubious or unknown quality. Completely cleansing potential inputs is not a viable option. Instead, organizations should tag and communicate questionable sources, making end users aware of possible issues and giving them the option to identify and discount unreliable data.
Big data²	Geospatial visualization can allow organizations to tap into location-aware unstructured external data sources, giving them further tools for analyzing, storing and integrating big data into conventional business intelligence and warehousing solutions.
Cloud³	Cloud-based storage and processing capabilities can provide organizations with a cost-effective way to build, scale and project geospatial visualization capabilities to their users.
Augmented reality (AR)	Geographic Information System (GIS) is providing views in three dimensions by taking advantage of smartphone cameras and on-board processing to layer visualizations on top of real-world landscapes. Recent advances in indoor location-based services could unlock new uses for enterprises ranging from retail stores to warehouses to front-office headquarters.

Lessons from the frontlines

Uncle Sam leads the charge

The U.S. Congress has passed legislation to provide citizens access to data and documents regarding its policies and operations. This includes a wealth of geospatial data – from census reports to national maps to weather history. The U.S. Department of Commerce released BroadbandMap.gov that aggregates 25 million data points of official and crowd-sourced data to show broadband availability and adoption across the nation. This information can be combined with population data, congressional budget allocation data, carrier advertisements around coverage/speeds and more to provide new insights to legislators, activists, customers and enterprises⁴.

Prescription for connectedness

A leading pharmaceutical company's new product launch was not meeting sales projections. To help pinpoint the problem, the company used geospatial visualization to understand the prescription habits, relationships and influence of doctors. The size of each doctor on the map reflected the number of drugs he or she prescribed. Links between doctors were drawn to designate affiliations – common patients, shared medical organization membership or other relationships such as social clubs and medical school. Finally, their physical location was mapped to reflect proximity, typically indicating co-practitioners in a hospital or clinic.

Historically, the company had targeted doctors with the highest pedigree documented through their publication record, speaking appearances and tenure. Cluster analysis within regions was performed to identify those with the most social and physical connections. They were surprised to learn that the influential doctors identified by geospatial visualization were not the “old guard” they had previously targeted. By balancing go-to-market efforts between the established opinion leaders and the newly identified influencers, the company was able to boost revenues by double digit percentages without a significant increase in sales or marketing spending.

Road rage and customer satisfaction levels

A hardware company saw drops in customer satisfaction levels in several key regions, so they used geospatial visualization to unearth the source of the problem. They mapped customer sentiment against service center locations, traffic patterns and competitor presence. The issue was quickly apparent. To save costs, the company had moved their customer service facilities away from downtown areas, which had caused a huge jump in commuting time for customers who relied on center-based support. These customers were the source of negative feedback. To address their concerns, the company launched an education program on how to use their virtual support channels, initiated on-location services for a handful of large accounts and simply acknowledged the issue with customers. As a result, the company was able to win back many of their disgruntled customers.





My take

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It's easy to get excited about the growing stream of new developments that are bringing geospatial technology to life. From emerging standards in geodata management, to advances in asset intelligence, to an explosion of potential applications, the foundation for a geospatial future is being built today. At the center of that future lies the geospatial web – an integrated platform of GIS information, geocoded web data and sensor data. This holds the strong likelihood (and risk) of dramatic disruptions for markets and business models – in entertainment, transportation, public health, telecommunications, manufacturing, defense and more. Geospatial capabilities are certain to upend “business as usual” on almost every front you can imagine.

These capabilities rely on a world in which pieces of data are attached to physical places. Accessed through devices ranging from smartphones and tablets to specialized glasses and even contact lenses, data is made instantly available to those needing the information, at the moment it's needed. A maintenance technician examining an aircraft engine with specialized glasses can see three-dimensional schematics showing the parts inside. As an epidemiologist drives through a neighborhood, her smartphone can deliver demographic profiles of the residents living there. Or, when a tractor salesman visits a farmer, his tablet can automatically download maintenance records for his equipment.

These kinds of opportunities for innovation are already in play. Location sensors in smartphones, for example, can trigger a host of communications, especially when it is integrated with personal profiles. The smartphone can deliver an intelligent presentation of information based on identity, agenda, itinerary, activities, roles and other relevant filters. Yet phones and tablets are but primitive forms of viewing technologies, which will likely give way to headsets, glasses, lenses and other display systems that operate fully synchronized with the physical world. That's what augmented reality is about, with companies like Layar, Junaio and Aurasma already breaking new ground in enhancing real-world objects with digital information.

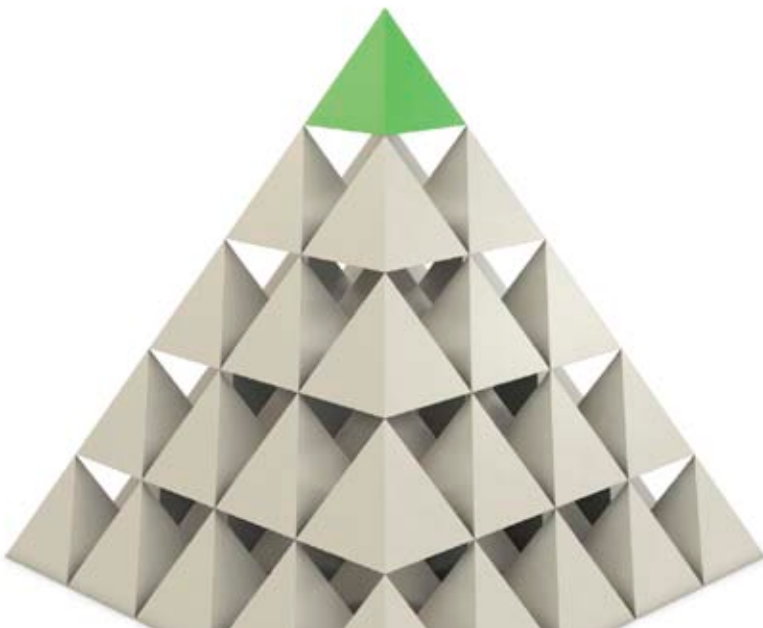
For businesses wanting to capitalize on the disruptive potential of geospatial visualization, one path to sustainable advantage lies in how locational data is captured, analyzed and stored. This is where the concept of “liquid data” comes into play – an approach to data management that allows information to flow wherever and whenever it's needed.

To some, geospatial visualization and the geospatial web may sound like futuristic fantasy. But for many leaders in the industry, the future is already here. The blending of augmented reality with analytics – enabled by a shift toward liquid data – is driving us inexorably toward breakthroughs in visualization that would have been science fiction just a few years ago. The Internet we know and love is converging with the Internet of things to create a brave new world of people, places and things being annotated with ever-more-relevant data.

Where do you start?

Geospatial visualization should be built on a foundation of solid data management disciplines. Once master data management, stewardship and integration capabilities are in place, there are a few natural places to start.

- **Answer the “so what.”** Can geospatial visualization provide answers to the organization’s key questions? Can it help identify where money can be saved, customer satisfaction levels may be improved or where competitive advantage could be found? Would visual insights aid communicating decisions to stakeholders? Like most efforts, the more granular the business objectives and specific the metrics, the more powerful the argument will be. The allure of flashy new tools or broad-stroke generalities of abstract value will not cut it.
- **Fish where there are fish.** Each business has pain points; use those to guide early geospatial scoping. Logistics and supply chains across distributed organizations are ripe with opportunities. Ask questions that might lead to new insights. Where are your customers? Where are customers relative to your work force warehouses or service centers? Where have your customers been? Where are your next customers likely to be? Where are your suppliers? Where are your competitors? If these answers are not easily available, geospatial visualization may provide them.
- **Know your baseline.** Understand your current state relative to the state of the art. Many organizations have no idea what data sources and analysis they currently have available, much less the different tools and infrastructure under license across departments and individuals. Identify the organization’s current state, and compare it with the capabilities needed for modeling, rendering and interacting. If there’s a gap, consider experimenting with subscription-based models which have a low entry cost.
- **Find new data, prep old data.** Take a look at the new data sources, such as social analytics and geospatial analytics, and consider how they could augment your traditional models. This new information could present new questions – and additional insights. To get there, historical systems will probably need prep work – cleansing addresses, geocoding data or adding GPS sensors to assets. Don’t go overboard; limit efforts to those data which are relevant to the immediate questions and goals at hand.
- **Democratize.** Visualization can place the power of analytics in more hands across the organization – Business Intelligence (BI) dashboards in the boardroom, browsers in customer service centers, sales projections by region on field management’s mobile devices. Moving analytics to the front line can help shift insight to action. Seek experience in supporting broad decision making effectively. Not all drivers need to be automotive engineers, but someone should be making sure the car is safe to take on the road.



Bottom line

Location is not only ubiquitous, but a meaningful and interpretable attribute. Creating visual, interactive, location-based models of complex data can multiply the power of data analytics. Organizations that combine the explosion of location-aware data with the power of geospatial analysis and wide accessibility of geospatial visualization can provide game-changing support for business decision making at levels never considered before. Geocoded data and fancy presentation layers are not enough, however, to make good on this potential. Underneath seemingly simple renderings lay complex analytical models and sound data management disciplines. Visualization, like many business efforts, should be supported by concrete objectives and well-defined questions that can benefit from geospatial analysis, and tested by those with specific experience in both analyzing and communicating location-aware data.

Leading organizations that follow these principles to provide geospatial visualization tools to employees, business partners and even customers that allow them to explore, manipulate and act on the insights they gain, will be putting Tobler's law to use for competitive advantage.

Endnotes

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² Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", www.deloitte.com/us/techrends2012, Chapter 6.

³ Additional information is available in Deloitte Consulting LLP (2011), "Tech Trends 2011: The natural convergence of business and IT", <http://www.deloitte.com/us/2011techrends>, Chapter 10; and Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", www.deloitte.com/us/techrends2012, Chapter 5.

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Location matters

The Federal government has been producing, compiling, and maintaining data with location as far back as the late 18th century when census data was used to apportion congressional seats geographically. Use of geospatial data has grown since then across the Federal sector in defense, national security, health care, environmental, and other domains but has still remained specialized. Most Federal data references geographic location in one way or another but relatively little is ever visualized or analyzed according to location. That is changing significantly now as more agencies gain access to advanced geospatial technology at lower cost — and use it to real advantage.

Geospatial visualization is designed to provide a common point of reference that makes data more effective by presenting it in new and enlightening combinations, allowing Federal agencies to operate both more effectively and more transparently. This in turn helps agency stakeholders, whether personnel, legislators, citizens, or other organizations, gain greater insights and make better decisions about their own concerns. Many agencies have in some way become both producers and consumers of geospatial data. Challenges persist, particularly, of collecting, organizing, maintaining, and sharing an exploding volume of data in an interoperable manner across levels of government and private industries. As geospatial data becomes more ubiquitous, though, and more accessible — especially with the prevalence of GPS-enabled mobile devices — it is also becoming a game changer in the way that people understand large-scale information and use it to drive new ways of doing business.

What is different for Federal

Today, barriers to geospatial visualization are decreasing as advanced tools, software, and innovations, such as cloud computing and real-time data analytics, become more available and affordable. Agencies that previously did not have the infrastructure and skills sets to develop a geospatial specialty are increasingly able to offer geospatial data and visualization as a normal means of interaction with their stakeholders. For example, the National Telecommunications and Information Administration and Federal Communications Commission jointly publish the National Broadband Map, a publicly searchable and interactive website that shows high-speed Internet availability (or scarcity) throughout the United States and is designed to encourage Internet access as an engine of economic growth. The website can also

allow those same agencies to gather corrections and new data back from the public (also known as crowdsourcing) and use them to create an even better map.

Some government initiatives are being designed to give agencies a jump-start for a low initial investment. For example, the Federal Geographic Data Committee (FGDC) is developing the Geospatial Platform, which is envisioned as a user-friendly, “one-stop shop” that combines map-based data and tools. The U.S. Geological Survey is developing the National Map, a set of foundational geospatial data layers that provide a consistent framework for geographic knowledge nationwide.¹ The National Geospatial-Intelligence Agency is raising its game by providing mobile users with apps that can let them work with detailed satellite imagery and the results of advanced geospatial analysis right in their hands.²

Several other factors are increasing agency usage of geospatial visualization beyond its traditional role in navigation. The need to do more with less, as budget cuts loom, is one such factor. With geospatial visualization, agencies can improve as well as showcase their efficiency, effectiveness, and the returns they achieve from public investment in infrastructure and services. As more people gain awareness of these tools and capabilities, the more they demand that agencies not only apply them but also share the results.

The Open Government initiative, which instructs agencies to take certain actions to promote the principles of transparency, participation, and collaboration, has led to the accumulation and publication of massive data sets on Data.gov. While it may be difficult for stakeholders to digest and interpret such data in its raw form, agencies can use visualization to demonstrate the data’s value to provide significant insights and better decision making.

Despite progress, many long-standing issues with open geospatial data still remain unresolved, from data quality and standards to accessibility and privacy. Improving data quality in particular is critical for effective government-wide adoption of geospatial visualization. Paradoxically, agencies coming to the table with the fewest legacy geospatial assets and capabilities may also be the least encumbered when it comes to adopting state of the art geospatial visualization technology and practices.

Lessons from the front lines

- **Provide better analysis to the public.** Geospatial visualization can help citizens zero in on the information they are seeking. For example, Recovery.gov is designed to help American taxpayers see how \$840 billion in stimulus funds are being spent in their area by showing it on thematic maps.³ In turn, citizens can report any discrepancies between actual events on the ground and what is indicated on the website. This can help the Recovery Accountability and Transparency Board to ferret out potential fraud, waste, and mismanagement of taxpayer money.⁴
- **Rethink what is possible.** When agencies first started using geospatial visualization, they hired geospatial analysts and went through long data development programs. They typically purchased expensive licenses for hard-to-use software and spent years in development before producing a single visualization. Today there are other paths available. New Web-based tools and location-embedded data types are lowering the bar for investment and helping agencies rethink what is possible. For example, there is the FGDC's Geospatial Platform effort and also other volunteer initiatives to provide new kinds of geospatial content through open source platforms. These developer-doer communities are playing critical support roles in areas like disaster management, emergency response, environmental modeling, and urban planning.
- **Dispel "luxury" perceptions.** Some government agencies believe that geospatial visualization is optional — a luxury in today's budget environment. This misconception undermines not only the insightfulness of geospatial visualization itself but also its value in helping to maintain high-quality geospatial data that is critical to government operations. Imagine a Federal government unable to deliver a letter to the right address, distribute proper funding to a neighborhood, or stage resources to a disaster-struck region. Agencies should challenge misperceptions of utility if they want to assess objectively how geospatial visualization can help meet their objectives.

Getting started

- 1. Start with real value.** Agencies should start by adding geospatial attributes to their existing data and promptly exploring what new insights and value can be gained. How can operations be transformed? What can citizens get from having access to these tools? How can visualization be supportive to the agency's relationship with citizens? By focusing on real value from the beginning, agencies can avoid "nice-to-have but not essential" debates.
- 2. Overcome barriers to data sharing.** Geospatial visualization can be most effective when it brings combinations of disparate data into focus. Effective agencies should be willing to transform, package, and share their data to support this — whether it is with another government agency or directly with citizens. This often requires increasing institutional confidence in data quality and overcoming cultural barriers to information sharing.
- 3. Become dynamic.** While static geospatial visualizations are easier to produce, tapping real-time data and making it accessible through visualization can be an incredibly effective tool. It is also a way to demonstrate the value of visualization as integral to the process of government, rather than a one-off product.

Bottom line

A common or well-understood point of reference can make a world of difference. Agencies should recognize and further leverage the many kinds of value that can be provided through geospatial visualization. As citizens increasingly become familiar with and consult rapid visual feedback, geospatial visualization can help agencies keep up, better conveying agency programs and value. That is why the Federal government is making strides to collect, manage, and provide consistent and quality framework data and tools for agencies, other state and local governments, and the private sector. Not only can it help them showcase their investments in new and creative ways — through analytics and visualization — but it can also enhance their efficiency and effectiveness and better shape outcomes. As cloud computing, sensor Webs, digital exhaust, and other technology trends converge to send vast rivers of data our way, geospatial visualization will likely become a critical means of staying afloat and navigating where we need to go. Federal agencies can increasingly pilot, adopt, and adapt geospatial visualization at a potentially lower cost, reduced risk, and for higher value as this technology continues to evolve.

Federal perspective endnotes

¹ Peter Folger, "Issues and Challenges for Federal Geospatial Information," <http://www.fas.org/sgp/crs/misc/R41826.pdf> (April 27, 2012).

² Robert K. Ackerman, Geospatial Intelligence Embarks on Dual-Hatted Mission, http://www.afcea.org/signal/articles/templates/Signal_Article_Template.asp?articleid=2929&zoneid=345 (April 2012).

³ Visit http://www.recovery.gov/About/Pages/The_Act.aspx

⁴ Visit http://www.recovery.gov/Contact/ReportFraud/Pages/Report_Fraud.aspx

8 Digital Identities



Managing identity in an increasingly digital world

The digital expression of identity grows increasingly complex every day. Not so long ago, an employee's entire digital presence belonged almost exclusively to the employer, a practice that culminated in the mainframe ID. As enterprise technology expanded to include new tools and platforms, the number of digital identities grew. Today, many workers must manage a dozen or more user names and passwords across different roles on different systems to do their jobs.

With the rise of the internet, corporate systems expanded beyond traditional firewalls, with users adding new "foreign" personas to the mix. Outside their workplaces, users established personal credentials on banking portals, consumer products sites, loyalty and reward programs, e-commerce retailers, local government services, home insurance policies and even remote access to cable TV. Recently, social media sites like Facebook, Twitter and LinkedIn, as well as other services like Foursquare, Spotify and Netflix have only amplified identity sprawl. Along the way, personal digital identities – everything from employee, customer, critic, citizen, spouse, parent, club member, home owner, teammate, hobbyist or all of the above – have continued to blend into the digital enterprise.

For security, privacy and regulatory control, digital identities must be unique, verifiable and non-repudiable. "Unique" means that the identity refers to a single entity and cannot be duplicated or re-used. "Verifiable" requires the ability to authenticate that users are who they say they are. And "non-repudiable" provides confirmation of the integrity of the identity and any subsequent communications. To meet the demands of enterprise efficiency, compliance and consumer expectations, identities must also be unified or federated, appropriately separable or portable with the credential holder, and layered to expose profile detail only at the level required by the use case.

Organizations see the power in providing this identity – and in owning the resulting relationship. In this pursuit, the use of federated identities *within* an enterprise is growing. In this scenario, a logical, single, overall digital identity with a unified view is brokered across several different systems and security profiles. This is especially useful in larger companies with distinct trust zones separated by business unit, geography or user role. Today, industry groups and government bodies are pushing broader efforts on federation across enterprises, efforts that may become the backbone of a more substantial digital identity.

Does this trend lead to a universal digital identity, seamlessly crossing between professional, private and social lives? Does it lead to a world in which appropriate context is managed across the range of credentials that an individual carries and the personas they inhabit? Time will tell. It's easy to envision a true mobile wallet delivering a single, unique and trusted identity that is accepted across all interactions. One that understands and manages the context of the transaction. One that serves up different layers of a person's identity with different controls and assurances, depending on who you are, where you are and what you have been doing.

To illustrate the point, consider that a stranger asking you for your social security number would elicit a different response than the one you would give a loan officer during a mortgage application. Ideally, a digital identity would follow you through life, across employers, geographies and life changes. While this may at first seem like a "flying car" future, the trend is clear. Enterprises today have a mandate to more seamlessly manage and enable digital identities for the personas of their employees, customers and partners, within and across enterprises; all of which lays the groundwork for shaping and creating a truly universal digital identity.

History repeating itself?

Digital identity management has been around for decades – from its humble beginnings as mainframe logins, to enterprise credentials, and eventually to the plethora of user names and passwords swirling around our lives in 2012. How is this latest thrust different?

	What were the challenges?	What's different in 2012?
User ID and password control (UID/PW)	<ul style="list-style-type: none"> • UID/PW controls have been frequently limited to a single system, creating identity sprawl and a risk of weak password management. • Proliferation of credentials has created duplication and errors in authentication, authorization, access control and accounting for a single user (identity) across multiple use cases (systems and functions within a system). 	<ul style="list-style-type: none"> • Biometric tokens replace or supplement passwords to increase strength and reduce authentication risk. • Certificate services support role-based access control across multiple applications. • Default Identity Providers (IdPs) such as Facebook, Google and LinkedIn emerge for multiple cross-enterprise services providers (SPs), especially in the social sphere. • Single sign-on (SSO) is being pursued not only across employer organizations, but also for banking and retail transactions, social networks and the local library. Everyone may eventually have one digital identity that allows contextual data based on the transaction requirements.
Single sign-on (SSO)	<ul style="list-style-type: none"> • SSO scope is commonly limited to enterprise boundaries. • With SSO, compromised identities pose a larger risk of exposing all related/connected systems. • Many SSO implementations use two-factor authentication to bolster security – typically involving a physical credential (something you have – such as a common access card (CAC) or a key fob) with a logical cert (something you know – such as a password). This can be cumbersome to the end-user, leading to dissatisfaction or, worse, circumvention of security procedures. • Even with advances in tools, single sign-on is still a complex endeavor, largely due to legacy systems requiring case-specific extraction of entitlements. 	<ul style="list-style-type: none"> • Near field communication (NFC) and emerging body area networks (such as 802.15 standards) propose less intrusive approaches to two-factor authentication – from smartphones today to wearable, embedded chips tomorrow. • Industry groups and governmental bodies are creating digital identities that can bridge some subsections of enterprise, social and personal credentials. Ubiquitous support will require convergence to a single trusted body – which is not likely in the near term. • More widely expanding standards like OpenID and SAML, as well as initiatives like Shibboleth and NSTIC, aid interoperability between organizational and system boundaries.
Identity, credential and access management (ICAM)	<ul style="list-style-type: none"> • Many organizations have basic identity, access and credential management systems. Isolation across business units and geographies is still prevalent – leaving end users to manage the various personas across their day-to-day systems and services. • Visibility into external digital personas has not been a priority; nor has management of the various relationships. As big data¹ and social business² grow in stature, scope and scale, enterprises will need the ability to correlate internal and external identity use cases. 	<ul style="list-style-type: none"> • A few point solutions for digital identities exist for consumer and trade networks, but only within well-defined sub-communities or consortia. These are the stepping stones for full-on, interoperable digital identities, and a pre-cursor to a true mobile wallet where personas and specific attributes can be selectively exposed based on the context of the relationship and transaction. • Some public services are evolving as de facto standards for pieces of the digital identity puzzle – today, Facebook Connect, Google Accounts and Twitter's API are all beginning to serve this role.

Technology implications

Executives of enterprises large and small are faced with the same challenges of managing and securing identities. The swift proliferation of digital identities, increased regulatory requirements and increased corporate fraud and security risks are creating the need to better manage these digital IDs. This may require several technology investments – that move from leading practices to necessities – in the world of digital identities.

Topic	Description
Identity, credential and access management (ICAM)	Security requirements continue to be critically important, building from traditional enterprise identity, access and credential management solutions (ICAM). These form the foundation of risk management, and are at the heart of digital identities. Leading organizations are integrating logical and physical security – another step towards one unifying view of authorization and entitlements for an individual.
Security and authentication standards	OpenID, SAML 2.0, ID-FF, WS * (WS star) and others have emerged to aid the exchange of authentication and authorization across security domains, whether they are systems, divisions or organizations. Commercial off-the-shelf (COTS) packages and emerging cloud offerings are natively supporting these standards, easing some of the technical challenges around interoperability. The U.S. federal government, led by the National Strategy for Trusted Identities in Cyberspace (NSTIC), is pushing for standards to create a shared ID credential ecosystem, including partnerships with private industries to sell authentication products that could be shared across enterprises ³ .
More rigorous compliance requirements	For almost all industries, there are increasing regulation requirements around managing digital identities. For banking, the FFIEC has been creating more guidelines around how banks should secure transactions and even dictating the frequency of re-attesting to user access rights. Likewise, energy, retail, healthcare and governments are doing the same. Overall, companies are trying to improve their security stance in reaction to growing regulation.

Lessons from the frontlines

Neither rain, nor snow, nor sleet, nor hail

Switzerland is leading the charge into digital identities, launching a country-wide electronic proof of identity project called SuiselD⁴. Launched in partnership with Swiss Post, citizens and businesses can sign up for a unique, verifiable, non-reputable digital identity. Any post office branch can be visited to verify personal information. Customers can choose either a card-based or USB stick-based digital identity that can be used for electronic signatures, commerce, accessing civic services and more. More than 10,000 SuiselDs have been issued, and more than 450 municipalities, churches, schools and businesses have embraced the standard. Also, because the service is SAML 2.0 compliant, it can be used to authenticate into leading independent software vendors (ISVs) like Oracle, SAP, Salesforce.com and Google Apps Engine⁵. Other countries have signaled that they will follow suit, notably India, which is actively pursuing its goal to create the world's largest biometrically identified identities database representing its 1.2 billion citizens⁶.

Share of wallet

A global bank grew through acquisition, adding investment management, wealth management, corporate services and various retail and commercial arms to the original depository business. Each line of business retained its siloed systems, including separate, disconnected identity management systems. In this environment, everyone lost. Customers were frustrated since each type of relationship (e.g., depository accounts, investment accounts) with the bank required its own unique user name and password. The business itself had no way to understand total customer value, leaving it blind to up-selling and cross-selling opportunities. A global federated identity system was the answer. Customers were given a single digital identity providing access to every type of relationship they had with the bank. With new visibility into customer profitability, the bank was able to grow share of wallet. But, along the way, the bank decided not to allow outside parties to make use of the customer identification – not even trusted business partners. For this bank, the potential revenue stream that may have come from identity servicing wasn't worth the added risk exposure from transactions it did not control.





My take

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Leaders today, both in government and industry, have a growing recognition that managing security is about managing risk. Every month, their digital-age organizations face billions of attacks from infiltrators seeking to manipulate, steal, deface or shut-down networks. The threats are increasing exponentially, as are the vulnerabilities. Every organization should assume that its network has or will be compromised.

The rapid evolution and adoption of new technologies, including the emergence of cloud computing and mobility poses advanced security risks. As the number of digital identities that must be managed continues to grow, security awareness, education and training will become increasingly critical for achieving an effective cybersecurity posture. The top three priorities I see for organizations that want to manage and secure digital identities in the coming year are:

Trust – but dynamically monitor. With pervasive cyber threats targeting networks and systems, cybersecurity should not be limited to building static defenses. Organizations should also add strength through dynamic monitoring and situational awareness. This requires a focus on forensics (analyzing an attack after it happens) and predictive analytics (using insights to take action in reducing future risk). A goal in 2012 should be to establish policies and procedures to achieve digital identification of everyone entering and exiting your networks.

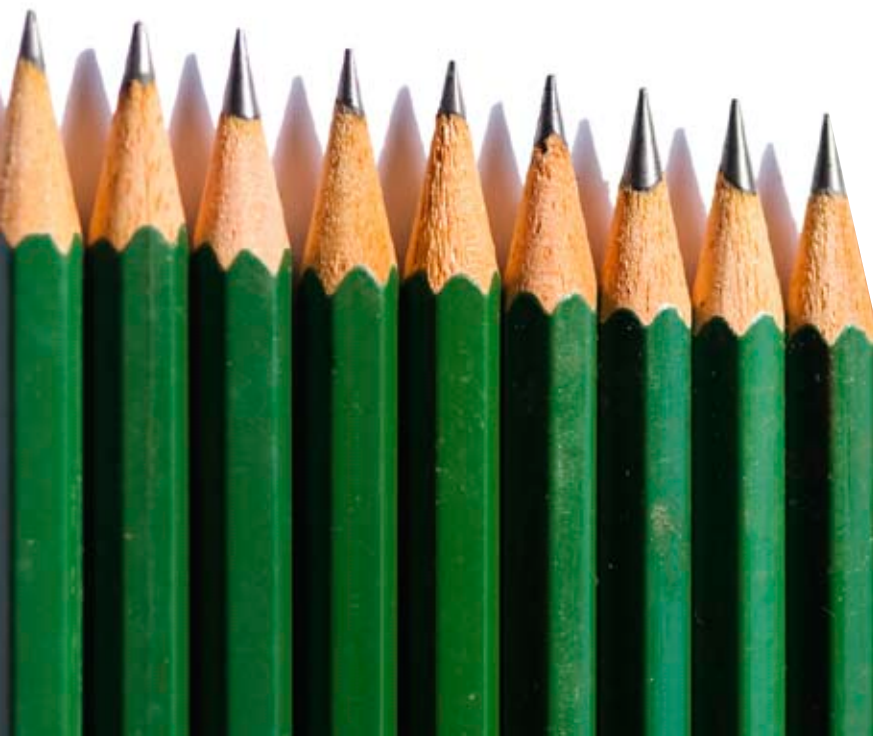
Share vulnerability. Leaders should manage cyber security risk by broadening the scope of the security and identity management mission across the organization and moving it permanently from back rooms into board rooms and situation rooms. “Just as security is built on trust, trust is built on sharing vulnerability,” explains John Hagel III, co-chairman, Deloitte Center for the Edge. That means cyber security isn’t limited to technical and policy considerations, but also includes positive identity recognition, patch maintenance and building a cyber mindset throughout the workforce. Awareness, education and training will become more important than ever, as organizations work to keep employees and service providers equipped with the knowledge, policies and culture to operate responsibly in a cyber environment.

Address expectations. In days gone by, employees went to work and logged onto a network at a computer terminal. Today, that terminal is in their pockets and purses. These mobile users are looking for ease of access and speed of use – and are assuming security and privacy. This environment requires a different security approach. As organizations integrate new technologies and IT systems expand into the cloud, cybersecurity must adapt to address the expectations of users – recognizing that, empowered with these technical evolutions, individuals will deliver both mission and business objectives.

Where do you start?

Digital identities should be an integral part of an organization's broader cyber intelligence pursuit, with identity, access and credential management forming the core of cyber protection⁷. Moving beyond isolated, self-contained identity silos to cross-enterprise services can open many doors – both to better security and control management, and as an enabler of innovation in cloud, mobile, social and analytics. Without a unique, verifiable, non-repudiable identity, these emerging technologies may have difficulty integrating with enterprise systems and may lack context even if they do.

- **Take inventory of identities.** Start taking stock of personas and identities. Determine where digital identities live, what user groups they map to, what they have access to and what job functions and processes they correspond to. Work to understand which external personas users are interacting with for their professional lives, and if they're willing to share those in their personal lives as well. Note the places where users depend on multiple IDs in their day-to-day activities. Identify new services or process improvements that would be made possible if silos were removed.
- **Know your ambition.** What is the desired scope for your digital identity effort? Should it extend across a geography? Across business units? To business partners? To other industry players or groups? To the government? To social or consumer platforms? Know your identity roadmap, balancing the potential benefits of greater visibility and information sharing with risk and technical complexity.
- **Create boundaries around federation.** If your digital identity roadmap extends beyond your organization, clear expectations, service levels and warrants must be put in place. Build trust with your most crucial partners. Spend time on legal contracts and agreements. Establish clear liability and responsibility.
- **Execute.** After taking the steps outlined above, it's all about executing the roadmap. Organizations have benefited from launching cross-functional teams led by the business and joined by technology, vendors, outside experts and business partners. Making the digital identity journey an explicit priority can improve its chances of delivering the expected value.



Bottom line

The number of credentials that define an individual has grown exponentially in recent years, and the majority has some form of digital footprint. This is especially true within large enterprises, where digital footprints have spiked due to the growth in personal or consumer-facing identities. As a result, there are an overwhelming number of personas, attributes and relationships that could potentially be managed under a single digital identity. In light of the tenets of outside-in architecture, and the onset of enterprise-dependent cloud, mobile and social forces, businesses have ample motivation to understand and capitalize on these external personas and attributes, as well as link to their corporate credentials. In the end, whoever understands employee, customer and prospect identity data will likely control the currency upon which postdigital innovation is traded – and on which new business models are likely to be defined.

Endnotes

- ¹ Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", www.deloitte.com/us/techtrends2012, Chapter 6.
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Opening doors

The Federal government set a course to implement a stronger level of electronic authentication for Federal government employees and contractors in 2004 with the issuance of Homeland Presidential Security Directive 12 (HSPD-12). Now, eight years later, the majority of those eligible possess these strong Personal Identity Verification (PIV) credentials with a current strong focus on expanding usage of these credentials for both physical and logical access in a strongly authenticated fashion. Not content to rest on its laurels, the Federal government is also now considering expanded use of these credentials and related capabilities for usage in areas such as digital signature, cloud computing, teleworking, mobile devices, transit, and financial applications. The Federal government has also provided guidance for non-Federal issuers to have interoperability with the government, known as PIV-I. With the President's Cyberspace Policy Review released in May 2009, one of the top 10 near-term actions was to "Build a cybersecurity-based identity management vision and strategy, leveraging privacy-enhancing technologies for the Nation."¹ As a result of this, the National Strategy for Trusted Identities in Cyberspace (NSTIC) was developed and released in April of 2011, and the Federal government again took a leadership role in promoting stronger use of identity and protection of privacy in online transactions.² This effort was different than that of HSPD-12/Federal Identity, Credential, and Access Management (FICAM), in that the intent is that the private sector ultimately leads the way to achieve the goals set forth with NSTIC. This initiative is also expected to have significant impact on the ability to use fewer accounts for online transactions, along with stronger processes and technologies to apply in conducting those transactions.

What is different for Federal

With HSPD-12, the Federal government has developed and maintains a strong set of supporting standards (Federal Information Processing Standard 201 and supporting special publications) and guidance (FICAM and FISMA) that can serve as a solid foundation for identity life cycle management (e.g., proofing, enrolling, credentialing) and interoperable usage and trust. This includes approval of both products and service providers that can benefit government agencies, non-Federal issuers, and even global organizations that can leverage these standards and technologies to their benefit. This specific foundation of trust supported by both processes and technologies can provide tremendous acceleration to enabling new online capabilities, applications, and services; transitioning to cloud offerings;

participating in managed services; reducing proliferation of personally identifiable information; strengthening privacy, security, and trust; securing and enabling mobile devices; and increasing compliance and reducing risk in addition to remediating audit-related issues, such as being able to determine proper segregation of duties.

The Federal government is not only focused on high levels of electronic authentication (i.e., PIV and PIV-I) but is also working closely with trust framework providers (e.g., OpenID, Kantara, SAFE) to promote the usage and acceptance of other credentials and service providers for enabling applications and additional populations of users. An important component of this is the establishment by the trust framework providers of accepted third parties to verify that the service providers are following the policies, procedures, and technical requirements for the specific frameworks and levels of trust (i.e., a trust but verify approach). This can also help reduce costs since historically the government had to fund and perform identity life cycle services for many, if not all, of these external users.

Announcements by both Visa and MasterCard to implement the EMV (Europay, MasterCard, and VISA) standard (i.e., chip-based vice magnetic stripe) for debit and credit transactions in the United States have also generated a significant amount of interest.^{3,4} Imagine if financial applications could be easily added or strongly linked and managed with government-issued PIV credentials, combining strong identity and financial transaction capabilities on a single credential. This could help reduce fraud and provide additional cost savings as multiple card programs may be consolidated. With chip-based financial credentials in the future, strong identity capabilities could also be added, enabling credential holders to increase online security while providing for transaction convenience.

Barriers to adoption still remain challenging, to be sure, but not intractable. While resources and funding top the list, technical and management challenges take center stage. There are significant change management impacts to large-scale or enterprise identity initiatives. Because digital identities would likely extend across the enterprise, each piece of physical and logical infrastructure could potentially be impacted, from facilities installing or upgrading access control systems, to networks and applications. The change will likely also affect end users, whose expectations should need to be managed to ensure a seamless transition.

Furthermore, governance structures should also be aligned, not merely within agencies, but government-wide to enable coordination among multiple stakeholders. Overall, roles, stakeholders, and authoritative systems of record will need to be clarified and unified.

Lessons learned from the front lines

- **Strong leadership, management, and vision are still fundamental.** Identity initiatives and programs can impact many aspects of an organization: human resources, legal, contracts/acquisition, IT, security, external partners, and stakeholders — potentially all users. As a result, strong program/project sponsorship is needed, along with more substantial change management and communications plans. These programs can be complex in execution, so it is essential to have clear messaging, vision, and leadership.
- **Experience and focus can make a difference.** Organizations may have failed in implementing identity and access management programs and FICAM-related capabilities by applying resources without significant experience in the policies, procedures, and technologies required to make a program successful. Agencies should tap into resources that not only have experience, but also have a specific focus in these areas.
- **Keep sight of the business case.** After making the business-based decision to embark on an enterprise

identity-related initiative, many organizations either lose track of their original business case or fail to measure or analyze some of the specific areas of return on investment identified. Additionally, some organizations move to implementations primarily based on compliance, missing the opportunity to generate other lasting benefits, and potential cost reductions for the organization.

Getting started

- 1. Develop the business case.** It is vital that a business case be developed, understood, and used to ultimately measure program effectiveness. This is often a vital step to obtaining key specific stakeholder buy-in, executive support, and the resources required for effectively implementing an identity program.
- 2. Identify and gain commitment of specific sponsors and stakeholders.** It is vitally important to have executive management guidance and buy-in for an enterprise identity initiative to be effective. This often involves the establishment of a strong governance model that includes clear definition of roles and responsibilities.
- 3. Establish an experienced delivery team.** Agencies should make sure that their delivery team has significant experience with effective identity program implementation. Early policy, procedural, requirements, and architectural decisions are critical to the effectiveness of an identity program.

Bottom line

The Federal government has provided a strong foundation for agencies, private sector organizations, and even citizens to provide and obtain stronger identity credentials for use in conjunction with new and enhanced services. Most agencies have the opportunity to implement enterprise-wide identity programs to generate significant benefits to the organization — to include, but not limited to, generating cost savings, accelerating the delivery of new and updated services, and aiding compliance and audit. Strong leadership support, including a substantial business case and a highly experienced delivery team are essential in not only developing a digital identity capability, but also to enable agencies and government as a whole to be ready to support the impact of emerging trends on the mission.

Federal perspective endnotes

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³ “Visa Announces Plans to Accelerate Chip Migration and Adoption of Mobile Payments,” Smart Card Alliance web site, August 9, 2011, <http://www.smartcardalliance.org/articles/2011/08/09/visa-announces-plans-to-accelerate-chip-migration-and-adoption-of-mobile-payments>

⁴ “MasterCard Introduces U.S. Roadmap to Enable Next Generation of Electronic Payments January 30, 2012 Framework to Deliver Enhanced Consumer Experience In-Store, Online, at the ATM and with Mobile Phones,” Smart Card Alliance web site, January 30, 2012, <http://www.smartcardalliance.org/articles/2012/01/31/mastercard-introduces-u-s-roadmap-to-enable-next-generation-of-electronic-payments-january-30-2012-framework-to-deliver-enhanced-consumer-experience-in-store-online-at-the-atm-and-with-mobile-phones>

9 Measured Innovation



Innovation is shifting from “eureka” to an institutional discipline

Innovation has long been accepted as an important driver of modern economic development. From economist Joseph Schumpeter’s work in the 1940’s¹ to Clayton Christensen’s more recent research² to conventional wisdom about technology’s meteoric impact on our daily lives. Corporations have taken note – recognizing that effective innovation can create new market value, drive efficiencies, extend the lifecycle of products and services, and help launch new business models. Emerging technology is a continuing source of potential for innovation in business, and the CIO is the executive to deliver on that opportunity. Sounds great. But how?

Therein lies the challenge. For some companies, innovation is seen as a mysterious, almost serendipitous process, a distraction from their core business. For the more adventurous, innovation involves feeding investments in creative minds with free license to explore concepts and follow their muse. Still others tend to pursue innovation that’s highly engineered. They create programs to solicit ideas from across the organization, explore those ideas that seem to have potential, expose promising candidates to the market, fail fast and scale soon. Then they iterate, rinse and repeat – focusing more resources on what works, and less on what doesn’t.

Any of these approaches, as absolutes, are flawed. Innovation is not a single monolithic thing. That’s why an alternative model of “measured innovation” is gaining traction today. Measured innovation has two precepts: First, innovation deserves a deliberate, disciplined approach. And second, the results of innovation need to be measurable, repeatable and linked to both business strategy and operational metrics.

This “measured” approach recognizes that there are several different kinds of innovation. Sustaining innovations, for example, are advances in an existing business model that improve operations and processes, drive efficiency gains, add new products and features (without compromising pricing) and contribute incremental value. Sustaining innovations might be pursued to improve an incumbent’s position – or used by new market entrants to steal share. They often capitalize on known deficiencies in current offerings – the “known known” opportunities for improvement. In addition, sustaining innovations can also apply to areas of predictable future advances, where expectations are clear around technology improvements, or other process, organization or marketplace breakthroughs. These are the “known unknowns.” Either way, sustaining innovations often seek to break through trade-offs in the productivity frontier. They focus on the value delivered at a given price compared to competitors, versus the dimensions of performance that a customer desires³.

Disruptive innovations are fundamentally different. They require creating a completely new business model. Disruptive innovations can be used to enter new markets or to defend an existing business. They can even be launched as preemptive strikes against emerging players posing viable threats. These are “unknown knowns” and “unknown unknowns,” respectively. Leading organizations invest in a portfolio of innovation spanning these multiple dimensions – sustaining versus disruptive, across existing and new markets.

The CIO is in a rare position to guide innovation investments given technology’s prominence across the business. And, because emerging technologies are important components of many innovative ideas, CIOs are likely to be in a better spot to help focus and drive resulting initiatives. CIOs can lead this digitally fueled ascent, realizing their potential as business revolutionaries and not just technology visionaries or “mind the store” stewards.

History repeating itself?

The role of CIO is constantly scrutinized. Why? Because the IT department's reach across business functions is substantial and costly enough to attract interest. What's more, high-profile emerging technologies such as cloud, mobile and analytics add a level of sizzle that is sure to draw attention. Finally, the consumerization of technology has raised comfort levels and lowered barriers of understanding across the enterprise. This combination of factors explains why CIOs are constantly in the spotlight, and it also underscores why CIOs should lead the drive for measured innovation within their organizations.

	What were the challenges?	What's different in 2012?
Idea hunts / innovation quests / innovation tournaments	<ul style="list-style-type: none"> • Open-ended, company-wide requests to generate breakthrough ideas tend to produce overwhelming amounts of early stage, low-quality ideas. Barriers to participate are intentionally low, which results in limited check-points to vet ideas or confirm the level of commitment of supporters. • Companies typically subsidize the exploration of unfounded ideas because submissions are completed "on the clock." • Review processes and stage-gates can fall victim to organizational biases and corporate politics, leading to potential conflicts of interest when disruptive ideas challenge the status quo. 	<ul style="list-style-type: none"> • Measured innovation calls for a focused approach to soliciting ideas. Instead of an unbounded search, leadership decides on clear strategic goals. What are the expectations around investments and results in sustaining and disruptive innovation across existing and new businesses? Simple guard-rails can dramatically improve the results of crowd-sourcing initiatives. • CIOs need to play an active role in shaping ideas, illuminating the state-of-the-possible, and in guiding activities towards either sustaining or disruptive innovation. • Organizations are recognizing that sustaining and disruptive innovations require fundamentally different approaches related to autonomy, metrics and time horizon.
CIO operational excellence / built-to-run focus⁴	<ul style="list-style-type: none"> • CIOs who focused solely on the business of IT rarely move past delivering incremental sustaining innovations. As the business becomes accustomed to the lights staying on, the behind-the-scenes toiling to maintain service levels often goes unrecognized. • As end-users procure more technology assets via the cloud, mobile or desktop application stores, the role of operational excellence for CIOs can be diminished. If widespread adoption of these solutions occurs outside of IT, CIOs may be left serving as the chief data center officer – or worse, the chief electricity officer. • During economic downturns, it's appropriate to channel energies towards efficiency gains. During periods of growth, a more nuanced IT leader is needed who can spur investments and help transform operating and engagement models. 	<ul style="list-style-type: none"> • Establishing an IT service catalog for most facets of the CIO's organization remains a leading practice. Success stories have reinforced its importance, and tools to manage the process make it attainable. But many service catalogs leave out innovation. Or, if considered, innovation is treated as a stand-alone, one-off capability. Innovation processes need to be embedded in the service catalog. • CIOs understand how technology changes can add value to the business. They need to develop the foresight and fortitude to take a stand for potentially revolutionary change. • The CIO should not simply manage the portfolio of in-flight investments. They should also champion new opportunities that align with the business strategy.
CIOs as revolutionaries⁵	<ul style="list-style-type: none"> • Not every CIO has the interest, experience or talent to drive innovation – either at the strategic or the tactical level. • Not every corporate culture considers IT as a strategic force. Some may have low tolerance for the CIO driving an innovation agenda. • Some CIOs were once intrigued by the charge to challenge the status quo and lead from the front. But many returned quickly to practical reality, unsure how to respond to the call to arms. • Some CIOs are not well-positioned for revolutionary behavior, either because of market conditions or company culture. 	<ul style="list-style-type: none"> • Strong leaders without depth in information technology are being placed in CIO positions, often based on their entrepreneurial instincts or raw managerial talent. • While not a substitute for committed leadership, measured innovation includes a recipe for structure, discipline and culture to help drive the mission. • While receptiveness to innovation theory may differ by industry, organization and even department, there is an acceptance (perhaps reluctantly) of the strategic role of emerging technology in fostering innovation.

Technology implications

Enabling tools can aid in the innovation journey, but they are no substitute for sparks of creativity or, more importantly, leaders who can recognize and nurture distinctive ideas and gain the organization's commitment to pursue them. However, once a definition and approach for innovation has been adopted, processes and supporting technology can help corral and amplify innovation efforts.

Topic	Description
Vendor and product management	CIOs can use technology vendors as potential sources of sustaining innovation. Moore's Law, Kryder's Law, Koomey's Law and Metcalfe's Law all lead to perpetual IT performance gains. New releases from software vendors offer efficiency and efficacy of simplified legacy features, new capabilities filling productivity gaps and other improvements. By selectively following strategic vendors' roadmaps, CIOs can incrementally grow their services and enhance value.
Innovation lifecycle tools	Specialized tools for portfolio and project management, idea generation and social collaboration have evolved to support the mechanics of idea collection, experience sharing, prioritization and measurement. These should be deployed in a focused manner consistent with the overall strategic objectives of the innovation portfolio, and actively managed by operational leadership.
Cloud-driven prototyping	Experimental, research-based innovation can be powered by cloud delivery models that help teams quickly explore new ideas at low initial costs. This allows operating expense based on actual usage to supplant historical upfront capital expenditure for initial prototyping and piloting – and ongoing burden of asset depreciation if ideas do not pan out.
Innovation ecosystems and idea networks	CIOs can take advantage of outside-in thinking, opening their innovation processes to external parties, open source options or sourcing niche third-party offerings to help flesh out their target solution architectures. This is especially true for sustaining innovations, where intellectual property ownership and usage issues may be less sensitive.
Analytics	Analytics can allow IT to deliver more value to the business by helping to answer "what do we need to know?" questions. It is also a tool to measure overall IT efficiency, guiding opportunities for incremental or breakthrough improvements in existing spend and service levels. Analytics is also essential for evaluating the innovation lifecycle and should have a heavy focus on the "so what" of actual business results and supporting metrics – a key tenet of measured innovation.
Social + Mobile	These emerging technologies are driving business transformation and bold new applications – sources of both sustaining and disruptive innovations. Social business and enterprise mobility are changing the way business is conducted and, increasingly, allowing new operating and business models to emerge. IT organizations should be educating their business counterparts on the potential of these new technologies – and preparing for the groundswell of demand once the implications are understood.

Lessons from the frontlines

Innovation in the land of beans and baristas

An end-of-year challenge was raised by Howard Schultz upon his return to Starbucks as CEO in 2008: Come back after the holiday season with big ideas. Starbucks CIO, Stephen Gillett, rose to the occasion – proposing the launch of a new business unit to drive transformation of the Starbucks store experience via emerging technologies. Digital Ventures was born, leading to a series of new initiatives across social, mobile, cloud and analytics. A wide range of sustaining innovation investments were required, such as replacing antiquated point-of-sale infrastructure, improving in-store networks and pushing desktop virtualization to allow employees to bring their own devices⁶. Digital Ventures has also been leading several disruptive efforts – pushing payments via mobile devices, providing subsidized in-store wireless networks with selected media content and finding new ways to bridge loyalty programs and digital marketing⁷. The company's effective financial performance is one measure of the effort's results. The growing importance of innovative technology in Starbucks business strategy is another – evidenced by the election of Clara Shih, CEO of a leading social media platform, to the board of directors in December 2011⁸.

Innovating 20% at a time

Much has been written on Google's "Innovation Time Off" policy that encourages employees to dedicate 20% of their work week exploring new, potentially divergent ideas. Offerings such as Gmail, AdSense and Google News have their origin in the program⁹. But behind the seemingly open-ended nature of the initiative lies a structured, rigorous approach to cultivating ideas, prioritizing investments and delivering on the potential. The ability to measure incremental progress and business impact are a big part of initial approval and ongoing project management. Leadership has an active role in helping focus ideas for sustaining innovations, while also shaping efforts around the broader business strategy to exploit disruption.





My take

Roy Rosin

Vice President of Innovation
Intuit

In 2005, we changed our approach to innovation at Intuit. Five years later, we had grown by 11 times that of the Dow, a dramatic transformation of a company that was already successful. So what changed?

For starters, our definition of innovation evolved. We realized that innovation is about creating and capturing value from new ideas – not just new launching new product ideas. Maybe it doesn't sound revolutionary to you today, but that insight fundamentally changed how we approached the job of innovation. It was the start of a major shift from a command-and-control, top-down approach to the bottom-up model that so many people are adopting today.

At the same time, our model evolved to take on a larger number of smaller innovation bets that could be validated (or invalidated) by the market relatively quickly. Much of this was enabled by technology. Consider that in the old days it could take months –and usually a significant investment – to spin out a new idea, set up the technology infrastructure required to make it work, test it internally and externally, gather the results and make a decision on whether to continue. But with the CIO and CTO tuned in, we were able to set up a platform to allow experimentation and measure effectiveness. This let us cultivate enough insight to make the case for expanding an initiative, or to shut it down before investing more.

Technology allows us to pull a few customers into the experiment immediately, at virtually no cost. And once an experiment was complete, technology also allowed us to get information about it to the right people internally. The concept of failing fast isn't our mantra. We want to increase the odds for successfully launching new ideas. But, if something is going to fail, there is no doubt that identifying it early and reacting is key – allowing funding (and resources) to be reallocated.

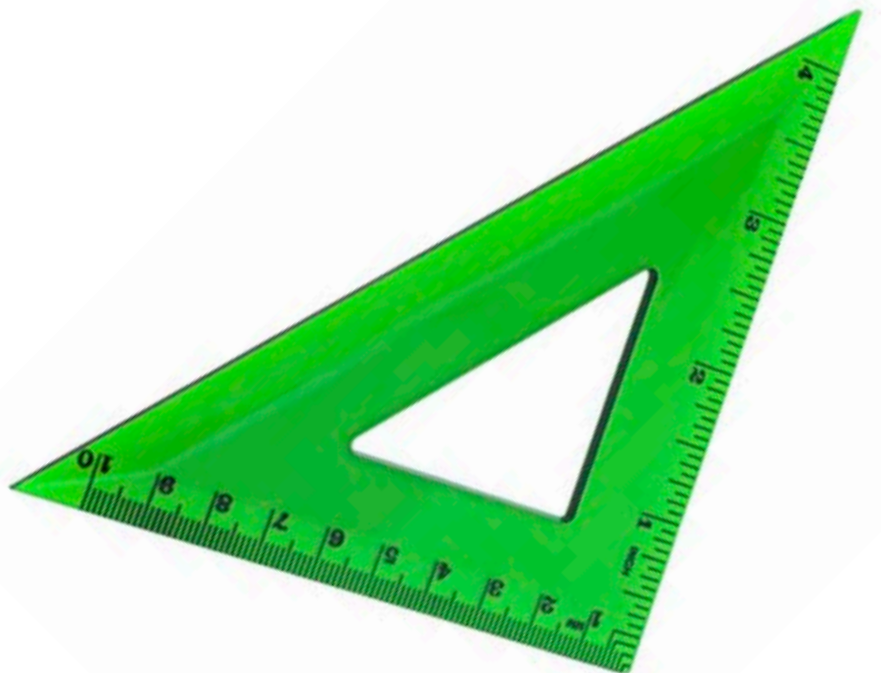
In the five-year span following the adoption of a new innovation model, experiments in TurboTax, our flagship product, zoomed from seven to 200. Just as importantly, online sales conversions experienced a huge increase. People often want to know how many failures it took to get those types of results. Offhand, most experts on innovation will likely say that the success rates for new initiatives are in the one or two out of ten range, but we were able to consistently hit a success rate of roughly six out of ten. But that number warrants a big asterisk: if you look at the six that succeeded, they often didn't bear much resemblance to the original idea that animated the experiment. That's because we used a disciplined approach to refine, measure and modify the idea in smaller increments as we went. Measured in pace, and driving attributable, measurable value. That's measured innovation.

Where do you start?

CIOs who are intrigued by the idea of measured innovation should take a hard look in the mirror. Institutional change sometimes comes only through sheer will. That doesn't mean you have to be a technical genius or the singular source of new opportunities, but it does mean you should take responsibility for inserting potential emerging technologies, recognizing quality ideas, championing concepts until sufficiently vetted and pushing for measurable results. Steve Jobs was an uncompromising cultivator of ideas. He pushed Apple's internal teams for innovations to drive breakthrough after breakthrough, while continuously improving their value chain for sustaining innovation¹⁰. Elements of that can be replicated.

- **What's in a name?** Understand what innovation and disruption mean to your organization. Agree on definitions around sustaining versus disruptive innovations. What does success look like? How should it be defined and measured?
- **Find your starting point.** Organizations go through cycles of invention, improvement and innovation. Some of your competitors may be pushing sustaining innovations; others may be lurking to disrupt. Determine the competitive position of your businesses, and honestly assess your company's DNA when it comes to driving change. Is your organization an early adopter? A fast follower? A reluctant participant?

- **Structure counts.** Innovation can be fostered several ways. Decide whether a centralized or distributed model will work most effectively. Many leading organizations employ a top-down structure, but some cultures may favor a bottom-up or flattened approach. Who has the vision, clout and attitude to lead the charge? Should innovation be continuous throughout the fiscal year? Should you focus on discrete events for selected periods of time? Regardless, an ecosystem of ideas and measured feedback are important, even for incremental achievements.
- **Don't fish in the street.** The time is ripe with digital technologies that make disruption possible. Instead of surveying from scratch, start with high potential topics: cloud, mobile, social and analytics. And don't overlook opportunities in big data, gamification and user empowerment.
- **Innovation is hard work.** Make it clear to your people that effective innovation looks more like the importing and exporting of ideas than "eureka" revelations that occur out of the blue. Even significant breakthroughs are usually grounded in research, incremental thinking and applied theory. Support the hard work of innovation by cultivating a culture of idea-sharing, crowd-sourcing, outside-in knowledge and cross-organization collaboration.



Bottom line

Creating a vision for driving innovation is the often-forgotten third role of CIOs. Beyond running the business of IT and delivering IT to support the needs of the business, CIOs should be leading the charge toward innovation through emerging solutions and technologies. The magnitude of needed change is likely to shift over time, but a mixture of incremental and breakthrough advances across sustaining and disruptive innovations will likely be needed to advance the organization toward a more competitive – and more profitable – position. CIOs should keep in mind the dual meanings of “measured innovation” – one describes pragmatic, disciplined growth; while the other reinforces the need to measure outcomes and refine approaches based on results.

Endnotes

¹ Joseph Schumpeter, *Capitalism, socialism and democracy* (UK: Routledge, 1943), 81-84.

² See: <http://www.claytonchristensen.com/>

³ Michael Raynor, *The Innovator's Manifesto* (New York: Crown Business, 2011), 62.

⁴ Additional information is available in Deloitte Consulting LLP (2010), “Depth Perception: A dozen technology trends shaping business and IT in 2010”, <http://www.deloitte.com/us/2010technologytrends>, Chapter 5.

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⁶ Caron Carlson, *With Gillett at the helm, Starbucks percolates with emerging technologies*, <http://www.fiercecio.com/story/gillett-helm-starbucks-percolates-emerging-technologies/2011-12-14> (December 14, 2011).

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⁹ Bharat Mediratta as told to Julie Bick, *The Google Way: Give Engineers Room*, <http://www.nytimes.com/2007/10/21/jobs/21pre.html> (October 21, 2007).

¹⁰ Walter Isaacson, *Steve Jobs* (New York: Simon & Schuster, 2011).

Small enough to win, big enough to matter

The Federal government has some pioneered historic innovations (the Internet comes to mind) that have changed the way we live, work, and explore. Fast forward to 2012. Budgetary pressures and more intense public scrutiny are compelling many Federal agencies to find new ways to innovate — whether it is to increase efficiency, add agility, or improve mission outcomes. However, agencies are seeing mixed results in their innovation approaches. Some build complex processes or establish separate innovation teams. Others lean on the “suggestion box” model. But innovations should be home runs; incremental improvements to solve new problems can have just as big an impact. Measured innovation can help agencies overcome the institutional, structural, and cultural hurdles by offering an alternative — a lightweight, accelerated mechanism that generates more predictable results.

What is different for Federal

An agency’s cultural affinity and focus around innovation — called the “innovative quotient” — can be critical to helping them move up the innovation maturity ladder and toward weaving innovation into everything they do. However, in the highly regulated Federal government, where missions are policy-driven rather than profit-driven, innovation has been constrained by structural barriers. At some agencies, innovation is a specific function or job, essentially precluding a large part of an agency’s workforce — employees who have the most to contribute to and gain from innovations — from potentially providing new ideas. As a result, this forms a cultural barrier to innovation; employees are not offered the incentive and opportunity to “explore” a new idea and take risks.

An agency’s organizational strategy can also influence its innovative capacity. Some agencies delegate innovation to a particular group (or industry), while others have formal programs with varying degrees of support and incentives. Some will recognize and allow innovation only in controlled environments. By contrast, some private sector companies were not only founded on innovation but have embedded it into their organizations. For example, a popular Web search engine company expects and allocates a percentage of an employee’s time to innovation and projects. Other companies encourage innovation with rewards, lab time, and even funding for effective teams to encourage good ideas. In many cases, government agencies should transform their organizational structures and skill sets to meet the changing times. Agencies that reevaluate and

take steps to increase their innovative quotient can make a more meaningful impact on their outcomes and overall operations.

While many Federal agencies are just starting to integrate innovation into their organizations, some stand out for their progress. The Defense Advanced Research Projects Agency and the Intelligence Advanced Research Projects Agency have embedded innovation into their processes and culture with results that have not only produced advances for government, but also industry. Examples include networked computing (the forerunner of the Internet) and geospatial intelligence (mapping applications). Similarly, projects like Challenge.gov are promoting innovation, collaboration, and openness across government through various incentives.

Lessons from the front lines

- **Equal opportunity innovation.** Innovation is about doing things differently, not just doing different things. Different from invention, innovation often arises when you effectively apply existing concepts to new problems. But agencies should resist an urge to create an “innovation department” to solve problems. These departments can often turn out to be counterproductive and limiting. In some cases, this model may be needed instead for research and development functions or product development. But it largely does not work when it is aimed at enhancing productivity and implementing change across an enterprise.
- **Hypotheses, not requirements.** A key to measured innovation is asking more effective questions — ones raised by specific mission problems — that set a balanced tone. Very general questions, like “Has anyone had any good ideas today?” are more likely to elicit underwhelming responses or misdirect people’s energies. On the other hand, overly prescriptive requests may spur comments on ideas that you already have, making it difficult to innovate at the critical early stage. The U.S. Air Force’s Cyber Command, which is asking how it can be more proactive, preemptive, and predictive in identifying cyber threats, took an effective approach to harnessing innovation. As described at the Armed Forces Communications and Electronics Association’s CyberSpace 2012 Symposium, Gen. William Shelton, chief of Air Force Space Command, said the service shifted from using the term “computer network operations” to a more active description of the mission — “cyberspace superiority.”¹

Reframing the problem is at the core of the service's new Air Force doctrine document and is helping the DoD to better integrate cyber operations across multiple domains.

- **Inspiration from unexpected places.** From W. Edwards Deming to Steve Jobs, history is brimming with examples of how the cross-pollination of unlikely disciplines led to specific innovations. Similarly, agencies seeking to achieve results in measured innovation should open the process to those outside of their traditional circles. Platforms like Challenge.gov² have produced a number of effective examples. For instance, NASA last year posted a problem related to mapping dark matter that had eluded scientists for decades. In less than one week, a doctoral student studying glaciers submitted an algorithm that outperformed those used in astronomy. The solution is now helping the space agency to more effectively calculate the size of the universe and lay the groundwork for future collaboration.

Getting started

- 1. Develop a relevant question.** Confirm the problem that is being solved directly relates to the agency's primary mission objectives.
- 2. Set criteria.** Determine the components and issues that need to be solved.
- 3. Discern good ideas from bad ideas.** Once the question has been posed, apply the criteria with a swift decision mechanism that catches good ideas faster. Remember, not all good ideas are new, but perhaps, newly applied.
- 4. Get to prototype faster.** The prototyping process works not just with technologies, but also with business-process innovations. Getting to prototypes faster can help people react to things that are tactile and visual rather than simply scrawled on a piece of paper.
- 5. Celebrate achievement.** Champion and publicize approaches to show that the organization values achievement so that future participants have the hope and inspiration that they can do it next time.

Bottom line

Measured innovation is not open-ended exploration. Instead, it is a disciplined approach in asking more relevant questions up front and then working backwards towards the approach. It is wise to balance your portfolio of "innovation initiatives" with lightweight innovation and disruptive innovation so you can build up a series of successes rather than only swinging for the fences with the harder-to-come-by big win. By helping employees to innovate, opening the process beyond the inner circle to more participants across disciplines, and following a rapid prototyping process that celebrates results, Federal agencies can make progress in overcoming real challenges that will likely enhance their missions and provide a return beyond expectation.

Federal perspective endnotes

¹ <http://www.military.com/news/article/air-force-news/air-force-space-chief-discusses-cyber-challenges.html>

² <http://www.whitehouse.gov/blog/2011/06/27/competition-shines-light-dark-matter>

10 Outside-in Architecture



Finding the sweet spot between 'need to share' and 'need to own'

For decades, businesses have typically been rewarded for consolidation around standard processes and stockpiling assets through people, technology and goods. Operations were assumed to be confined within organizational boundaries, with transactions viewed as short-lived events following well-defined steps. Systems were built primarily to enhance execution within their own self-contained scope of control.

Conventional wisdom about these principles is changing, and it's changing fast. Flexibility in operating and business models today is emerging to be a key differentiator. Markets and business conditions are shifting rapidly, necessitating new capabilities that can adapt to changing players, rules and desired outcomes. Sustaining innovation, both inside the organization and within broader ecosystems, is emerging as a top priority.

Many companies are discovering they need a new kind of leverage – *capability* leverage – to mobilize third parties that can add value. As a result, the traditional *need to own* is colliding with the emerging *need to share*, shifting solution architectures away from a siloed, enterprise-out design pattern. These new architectures are designed to *anticipate* service and people dependencies from the outside – and to *require* that data and systems be encapsulated for external consumption. Outside-in, not inside-out, is becoming the standard.

Outside-in architecture requires an organization to think about its operations and processes as a collection of business capabilities or services. Each individual service can then be examined to determine how it can be most effectively fulfilled – either by strategically standardizing on existing package solutions or custom technology

investments; or by sourcing through platform, software or business services available through the cloud. Similar analysis should be performed at the data, information and employee levels.

Most organizations that adopt outside-in thinking are in a strong position to share information and outcomes with business partners – and even with the public – to foster trust, gain insights and spur ecosystem investment. This is partly because technical architectures are emerging that allow end-to-end business capabilities to be orchestrated across large numbers of corporate entities. They also enable a combination of on-premise and cloud-based services. Plus, outside-in organizations are able to efficiently find and access specialized, independent contractors, allowing experience to be sourced at the time of need.

An outside-in architecture vision represents a significant departure from the status quo. Bringing together third parties to grow services and create value effectively requires the ability to manage, coordinate and orchestrate many moving parts. At the same time, defining and implementing policies across solutions, enterprises and providers is essential – at the infrastructure level, at the application level, at the people level and at the business level. This takes enormous discipline.

As outside-in becomes the new normal, standards will emerge and platforms will likely evolve to decrease the cost of provisioning, managing and controlling each step in long-running processes. In the short-term, however, this architectural transition requires new skills from the CIO and the IT organization. CIOs who anticipate and understand the opportunity will likely have the ability to become much more effective business collaborators with other executive leaders.

History repeating itself?

A service-oriented business architecture has been the Holy Grail of IT departments for years¹. Outside-in architecture is an even more advanced concept – one in which workers, business functions, IT systems and supporting infrastructure are essentially interchangeable building blocks across many different organizations and participants. While outside-in architectures can be deployed more easily if service-oriented architectures are already in place, transition paths to outside-in can accommodate more traditional enterprise architectures through the use of wrappers and other measures.

	What were the challenges?	What's different in 2012?
Enterprise application integration (EAI)	<ul style="list-style-type: none"> • Predominantly focused within organizational boundaries, with proprietary middleware tools and messaging protocols that made cross-organization communication difficult. • Many use cases were based on data synchronization and enforcing the integrity of distributed invocations of transactional systems. This approach was incomprehensible to business resources – and tightly coupled with underlying technologies. • Advanced techniques such as workflow and business process management assumed a sequential, deterministic, short-running series of transactions. Solutions were less effective in dealing with uncertainty, or when they required significant human intervention. 	<ul style="list-style-type: none"> • Outside-in architecture requires that higher-level business capabilities are defined clearly, which in turn allows for a level of abstraction that can ease heterogeneous communication and semantic context. • A clean separation of services up and down the stack, from high-level business capabilities to low-level infrastructure, requires loose coupling. Each service can call another service's business rules, data or infrastructure only through the well-defined interface. Any individual service can be swapped out without affecting other pieces of the architecture. • Outside-in architecture assumes long-running interactions with a master "hub" orchestrating a predefined end-to-end process. Each node must be prepared to fully describe its business context. The policy layer is essential, as it can manage access, guide invocation and allow for distributed business rules to be applied.
Service-oriented architecture (SOA)/ Web services	<ul style="list-style-type: none"> • SOA and web services proved to be effective architecture patterns, but solely for the technical stack. • Refactoring of legacy packages and custom systems was easiest when tapping into existing interfaces and APIs – sacrificing loose coupling for speed of integration. • Difficulties in sharing business context, process semantics and rules for manual interaction across internal and external actors. 	<ul style="list-style-type: none"> • Outside-in architecture advances SOA beyond the technical stack, allowing organizations to dynamically assemble combinations of people, processes and systems to solve business problems. • Outside-in architectures can be formed by retrofitting legacy systems. But required layers of abstraction and extensibility will likely improve upon existing control points and interfaces, leading to the need to build out additional inter- and intra-application components. • Policy-driven interoperability is designed to help solve several of the correlation and context issues – ideally operating on stateless, independent and self-contained services.

Technology implications

The technology shift to outside-in has been decades in the making, as stove-piped and proprietary technical stacks have been giving way to standards, web-based communication. Adding to the momentum has been the drive for interoperability from the operating environment up to the capability level. Bringing the full vision of outside-in architecture to fruition requires a sophisticated platform of services to identity, provision, orchestrate, meter, bill and mediate events.

Topic	Description
Atomic transaction processing	As workloads span multiple systems and organizations, there is little confirmation of atomicity across discrete, self-contained units of work. In an outside-in world, failure must be addressed not by automated roll-back, but with compensating transactions, which either undo what has occurred up to the point of failure or address the issue that is halting execution.
Human interaction	Outside-in is inherently a pessimistic architecture, one that accounts for fluid business rules and capabilities while anticipating exceptions. End users – employees, partners and even customers – are seen as necessary adjudicators, applying business context to help make decisions in case of a conflict or failure. They also help monitor whether business and market evolutions require underlying rule or policy updates.
Time sensitivity	Because outside-in architecture must allow for long-running transactions, it is likely that policies and rules may change before a transaction reaches its conclusion. This can lead to a need for temporal awareness across services or for versioning so that this interaction is allowed to run to completion under the old policy ² . Systems should allow for the evaluation of transactions, the versioning and persistence of services and policies, and the ability to recreate state and subsequent logic according to business context.
Policy extraction	Legacy systems and data sources can be encapsulated and service-enabled through several modern tools, from mining metadata to investigating integrated development and run-time environments, to generating code stubs and starting-points for policy externalization.
Federated identities	Governing authentication, access and entitlements of individuals and systems to underlying workloads – manual tasks, transactions or data – is a critical centralized policy required for effective outside-in architecture, with interoperability between actors and agents.
Backwards compatibility	Tactically, outside-in architectures should be tolerant of aging technologies and of traditional offline modes of communication, such as voice, fax and hardcopy, to allow for a wide range of potential participants. At a more sophisticated level, services, rules and policies must follow API leading practices to protect context and interoperability as updated versions are released.

Lessons from the frontlines

Putting the customer in customer service

Rearden Commerce reimagined its travel and entertainment services from the outside in, by providing service to end users through facilitating multi-party transactions (such as travel itineraries with flights, car services and hotels) sourced from more than 200,000 member merchants. A virtual common policy platform was created, which can be invoked by two million customers when searching for offers based on geography, vendor preference, logistics and expense policy constraints. The platform is also used by merchants when listing, describing and promoting their potential services. In addition, it is used by Rearden to drive long-running transactions and resolve exceptions – such as rebooking tickets, changing hotels and canceling dinner reservations in real-time if a flight segment is delayed. New partner services can be continuously added to the ecosystem, so they can be discovered by customers who may need them. Rearden moves beyond the business capabilities layer by linking its functional services to the underlying infrastructure stack. Servers can be automatically provisioned at the hardware layer due to policies encountered at the business layer. In addition, response time delays that may violate service-level agreements (SLAs) can lead to packet prioritization at the network layer to help mitigate potential issues.

Supplying flexibility and scalability to the supply chain

An ever-changing virtual supply chain is at the heart of Li & Fung's growth in recent years. The company itself does not perform any of the steps in the supply chain. Instead, it orchestrates the efforts of more than 10,000 business partners in more than 40 countries, dynamically procuring the capabilities to produce a wide range of apparel and goods. Li & Fung's business architecture has been defined in terms of services and capabilities, with attributes of price, timing, quality and reliability driving policy-matching and constraints. As an example, managing director William

Fung describes the manufacturing of a men's shirt with a typical nine-month window: The cheapest way to produce the shirt is to get fabric from certain parts of China, ship it to Bangladesh, and make the shirt there. But if the shirt sees high market demand and requires an in-season manufacturing run, it is better to take the same fabric and produce the shirt in Shanghai – at higher costs, but with faster turn-around time and higher quality³. As a result, Li & Fung can move quickly to capture innovative product ideas or market arbitrage around any distinct part of its value chain.

Financing terms on their terms

TradeCard is a New York-based company providing supply chain management solutions to more than 4,000 business partners operating in 50 countries around the world. The company provides financing arrangements to participants in the global supply chains of their clients. These supply chains can involve diverse participants from many parts of the world, which means they involve long-lived interactions. Because of increasingly volatile global economic conditions and the risk of disruptions, new financing requirements can arise unexpectedly, often with the need for new participants to be brought in. Since financing decisions are heavily shaped by broader business policies that can change rapidly, TradeCard has evolved to an IT model with key components of the outside-in architecture, including an emphasis on explicit management and mediation of policies across diverse participants. For example, TradeCard became aware of the impact of a change in a buyer's payment strategy for a specific supplier. The buyer wanted to pay invoices on a 45-day basis, but the supplier needed to be paid on a 30-day basis. TradeCard was able to broker a private relationship between the supplier and a financing agency, where the financing agency paid the supplier, charging a fee to make the early payment.



My take

Dan Pritchett

Chief Technology Officer

Rearden Commerce

Rearden Commerce's business is largely focused on the travel industry. Our job is to help connect travelers to the services they need – housing, airfare, ground transportation and special services. By definition, we're dealing with a fragmented industry, with a multitude of "outside" constituents and resources, from the biggest airlines to mom and pop travel shops. Outside-in architecture is the air we breathe.

Our technology platform needs to act like a global distribution system – one that can integrate with cutting-edge technologies one minute or mimic the cryptic 3270 terminal commands to a legacy booking system the next. And one that can route requests based on the ever-changing needs of the traveler across a fluid collection of service providers.

From the start, we faced a number of outside-in challenges, starting with policies. In business travel, policy is a big deal. For example, consider issues of determining which employees are allowed to fly first class, or the need to stay within preset budget limits, or the challenge of keeping track of individual travel preferences. Our approach evolved to externalize policy from the code itself, allowing policies to be expressed based on individual customer needs and preferences. As you can imagine, this wasn't something we were able to accomplish overnight. We had to rewrite virtually all our code to make our policy external. And, as you add partners to the platform, there's a greater demand for policies to be both transparent and external, rather than inherent to the platform.

While this has been an enormous amount of work, it's well worth the effort. Travel buyers appreciate the fact that these systems understand their individual preferences and requirements – the context is automatically defined. For travel providers, having direct, transparent access to policies helps them to operate more efficiently and deliver the tailored services that keep customers happy. Sharing more information, more intelligently, is a good thing.

An outside-in approach has also made it easier to dive into new technologies such as cloud and mobile, because we start with a services mentality. Mobile, for instance, is a logical extension of what we do, and our technology platform has shown to be an excellent foundation as we introduce mobile offerings. As we move deeper into the cloud, we expect to find the same to be true. These capabilities can also allow us to expand the reach of our transparent, outside-in approach among travel consumers and service providers alike.

Where do you start?

Outside-in architecture should not be relegated to the role of an academic exercise or thought experiment. The concepts are real and tangible. However, they do represent a series of significant shifts for the enterprise, which should reconsider everything from how business processes are envisioned to the lowest level of the technical operating environment.

The good news is that companies can make the migration to outside-in architectures pragmatically, starting with efforts to access and mobilize third-party resources. These initiatives can often be launched with modest, short-term efforts. Begin by exposing the necessary internal resources through wrappers – and by making them available to specialized policy and interaction servers – rather than trying to re-architect everything inside the enterprise. For example, Rearden Commerce has been migrating to an outside-in architecture for several years through a staged effort, while continuing to run its core business and support growth rates.

Before the technical architecture and the migration path get locked down, though, the following issues should be considered from a business and technical perspective:

- **Business service decomposition.** Don't make any moves around orchestration and policy layers until you take a step back and deconstruct your business into coarse capabilities. These should then be decomposed into business services. Avoid process definition traps, since the order of sequential steps is less important at this point than articulating the steps themselves. Make sure the semantics and context used to describe services are business-based. The point is to loosely couple the architecture, separating business architecture from the applications, data and infrastructure.
- **Look for diversity.** Focus early on business areas with a large number of existing or potential service providers, or areas with high volatility in business rules or policies. The real potential of outside-in is to create value by orchestrating demand with the most effective supply in dynamic markets.

- **Long-running interactions.** Another source of opportunity is any business service with extended time between start and finish. The pessimistic architecture of outside-in can allow for exceptions to be properly handled and any manual workloads to be effectively handled.
- **Look at the edges.** Early and effective outside-in migrations take place at the edge of an organization's core platforms. Ancillary value creation opportunities involve more active collaboration with third parties, and allow both the business and the technology organizations to introduce outside-in concepts and gain real world functional and technical design experience. That learning can then be applied to the broader organization.
- **Innovation revolution.** A disciplined approach to innovation, whether internal or external, can identify candidates to anchor an outside-in architecture transformation. Does a peer business unit have a better dynamic pricing engine? Outside-in architecture can take localized innovations and help drive them to enterprise assets. Does an external rating service provide real-time information that makes your product's value proposition clearer to customers? Incremental additions from external sources can help illustrate the value of outside-in and provide the catalyst to get business and technology providers on board.



Bottom line

Outside-in architecture institutionalizes the ‘need to share’ philosophy that is required as ecosystems get more complex, constituents get more social and business factors change at Internet speed. There are some nuances and technical implementation details, but the most critical step is to identify specific opportunities to connect with a large number of other businesses in arenas where performance is under growing pressure. Consider starting by exposing IT resources, applications and data using wrappers with the specific goal of accessing complementary resources that can help drive performance improvements. The good news is that there are pragmatic pathways for enterprises to potentially reap early benefits of outside-in architectures, without requiring a massive re-architecture at the outset.

Endnotes

¹ Additional information is available in Deloitte Consulting LLP (2010), “Depth Perception: A dozen technology trends shaping business and IT in 2010”, <http://www.deloitte.com/us/2010technologytrends>, Chapter 10.

² Thomas B. Winans and John Seely Brown, *Web Services 2.0 - Policy-driven Service Oriented Architectures*, <http://johnseelybrown.com/Web%20Services%20POV.pdf> (May 2008).

³ William Fung, *The Supply Chain is Flat*, <http://m.strategy-business.com/article/00018?gko=46d39> (February 3, 2010).

Go with the flow

To adapt to a rapidly shifting business landscape with greater expectations of agility and transparency, many private- and public-sector organizations are increasingly adopting an outside-in thinking that mobilizes third-party resources to help provide new capabilities, sustain innovation, enable disruption, and add value. They have learned that an inside-out approach can be limiting — business processes and operations thinking confined within their own boundaries.

Outside-in architecture is based on the premise that more effective enterprise design can no longer be achieved by simply automating existing business processes or focusing modernization solely on system or device enhancement (that is, an inside-out approach). More effective enterprise architecture requires a design that is driven by an outside-in services perspective while taking advantage of modern IT as an enabler. In other words, the (re)design of the enterprise should be driven by the values and relationships of the services and capabilities delivered to stakeholders and other participants in the mission/business ecosystem, followed by the subsequent improvement of business operations to achieve today's cost, quality, and timeliness objectives. In this sense, outside-in architecture can provide better guidance for complex collaborative ecosystems that are "relational" in nature by focusing on supporting relationships (and long-term business connections) with citizens, other government agencies, and commercial partners rather than short-term transactions.

As an example, many Federal agencies consider information sharing as moving data from within an organization to outside its borders — a classic inside-out architecture perspective. Outside-in architecture, which is based on both a new paradigm of information management and a new operating environment, turns that on its head. Rather than view information as stacks and piles that should be managed behind institutional walls, agencies should regard it as a dynamic flow that constantly changes shape, size, and direction. Private sector organizations are working to shift to this new model, renewing their interest in a host of technologies and processes like enterprise application integration and service oriented architecture. For Federal agencies, the effort suggests the shape of the enterprise to come.

What is different for Federal

"Need-to-know" is typically a well-versed tenet in the Federal government, which sharply defines agency functions, responsibilities, and governing policies. However, as many new agencies have been formed over the past decade with distinct configurations, functions, and areas of operational responsibilities, their need to share has quickly eclipsed their need to own in terms of information — extending even to systems and capabilities. While organizational jurisdictions are relatively firm, boundaries are softening. Agencies are increasingly collaborating with one another to leverage information, sharing components, leading practices, and effective systems more than ever before to improve or even provide new mission capabilities. From intelligence to health care, agencies are enhancing their capabilities by adding specialists and tools to help take advantage of this cross-component collaboration.

Information sharing is one of the top drivers of outside-in architecture for Federal agencies, which are both incentivized and mandated to socialize information among multiple stakeholders. Exchange of critical data has become ingrained in several areas, such as the intelligence community, which developed cross-agency tools like Intellipedia, law enforcement agencies, which established fusion centers and the Information Sharing Environment, and civilian agencies, which share information with industry to accomplish their mission. However, the exponential growth of information is rapidly outstripping the abilities of agencies to fully manage their data. Through an outside-in architecture, agencies can reach a much higher potential. They can start by tapping into data using a hub-and-spoke (agency at the center with point-to-point linkages to each outside entity), shareable architecture rather than try to manage and control it directly.

When used to its potential, Federal Enterprise Architecture (FEA) is designed to drive an outside-in perspective aligning desired capabilities with the business goals at an enterprise level. It is currently evolving for a greater focus on transparency, collaboration, and the mission's need to share. As a result, outside-in architecture can provide better guidance for complex collaborative ecosystems that are relational in nature. It focuses on supporting relationships — and long-term business connections — with citizens, other government agencies, and private-sector collaborators.

Transforming to a new outside-in architecture can lead to discoverable services and data sources that provide greater information sharing to meet mission requirements and support a broader community — across the government, linked with industry, and connected with citizens. Taking an outside-in *services* perspective, operations and processes can be viewed as a collection of business capabilities or services and allow a more effective enterprise design.

However, there are significant barriers — particularly in operational security and data sensitivity — in transitioning to an outside-in mindset. Redefining boundaries and updating processes for security and information management is needed. Additionally, many agencies have not yet developed mechanisms that are effective enough to access data and manage identities. While new policies, such as OMB Mandate 11-11¹ (which seeks to expedite the implementation of standard credentials for facility and information access), will help mature some of these capabilities, other challenges may be more difficult to resolve. For instance, despite greater information sharing over the last decade, agency culture and organizational designs still inhibit the full potential for data exchange. These issues are pitting legitimate need-to-know concerns against a need-to-share world. Overcoming them will require strong leadership.

Lessons from the front lines

- **See the big picture.** Information typically is not where we need it to be. This core principle is motivating several Federal departments to consolidate their information stores to gain greater visibility into a particular problem, taking a broader government view. For example, the Department of Treasury is exploring ways to consolidate multiple views of public finances into a single, integrated perspective — a perspective that can be a starting point for several agencies or programs. It is about combining data capabilities and reducing overlap, duplication, and waste, while also increasing accuracy.
- **Value community.** While outside-in architecture can provide agencies with a host of benefits inside their organization, a significant asset might be the power that it taps outside of the organization. For example, intelligence and coalition partners within the DoD have banded together to counter the threat of Improvised Explosive Devices (IEDs). As a result, the DoD community is using multiple data sets and an array of capabilities to link IEDs to the terrorists that fund their development to hopefully reduce the risk to service members and save lives.
- **Strive for better, not more.** The public today does not necessarily want more government services, they want better services. Agencies should consider embracing social media and information sharing as tools to help meet these expectations and the mission. Younger generations of both constituents and workers, who tend to be more tech-savvy, better networked, and demand greater responsiveness, are also driving agencies to adopt an environment that changes from near-time to real-time information flow. To gain competitive talent and fulfill citizen expectations, agencies may have to accept a minor decrease in fidelity for a major increase in agility.

Getting started

- 1. Build on sharing efforts.** Agencies should build on effective information sharing efforts through already established working relationships and governance structures. Programs like the National Information Exchange Model offer ready examples that agencies should look to in their transition to an outside-in architecture.
- 2. Gain cross-agency support.** Existing collaborative structures like the Federal CIO Council and the Information Sharing Environment (which specifically serves law enforcement and justice organizations) can serve as catalysts for change. Agencies should take advantage of these opportunities to build interoperable systems that bridge traditional stove-pipes.
- 3. Use shared services.** The Federal CIO's "Shared-First" initiative aims to establish a host of shared IT services across the government from cloud computing to a government-wide marketplace for data center availability. This shared approach is designed to improve return on investment, enhance productivity, and increase communications with stakeholders. It will likely form the backbone of any outside-in architecture and should be actively engaged.

Bottom line

Outside-in architecture is not a technology, but a change in the way many Federal agencies see their role in the information landscape across the Federal government. As that landscape is transformed, traditional organizational structures — both in terms of governance and data — should adapt. Agencies can begin by accessing and mobilizing third-party resources to help them launch, at first, modest efforts and then building on that to enhance the mission and improve value. Although many challenges persist — cybersecurity and organizational boundaries being chief among them — the need to share information and the potential for enhanced collaboration are already shaping concurrent initiatives across the government. These will only increase the imperative for agencies to facilitate this new model of operation, not only to adapt to a post digital reality, but to accomplish mission objectives at a new scale and speed.

Federal perspective endnote

¹ <http://www.whitehouse.gov/sites/default/files/omb/memoranda/2011/m11-11.pdf>

Conclusion

Next floor – Postdigital

This year's trends are manifestations and applications of digital forces – analytics, mobility, social business, cloud and cyber security – already in play. As we observe accelerating patterns of adoption, we envision a time in which these forces are mature, implemented and integrated. Baked-in vs. bolted-on. Creating a new normal. It is then that we will be entering the postdigital era.

In the post-industrial era, business didn't set industrialization aside – it just became the new normal. The postdigital era is following a similar pattern, but it's about leveraging digitalization vs. industrialization. The Postdigital Enterprise will be a business that thrives in that emerging future where operating models, business models and even markets and industries are transformed.

Today, each of these trends can be valuable individually. The combination of two, three, or even more can help accelerate progress towards this new set of business capabilities – enabling a new set of business rules for operations, performance and competition.

We close this year's report with the familiar quote from writer and futurist William Gibson: "The future is already here... it is just not evenly distributed." Our hope is that the Tech Trends 2012 will help you elevate your business and technology to the top of the distribution.

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